
**Information technology — UPnP
Device Architecture —**

Part 20-14:

**Audio video device control protocol —
Level 4 — Scheduled recording service**

Technologies de l'information — Architecture de dispositif UPnP —

*Partie 20-14: Protocole de contrôle de dispositif audio-vidéo —
Niveau 4 — Service d'enregistrement programmé*



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Foreword

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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 and later by UPnP Forum. 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 29341-1:2008
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

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 WANPPPConnection: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

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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 RADAConfig: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

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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

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1 Scope

This service definition is compliant with the UPnP Device Architecture version 1.0 [14]. It defines a service type referred to herein as ScheduledRecording service.

The ScheduledRecording service is a UPnP service that allows control points to schedule the recording of content. Generally, this content is broadcast content, but this specification does not limit itself to broadcast content. This service type enables the following functions:

- Create a recordSchedule so that it is added to the list of recordSchedule instances. Each recordSchedule describes user-level recording instructions for the ScheduledRecording service.
- Browse a list of recordSchedule instances stored by the ScheduledRecording service.
- Delete a recordSchedule so that it is removed from the list of recordSchedule instances.
- Browse a list of recordTask instances, stored by the ScheduledRecording service. The ScheduledRecording service may create zero or more recordTask instances for each recordSchedule. A recordTask represents a discrete recording operation of a recordSchedule.
- Enable or disable individual recordTask instances.
- Enable or disable a recordSchedule.
- Receive notifications indicating change of recordSchedule or recordTask list.

The ScheduledRecording service does not require a dependency on any UPnP services other than a co-located ContentDirectory service, which provides the following functions:

- A ContentDirectory service provides channel line-up to allow users to find recordable channels. A control point may use this metadata when creating a recordSchedule on a ScheduledRecording service.
- A ContentDirectory service may provide Electronic Program Guide (EPG) features to allow users to find recordable content. A control point may use this metadata when creating a recordSchedule on a ScheduledRecording service.
- Contents recorded by the ScheduledRecording service may be exposed by a ContentDirectory service.

The architectural relationship among the different concepts, defined by the ScheduledRecording service can be summarized as follows: A ScheduledRecording service owns a flat (that is: non-nested) list of recordSchedule instances, meaning that the ScheduledRecording service may create, destroy, or change recordSchedule instances. A recordSchedule represents user-level instructions to perform recording operations. Generally, a user constructs his instructions to a ScheduledRecording service via a control point that invokes UPnP actions that affect the list of recordSchedule instances. In all cases, the ScheduledRecording service shall be able to describe discrete recording operations for a recordSchedule through a list of associated recordTask instances. A recordTask can only exist with a recordSchedule (that is: never orphaned). Thus when a recordTask is created by the ScheduledRecording service, its lifetime depends on its parent recordSchedule. An individual recordTask can be selectively enabled or disabled.

This service template does not address:

- Implementations where the ScheduledRecording service and its associated ContentDirectory service are not co-located in the same device.

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.

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3 Terms, definitions, symbols and abbreviations

For the purposes of this document, the terms and definitions given in [14] and the following 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

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 Terms specific to ScheduledRecording service

3.2.1 CDS

ContentDirectory service

3.2.2 EPG

Electronic Program Guide

3.2.3 SRS

ScheduledRecording service

3.2.4 CDS object

An object in a ContentDirectory service metadata hierarchy; that is: [item](#) or [container](#).

3.2.5 User Channel

A User Channel is a ContentDirectory service object that exposes the (continuous) content stream of a particular broadcast channel. Usually, the actual channel that the User Channel exposes is determined by the user through some device-specific interaction. Examples are: manual programming of a number of channel presets; invoking of the auto-scan functionality of a device; predefined fixed channel assignments by the device manufacturer.

3.2.6 Channel Group

A Channel Group is a ContentDirectory service [container](#) that holds a number of User Channel items. Typically, a Channel Group contains User Channel items that are bound to a particular hardware resource. Examples include: a single analog cable TV tuner, a HDTV digital tuner, an AM/FM radio tuner, etc.

3.2.7 Channel Line-up

A service provider-generated list of channels with their associated content provider.

3.2.8 object

A [recordSchedule](#) or a [recordTask](#) (see definition of [recordSchedule](#) and [recordTask](#) below).

3.2.9 class

As defined in the ContentDirectory service specification, a class is used to assign a type to an object. It also identifies the minimum required set of properties that shall be present on that object and the allowed properties that may be present. Classes are organized in a hierarchy with certain classes being derived from others as in a typical object-oriented system. This specification defines two base classes ([recordSchedule](#) and [recordTask](#)) from which all other classes are derived.

3.2.10 object Modification

An object is considered modified when one of its properties (or its list of properties) is modified; that is: added, removed or changed in value (see definition of property below).

3.2.11 [recordSchedule](#)

A ScheduledRecording service construct that represents a complete set of recording instructions to the service, which allows the service to generate [recordTask](#) objects as necessary to record the desired content. The creator of the [recordSchedule](#) object assigns it a specific class, based on the type and complexity of the instructions, used to identify the content.

A [recordSchedule](#) is represented in XML as an `<item>...</item>` element.

3.2.12 Conflicting [recordSchedule](#)

A conflicting [recordSchedule](#) exists when one or more of its associated [recordTask](#) instances is in conflict with another [recordTask](#) instance.

3.2.13 recordTask

A ScheduledRecording service construct that represents a discrete recording operation of the underlying recording system. A recordTask is created by its parent recordSchedule and can not be directly created by the user. The parent-child relationship of recordSchedule and recordTask can be 1-to-zero or more.

A recordTask is represented in XML as an `<item>...</item>` element.

3.2.14 Conflicting recordTask

A conflicting recordTask exists when it overlaps in time with one or more other recordTask instances and the ScheduledRecording service has insufficient resources to record all of them. Existing pre-roll and post-roll adjustments (as defined by the scheduledStartTimeAdjust and scheduledDurationAdjust properties) shall be taken into account when determining conflicts.

3.2.15 recordScheduleParts

A ScheduledRecording service construct that represents user-level recording instructions to the service, which provide a template to generate complete recordSchedule objects. The creator of the recordScheduleParts object assigns it a specific class, based on the type and complexity of the instructions, used to identify the content.

A recordScheduleParts is represented in XML as an `<item>...</item>` element.

3.2.16 Property-set Data Types

Certain ScheduledRecording service actions use *property-set* arguments that contain information about a set of properties, typically expressed in the form of an *srs XML Document* (for example, the Elements argument of the CreateRecordSchedule() action). The set of properties that can exist in a *property-set* argument is implementation dependent. Indeed, the set of allowed properties that a particular ScheduledRecording service chooses to implement is vendor dependent.

This specification currently defines three different *property-set* data types:

- A_ARG_TYPE_RecordSchedule
- A_ARG_TYPE_RecordTask
- A_ARG_TYPE_RecordScheduleParts

Although these three types are different, they are very similar in nature and are defined using the same SRS schema [26], which defines all the properties that can ever occur in any of the three *property-set* data types. They differ only in the set of properties that can appear in them and in the values that are allowed for these properties.

3.2.17 Property

A property in the ScheduledRecording service represents a characteristic of an object. Properties are distinguished by their names. The ScheduledRecording service defines two kinds of properties – independent and dependent. Each independent property has zero or more dependent properties associated with it. Independent property names contain no “@” symbol; they could contain an XML namespace prefix (see below for an explanation of the relationship between properties and XML). Each dependent property is associated either with exactly one independent property or directly with a ScheduledRecording service class. The name of a dependent property that is associated with an independent property is the concatenation of three parts: its associated independent property name, the “@” symbol, and a name for the relationship between the two properties’ values. The name of a dependent property that is associated directly with a class is just the “@” symbol followed by the relationship name. Their data types and meanings are defined in Annex B.

Even though ScheduledRecording service properties are not XML objects, XML is used to express them in all exchanges between a control point and a ScheduledRecording service implementation. This creates an unavoidable relationship between XML syntax and property names and values. In XML, an independent property is represented as an element. The property name is used as the element name. The property value is the element content. A dependent property is represented as an attribute in XML. The dependent property's relationship name is used as the attribute name. The dependent property's value is the attribute value. For dependent properties that are associated with an independent property, the attribute appears in the start tag of the element that represents its associated independent property. For dependent properties that are associated directly with a class, the attribute appears in the top-level start tag for each object of that class.

Examples:

Table 1 — Properties in XML

Property Name	XML Representation (srs declared as default namespace)
<u>title</u>	<title>...</title>
<u>taskProgramCode</u>	<taskProgramCode>...</taskProgramCode>
<u>taskProgramCode@type</u>	<taskProgramCode type="...">...</taskProgramCode>
<u>@id</u>	<item id="...">...</item>

3.2.18 Member Property

A property is a member of a particular class when the property is declared to be either required or allowed for that class.

3.2.19 Supported Member Property

A supported member property is a member property that is supported by a particular ScheduledRecording service implementation, according to the information returned by the GetPropertyList() action.

3.2.20 Multi-valued property

Some independent properties are multi-valued. This means that the property may occur more than once in an object.

3.2.21 Single-valued property

Most independent properties are single-valued. This means that the property shall occur at most once in an object. Some single-valued properties can contain a CSV list of values. A dependent property is always considered single-valued, because it can occur at most once with each occurrence of its associated independent property, even though the independent property could be multi-valued.

3.2.22 XML Document

A string that represents a valid XML 1.0 document according to a specific schema. Every occurrence of the phrase “*XML Document*” is preceded by the appropriate root element name, italicized, as listed in column 3, “Valid Root Element(s)” of Table 5.

For example, the phrase “*srs XML Document*” refers to an XML document based on the SRS Schema as defined in [26]. Such a document comprises a single <srs ...> root element, and it is allowed to be preceded by the XML declaration: <?xml version="1.0" ...?>.

Therefore, the string containing the *srs XML Document* will have one of the following two forms:

“<srs ...>...</srs>”
or

```
<?xml ...?>
<srs ...>...</srs>
```

3.2.23 XML Fragment

An *XML Fragment* is a sequence of XML elements that are valid direct or indirect child elements of the root element according to a specific schema. Every occurrence of the phrase “*XML Fragment*” is preceded by the appropriate root element name, italicized, as listed in column 3, “Valid Root Element(s)” of Table 5.

For example, the phrase “*srs XML Fragment*” refers to a sequence of XML elements that are defined in the SRS Schema as defined in [26]:

```
<item id="..." ...>...</item>”
or
<recordDestination          mediaType="..."          preference="...">
...
</recordDestination>”
or
<title>...</title>
<class>...</class>
<...>...</...>
...
<...>...</...>”
```

3.2.24 actualScheduledStartTime

The actual scheduled start date&time of a program item is defined as:

$$\text{actualScheduledEndTime} = \text{scheduledStartTime} + \text{scheduledStartTimeAdjust}$$

where scheduledStartTime is the scheduled broadcast start date&time of the program item and scheduledStartTimeAdjust is a user-supplied adjustment to that date&time, for example for pre-roll purposes.

3.2.25 actualStartTime

The actual start date&time of a program item is defined as:

$$\text{actualStartTime} = \text{actualScheduledStartTime} + \text{any device-specific record startup latency.}$$

3.2.26 actualScheduledEndTime

The actual scheduled end time of a program item is defined as:

$$\text{actualScheduledEndTime} = \text{scheduledStartTime} + \text{scheduledDuration} + \text{scheduledDurationAdjust}$$

where scheduledStartTime is the scheduled broadcast start date&time of the program item, scheduledDuration is the scheduled broadcast duration of the program item and scheduledDurationAdjust is a user-supplied adjustment to that duration, for example to select just a part of the program for recording.

3.2.27 actualEndTime

The actual end date&time of a program item is defined as:

$$\text{actualEndTime} = \text{actualScheduledEndTime} + \text{any device-specific record teardown latency.}$$

3.2.28 actualScheduledDuration

The actual scheduled duration of a program item is defined as:

$$\begin{aligned}
 actualScheduledDuration &= actualScheduledEndTime - actualScheduledStartTime \\
 &= \underline{scheduledDuration} + \underline{scheduledDurationAdjust} \\
 &\quad - \underline{scheduledStartTimeAdjust}
 \end{aligned}$$

where scheduledDuration is the scheduled broadcast duration of the program item, scheduledDurationAdjust is a user-supplied adjustment to that duration, and scheduledStartTimeAdjust is a user-supplied adjustment to the scheduled start date&time.

3.2.29 Lexical Sort Order

Lexical sort order refers to string sorting – also called collation – based on language and regional conventions. It is *not* based on the binary codes of the characters in strings. Furthermore, lexical sorting is not based on character sets; a single character set may have multiple sort orders, again according to language and regional conventions. It is also possible to have lexical sorts that are further refined according to user preference. For a complete discussion of this topic see [36], and the related standards [37] and [38]. The lexical sort algorithms are defined in [36]. It uses a secondary algorithm defined in [37] and supporting data tables defined in [38]. These three references together – [37], [36] and [38] – should be sufficient to implement a robust lexical sort.

Simple example: one of the most familiar examples is case-insensitive sorting on the ASCII subset of Unicode. In a binary ASCII sort, all lower case letters sort after the upper case “Z” because “Z” has a character code of 0x5A, and all lower case character codes are greater than or equal to 0x61.

More complex example: the “ö” character in German sorts between “n” and “p” characters whereas in Swedish, it sorts after “z”.

3.2.30 Lexical Matching

Lexical matching compares two (sub)strings for equality under certain lexical sorting conditions. *It is important to note* that equality in lexical matching is often less restrictive than equality in lexical sorting. In other words, two strings that are equal under a lexical sort will always be a lexical match. However, two strings that are a lexical match might not be equal under a lexical sort for the same language and region. In some cases, an implementation’s lexical sort might consider all alphabetic characters with diacritical marks (accents, umlauts, circumflexes, etc.) to be distinct, yet the same implementation might ignore diacritical marks in lexical matching. For example, the strings “résumé”, “resume” and “résumé” might sort as “resume” < “résumé” < “résumé”, but when a lexical match using the string “resume”, might find all three strings “résumé”, “resume” and “résumé”. For implementation techniques, see clause 8 in [36].

3.2.31 Simple Non-case-sensitive Sort Order

A simple non-case-sensitive sort order applies only to Roman alphabetic characters. All lower case ASCII alphabetic characters shall sort the same as their uppercase equivalent, except when compared directly with their upper case equivalent, in which case the upper case character should sort before its lower case equivalent. This means that of the following three ordering relations, (1) shall be true, at least one of (2) and (3) shall be true, and (2) should be true.

$$“A” \leq “a” < “B” \leq “b” < \dots < “Y” \leq “y” < “Z” \leq “z” \quad (1)$$

$$“A” < “a” < “B” < “b” < \dots < “Y” < “y” < “Z” < “z” \quad (2)$$

$$“A” = “a” < “B” = “b” < \dots < “Y” = “y” < “Z” = “z” \quad (3)$$

Additionally, the same upper and lower case relationships should hold for non-ASCII Roman alphabetic characters. That is, lower case alphabetic characters with

diacritical marks should sort as their upper case equivalent, except when compared directly with their upper case equivalent, in which case the upper case character should sort before its lower case equivalent. The ordering relation between ASCII and non-ASCII alphabetic characters is left unspecified. Also, the ordering relation between non-ASCII alphabetic characters that are not upper or lower case equivalents of each other is left unspecified. This is summarized in the following relations, where *c* represents any non-ASCII Roman alphabetic character. (4) should be true for all *c*. (5) should be true for all *c*. If (5) is false for any *c*, it should be false for all *c* and (6) should be true for all *c*.

$\text{upper}(c) \leq \text{lower}(c)$ (4)

$\text{upper}(c) < \text{lower}(c)$ (5)

$\text{upper}(c) = \text{lower}(c)$ (6)

3.2.32 Simple Non-case-sensitive Matching

In a simple non-case-sensitive match, relation (1) above in subclause 3.2.31 shall be true, and relation (6) above in subclause 3.2.31 should be true.

3.2.33 Numeric Sort Order

A sort order in which values are compared numerically. If the type of an individual value is numeric, the numeric value is used. If the type of an individual value is string, the string is converted to a number and that numeric value is used.

3.2.34 Boolean Sort Order

Boolean values are sorted with "0" (false) being less than "1" (true).

3.2.35 Sequenced Sort

A sequenced sort is a sort applied to a set of values, each of which is composed of a sequence of subvalues. The sequence is often in a CSV list, but there are other kinds of sequences used for sorting in this specification. The sequenced sort starts by sorting based on the first subvalue in the sequence. If all values differ in the first subvalue, the sort is finished. Otherwise, each subset of equal subvalues is then sorted based on the next subvalue in the sequence. This process repeats iteratively until there are no more subsets of equal subvalues or the sequence is exhausted.

3.2.36 Sequenced Lexical Sort

A sequenced sort in which all subvalues are strings and the subvalues are compared lexically.

3.2.37 Sequenced Numeric Sort

A sequenced sort in which each subvalue is either a number or the number represented by a string.

3.2.38 Lexical Numeric Sort

A lexical numeric sort is one where one or more substrings are known to represent numbers. The strings are then sorted using a sequenced sort, where the sequence is composed of the sequence of non-numeric and numeric substrings from the larger string.

For example, assume a property has the form <letter>-<number>, where <number> ranges from 1 to 10. In a straight ascending lexical sort, the values "A-10", "A-1", "A-2" would sort as: "A-1", "A-10", "A-2". "A-10" sorts before "A-2" because they are equal in the first two character positions, but in the third position, "1" < "2". However, in a lexical numeric sort, each string is considered to be a sequence of a letter and number separated by a hyphen. These values then sort as "A-1", "A-2", "A-10" because all three are equal in the first subvalue, "A", but the second subvalue sorts as 1, 2, 10 in numeric order.

3.2.39 **type** Relationship Sort

This is a sort defined exclusively for independent properties that have a dependent property relationship named "**type**". These properties are sorted as a sequence of two subvalues: the first subvalue is the value of the property's **xxx@type** dependent property; the second subvalue is the value of the independent property **xxx** itself. The **xxx@type** subvalues are sorted as specified for the dependent **xxx@type** property in its own subclause. The independent property subvalues are sorted according to the order specified in its subclause. Sorting of the independent property may vary with the value of the dependent property.

3.3 Symbols

3.3.1

::

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 2:

Table 2 — EBNF Operators

Operator	Semantics
<code>::=</code>	definition – the non-terminal symbol on the left is defined by one or more alternative sequences of terminals and/or non-terminals to its right.
<code> </code>	alternative separator – separates sequences on the right that are independently allowed definitions for the non-terminal on the left.
<code>*</code>	null repetition – means the expression to its left may occur zero or more times.
<code>+</code>	non-null repetition – means the expression to its left shall occur at least once and may occur more times.
<code>[]</code>	optional – the expression between the brackets is allowed.
<code>()</code>	grouping – groups the expressions between the parentheses.
<code>[character range]</code>	character range – 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 3 — CSV Examples

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

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 4 and Table 5. For each such namespace, Table 4 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 5 to cross-reference additional namespace information. Table 5 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 4. 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 4 — 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	AllowedTransformSettings and AllowedDefaultTransformSettings 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 LastChange state variable for AVTransport	[5]
cds-event	urn:schemas-upnp-org:av:cds-event	Evented LastChange state variable for ContentDirectory	[7]

Standard Name-space Prefix	Namespace Name	Namespace Description	Normative Definition Document Reference
cm-dciu	urn:schemas-upnp-org:av:cm-deviceClockInfoUpdates	Evented <u>DeviceClockInfoUpdates</u> state variable for ConnectionManager	[9]
cm-ftrlst	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]
rsc-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]
<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 5 — Schema-related Information

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

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

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 4. 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 6.

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

Table 6 — 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 4 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.
- **yyyymmdd** is the year, month and day (in the Gregorian calendar) that this schema was released.

Table 5 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 "rsc-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/rsc-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 "rsc-event" namespace was "<http://www.upnp.org/schemas/av/rsc-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 "rsc-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/rsc-event-v2.xsd" is linked to the most recent schema release of version 2 of the "rsc-event" namespace. Therefore, on May 31, 2006 (20060531), the undated schema URI was linked to the schema that is otherwise known as ".../av/rsc-event-v2-20060531.xsd". Furthermore, if the schema for version 2 of the "rsc-event" namespace was ever re-released, for example to fix a typo in the 20060531 schema, then the same undated schema URI (".../av/rsc-event-v2.xsd") would automatically be updated to link to the updated version 2 schema for the "rsc-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/rsc-event.xsd" was linked to the schema that is otherwise known as ".../av/rsc-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/rsc-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: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:ScheduledRecording:2](#)

ScheduledRecording service is used herein to refer to this service type.

5.2 ScheduledRecording Service Architecture

5.2.1 recordSchedule

A ScheduledRecording service implementation has a single, flat list of recordSchedule instances. A recordSchedule represents the user-level recording instructions to the ScheduledRecording service. These user-level instructions have various levels of complexity. For example, a simple instruction can state: “record channel 15 at 4PM on

March 19, 2004,” while a more complex instruction can state: “record all episodes of the *DIY Home Improvement Show* on any channel that has the show for the next month.” The behavior of a recordSchedule is described by one or more properties, and these properties can be manipulated through several actions.

As shown in Figure 1, when a control point requests a new scheduled recording to the ScheduledRecording service via the CreateRecordSchedule() action, the control point sets a number of properties and passes them to the ScheduledRecording service to express user-desired instructions to the scheduled recording. Then, as a response to the CreateRecordSchedule() action, the ScheduledRecording service creates a recordSchedule, assigns a unique ID to the recordSchedule and returns the recordSchedule with the complete set of initial property settings. The ScheduledRecording service shall add allowed properties to the recordSchedule when a control point did not specify them. Additionally, the ScheduledRecording service may add some informative properties.

If a control point specifies unsupported or unknown properties as input to the CreateRecordSchedule() action, the ScheduledRecording service shall gracefully ignore these. A control point can always parse the generated recordSchedule returned in the Result argument of the CreateRecordSchedule action to verify whether certain properties were rejected by the ScheduledRecording service. If unsupported values are set for supported properties, the ScheduledRecording service shall return an error and the recordSchedule shall not be created.

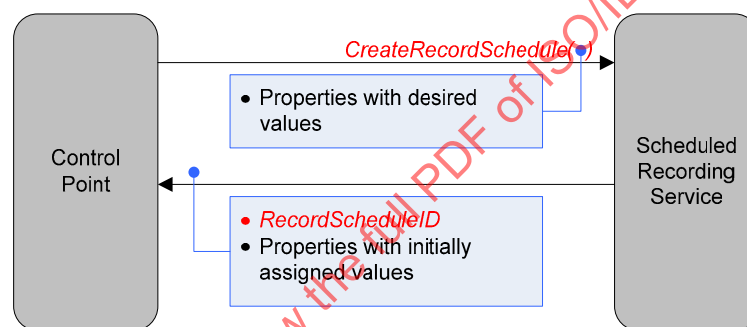


Figure 1 — Creating a new recordSchedule

Some properties are defined as allowed in the ScheduledRecording service. Therefore, a control point needs to determine which properties a ScheduledRecording service implementation actually supports. Since support levels and allowed values for properties can be different for recordScheduleParts, recordSchedule or recordTask usage, a pair of actions (GetPropertyList() and GetAllowedValues()) are provided to retrieve the relevant information. Figure 2 illustrates the concept.

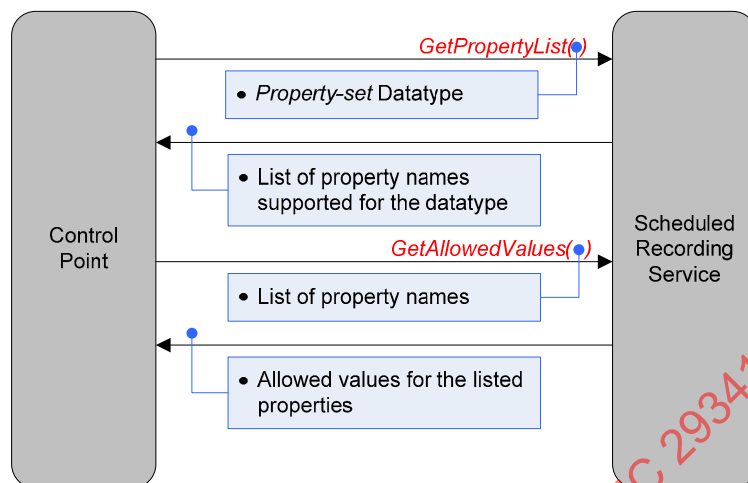


Figure 2 — Capability check.

Figure 3 illustrates how recordSchedule instances can be browsed by the control point after they have been created, to retrieve the updated current values of the properties.

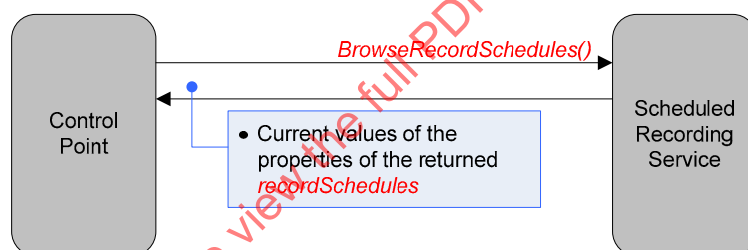


Figure 3 — Browse recordSchedule.

Figure 4 illustrates how a control point can delete a recordSchedule from the ScheduledRecording service.

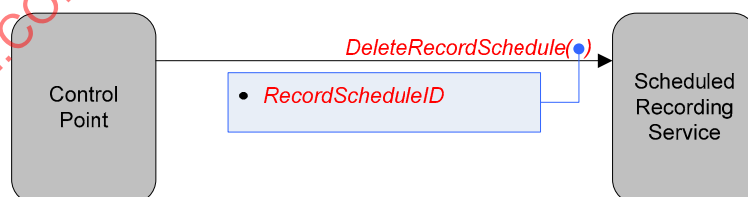


Figure 4 — Delete a recordSchedule

5.2.2 recordTask

A recordSchedule will generate one recordTask for each recording operation that matches the criteria of the recordSchedule. A recordTask also has properties indicating its behavior. A recordTask is different from a recordSchedule in that it always represents a single recording operation whereas a recordSchedule may actually represent multiple recording operations. For example, a ScheduledRecording service that interprets a recordSchedule to lead to three different recording operations could generate three different recordTask instances over its lifetime. At a given time,

a recordSchedule can have zero (no recording operations currently scheduled) or more recordTask instances associated with it. A ScheduledRecording service shall report at least one recordTask when the underlying system is performing a recording operation for some recordSchedule.

When a recordSchedule is created, the ScheduledRecording service generates necessary recordTask instances associated with each scheduled recording occurrence. The ScheduledRecording service may also later add a new recordTask whenever a new scheduled recording occurrence arrives. Similarly, a ScheduledRecording service may delete recordTask instances when they are no longer needed. This may happen in a device dependent manner. For example, some ScheduledRecording service implementations delete a recordTask when the recording is finished while other ScheduledRecording service implementations keep maintaining finished recordTask instances. A recordTask can only be created by the ScheduledRecording service as a result of a *trigger* from a recordSchedule. A control point can never create a recordTask directly. Both a recordTask and a recordSchedule may be deleted by the ScheduledRecording service or a control point.

The lifetime of a recordTask is determined in a vendor dependent way. Some implementations maintain a recordTask even after it finishes its recording while others may delete the recordTask once the recording finishes. However, in any implementation, when a recordSchedule is deleted, the ScheduledRecording service shall delete all of its associated recordTask instances.

5.3 State Variables

Like the ContentDirectory service, the ScheduledRecording service is primarily action-based. The service state variables exist primarily to support argument passing within service actions. Information is not exposed directly through explicit state variables. Instead, a client retrieves ScheduledRecording service information via the return arguments of the actions defined below. The majority of state variables defined below exist simply to provide data type information for the arguments of the various actions of this service.

Reader Note: For a first-time reader, it might be more helpful to read the action definitions before reading the state variable definitions.

5.3.1 State Variable Overview

Table 7 — State Variables

Variable Name	R/A ^a	Data Type	Allowed Value	Default Value	Eng. Units
<u>SortCapabilities</u>	<u>R</u>	<u>string</u>	CSV (<u>string</u>) See 5.3.2		
<u>SortLevelCapability</u>	<u>R</u>	<u>ui4</u>	See 5.3.3		
<u>StateUpdateID</u>	<u>R</u>	<u>ui4</u>	See 5.3.4		
<u>LastChange</u>	<u>R</u>	<u>string</u>	See 5.3.5		
<u>A_ARG_TYPE_PropertyList</u>	<u>R</u>	<u>string</u>	CSV (<u>string</u>) See 5.3.6		
<u>A_ARG_TYPE_DataTypeID</u>	<u>R</u>	<u>string</u>	See Table 8 and 5.3.7		
<u>A_ARG_TYPE_ObjectID</u>	<u>R</u>	<u>string</u>	See 5.3.8		
<u>A_ARG_TYPE_ObjectIDList</u>	<u>CR</u> ^a	<u>string</u>	CSV (<u>string</u>) See 5.3.9		
<u>A_ARG_TYPE_PropertyInfo</u>	<u>R</u>	<u>string</u>	See 5.3.10		

Variable Name	R/A ^a	Data Type	Allowed Value	Default Value	Eng. Units
<u>A_ARG_TYPE_Index</u>	<u>R</u>	<u>ui4</u>	See 5.3.11		
<u>A_ARG_TYPE_Count</u>	<u>R</u>	<u>ui4</u>	See 5.3.12		
<u>A_ARG_TYPE_SortCriteria</u>	<u>R</u>	<u>string</u>	CSV (<u>string</u>) See 5.3.13		
<u>A_ARG_TYPE_RecordSchedule</u>	<u>R</u>	<u>string</u>	See 5.3.14		
<u>A_ARG_TYPE_RecordTask</u>	<u>R</u>	<u>string</u>	See 5.3.15		
<u>A_ARG_TYPE_RecordScheduleParts</u>	<u>R</u>	<u>string</u>	See 5.3.16		
<i>Non-standard state variables implemented by an UPnP vendor go here.</i>	<u>X</u>	<i>TBD</i>	<i>TBD</i>	<i>TBD</i>	<i>TBD</i>
^a For a device this column indicates whether the state variable 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>).					

Table 8 — Allowed values for the DataTypeID argument

Value	R/A ^a
" <u>A_ARG_TYPE_RecordSchedule</u> "	<u>R</u>
" <u>A_ARG_TYPE_RecordTask</u> "	<u>R</u>
" <u>A_ARG_TYPE_RecordScheduleParts</u> "	<u>R</u>
Vendor-defined	<u>X</u>
^a For a device this column indicates whether the state variable 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>-</u> <u>D</u> when deprecated (e.g., <u>R-D</u> , <u>A-D</u>).	

5.3.2 SortCapabilities

This required state variable contains a CSV list of property names that the ScheduledRecording service can use to sort the information returned in the Result argument of various actions, such as BrowseRecordSchedules() and BrowseRecordTasks(). An empty string indicates that the device does not support any kind of sorting. A wildcard "srs:*" indicates that any supported property within the srs namespace can be used for sorting.

5.3.3 SortLevelCapability

This required state variable contains an integer that indicates the maximum number of property names that can be specified in the SortCriteria argument at the same time.

5.3.4 StateUpdateID

This required state variable is a ScheduledRecording service system-wide numeric value. Its initial value is 0.

- a) StateUpdateID shall be incremented by 1 whenever any of 1) – 3) below occurs:
 - 1) A recordSchedule or recordTask is created or deleted.
 - 2) A recordSchedule or recordTask is modified, which means that one or more properties are added, deleted or had their value changed.
 - 3) Any other change to the state of the ScheduledRecording service that could be observed by a control point. This includes any vendor- or other future-defined behavior.
- b) When the value of StateUpdateID is equal to the ui4 maximum value of 4294967295 ($2^{32}-1$), incrementing it causes it to roll over to the value 0.
- c) The increment and the operation that caused it shall occur atomically relative to all information visible to any control point – including both action out arguments and event variable values.

For example, consider the case where a control point invokes CreateRecordSchedule() to create a new recordSchedule that also immediately spawns exactly one recordTask. Assume that StateUpdateID is 10 when the control point invokes the action and that for a short time period around this invocation, no other activity occurs that affects the value of StateUpdateID. During this time period, exactly one of 1) – 3) below shall be true as seen by all external observations (including the returned values from this CreateRecordSchedule() invocation):

- 1) StateUpdateID is 10; and the new recordSchedule has not been created; and the new recordTask has not been created.

- 2) StateUpdateID is 11; and the recordSchedule has been created; and the new recordTask has not been created; and the recordSchedule's value of currentRecordTaskCount is 0, indicating that no recordTask has been created.
- 3) StateUpdateID is 12; and the recordSchedule has been created; and the new recordTask has been created; and the recordSchedule's value of currentRecordTaskCount is 1, indicating that the child recordTask has been created.

ScheduledRecording service implementations should maintain the same value for StateUpdateID through power cycles and any other disappearance/reappearance of the service on the network. Control points can use a change in the value of this variable to determine if there has been a change in the ScheduledRecording service.

The value of the StateUpdateID state variable, returned within events and returned as an output argument of certain actions should be monitored very closely by control points. Indeed, whenever an action returns with a StateUpdateID value in its UpdateID argument that is less than the StateUpdateID value received in the updateID attribute from the most recent LastChange event, the information returned by that action is potentially stale. A control point might want to refresh that information for instance by invoking the appropriate Browsexxx() or Getxxx() action. It is safe to use the information as long as the StateUpdateID value returned in the UpdateID argument of the action is greater than or equal to the StateUpdateID value received in the updateID attribute from the most recent LastChange event.

5.3.5 LastChange

Note: It is assumed that the default namespace for this subclause 5.3.5 of the specification is srs-lc.

This required state variable is used for eventing purposes to allow clients to receive meaningful event notifications whenever a recordSchedule or recordTask in the ScheduledRecording service changes. The schema for the *StateEvent XML Document* used in this state variable is defined in [27]. The XML header `<?xml version="1.0" ?>` is allowed. One root element, `<StateEvent>` shall contain zero or more elements, each of which represent one update to a recordSchedule or recordTask instance. Six types of update elements are defined as shown in Table 9. Future ScheduledRecording service specifications may add other types of update elements. A vendor may add vendor-defined elements. The ScheduledRecording:1 service does not define the value for these elements. Vendor-defined element names shall follow the rules set forth in subclause 4.4. Note that future ScheduledRecording service specifications may define sub-elements for the elements. Also note that this state variable shall be properly escaped as defined in [39].

Table 9 — Allowed Elements in <StateEvent> Element

Element Name	Description
RecordScheduleCreated	A new <u>recordSchedule</u> is created.
RecordScheduleModified	One or more properties of a <u>recordSchedule</u> are modified (added, deleted or values are changed).
RecordScheduleDeleted	A <u>recordSchedule</u> is deleted.
RecordTaskCreated	A new <u>recordTask</u> is created.
RecordTaskModified	One or more properties of a <u>recordTask</u> are modified (added, deleted or values are changed).
RecordTaskDeleted	A <u>recordTask</u> is deleted.

Element Name	Description
<i>Vendor-defined</i>	See subclause 4.4.

Each element shall have one updateID attribute, which is set to the value of the StateUpdateID state variable at the time of the update and one objectID attribute, whose value is set to the value of the @id property of the updated recordSchedule or recordTask instance. Future ScheduledRecording service specifications may add other attributes to existing update elements. A vendor may add vendor-defined attributes for existing update elements.

Example (before XML escaping)

```
<?xml version="1.0" encoding="UTF-8"?>
<StateEvent
  xmlns="urn:schemas-upnp-org:av:srs-event"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs-event
    http://www.upnp.org/schemas/av/srs-event.xsd">
  <RecordScheduleCreated updateID="213" objectID="s001"/>
  <RecordTaskCreated updateID="214" objectID="s001-001"/>
  <RecordTaskModified updateID="215" objectID="s001-001"/>
</StateEvent>
```

The LastChange state variable is evented and moderated. When multiple updates occurred within a LastChange moderation period, the new LastChange state variable reports more than one update at the same time. A series of updates and the resulting eventing activity are illustrated in their temporal order in the following example.

Example

0: ScheduledRecording service activity = Power-on.

StateUpdateID = 0

LastChange (before XML escaping):

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

GENA behavior: None

1: ScheduledRecording service activity = a recordSchedule with @id = "s001" is created.

StateUpdateID = 1

LastChange (before XML escaping):

```
<?xml version="1.0" encoding="UTF-8"?>
<StateEvent
  xmlns="urn:schemas-upnp-org:av:srs-event"
```

```

xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="
  urn:schemas-upnp-org:av:srs-event
  http://www.upnp.org/schemas/av/srs-event.xsd">
  <RecordScheduleCreated updateID="1" objectID="s001">
  </RecordScheduleCreated>
</StateEvent>

```

GENA behavior: Nothing is evented since there are no current subscribers.

2: ScheduledRecording service activity = new control point signs up for events.

StateUpdateID = 1

LastChange (before XML escaping):

```

<?xml version="1.0" encoding="UTF-8"?>
<StateEvent
  xmlns="urn:schemas-upnp-org:av:srs-event"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs-event
    http://www.upnp.org/schemas/av/srs-event.xsd">
  <RecordScheduleCreated updateID="1" objectID="s001">
  </RecordScheduleCreated>
</StateEvent>

```

GENA behavior: Send initial Notify with the LastChange value above.

3: ScheduledRecording service activity = a recordTask with @id = "t001-000" is created. Its associated recordSchedule with @id = "s001" is modified by the ScheduledRecording service at the same time because its currentRecordTaskCount property is updated to reflect the existence of the new recordTask.

StateUpdateID = 3

LastChange (before XML escaping):

```

<?xml version="1.0" encoding="UTF-8"?>
<StateEvent
  xmlns="urn:schemas-upnp-org:av:srs-event"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs-event
    http://www.upnp.org/schemas/av/srs-event.xsd">
  <RecordTaskCreated updateID="2" objectID="t001-000">
  </RecordTaskCreated>
  <RecordScheduleModified updateID="3" objectID="s001">
  </RecordScheduleModified>
</StateEvent>

```

GENA behavior: Wait for the next moderation period to elapse and then send Notify with the LastChange value above.

4: ScheduledRecording service activity = a recordTask with @id = "t001-001" is created. Its associated recordSchedule with @id = "s001" is modified by the ScheduledRecording service at the same time because its currentRecordTaskCount property is updated to reflect the existence of the new recordTask. Within the same moderation period, a recordTask with @id = "t001-002" is also created. Its associated

recordSchedule with @id = "s001" is modified by the ScheduledRecording service at the same time because its currentRecordTaskCount property is updated to reflect the existence of the new recordTask.

StateUpdateID = 7

LastChange (before XML escaping):

```
<?xml version="1.0" encoding="UTF-8"?>
<StateEvent
  xmlns="urn:schemas-upnp-org:av:srs-event"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs-event
    http://www.upnp.org/schemas/av/srs-event.xsd">
  <RecordTaskCreated updateID="4" objectID="t001-001">
  </RecordTaskCreated>
  <RecordScheduleModified updateID="5" objectID="s001">
  </RecordScheduleModified>
  <RecordTaskCreated updateID="6" objectID="t001-002">
  </RecordTaskCreated>
  <RecordScheduleModified updateID="7" objectID="s001">
  </RecordScheduleModified>
</StateEvent>
```

GENA behavior: Wait for the next moderation period to elapse and then send Notify with the LastChange value above.

5.3.6 A ARG TYPE PropertyList

This required state variable is introduced to provide type information for various action arguments that contain a CSV list of property names. Namespace prefixes shall be included with all property names (see subclause 4.3). The exact semantics of these property names depend on the associated action.

5.3.7 A ARG TYPE DataTypeID

This required state variable is introduced to provide type information for various action arguments that are used to identify a specific *property-set* data type (see subclause 3.2.16). An argument of type A ARG TYPE DataTypeID can have the values listed in Table 8.

5.3.8 A ARG TYPE ObjectID

This required state variable is introduced to provide type information for various action arguments that uniquely identify an individual recordSchedule or a recordTask by their object ID.

5.3.9 A ARG TYPE ObjectIDList

This conditionally required state variable shall be supported if the GetRecordScheduleConflicts() or GetRecordTaskConflicts() actions are implemented. The state variable is introduced to provide type information for various action arguments that contain a CSV list of object IDs (@id) used to identify a collection of either recordSchedule or recordTask instances (the list shall be homogeneous).

5.3.10 A ARG TYPE PropertyInfo

This required state variable is introduced to provide type information for various action arguments that contain detailed XML-based information on supported properties and their interdependencies for a particular ScheduledRecording service implementation. The format of these arguments is similar to the XML Service Description (SCPD), but instead of describing state variables and actions, they describe properties, their allowed values, and interdependencies.

Refer to [2] for the definition of the AVDT Datastructure Template.

Note that since the format of these arguments is based on XML, it needs to be escaped (using the normal XML rules: subclause 2.4 in [39]) before embedding in a SOAP response message.

5.3.11 A ARG TYPE Index

This required state variable is introduced to provide type information for various action arguments that specify an offset into an arbitrary set of objects. A value of 0 represents the first object in the set.

5.3.12 A ARG TYPE Count

This required state variable is introduced to provide type information for various action arguments that specify a number of arbitrary objects.

5.3.13 A ARG TYPE SortCriteria

This required state variable is introduced to provide type information for various action arguments that contain a CSV list of property names prefixed by one or more sort modifiers. Namespace prefixes shall be included with all property names that do not belong to the srs namespace. Namespace prefixes may be included with property names that belong to the srs namespace (see subclause 4.3). The "+" and "-" sort modifier prefixes indicate that the sort is in ascending or descending order, respectively, with regard to the value of the prefixed property name.

5.3.14 A ARG TYPE RecordSchedule

This required state variable is introduced to provide type information for various action arguments that contain a list of zero or more recordSchedule objects. All instances of this data type shall comply with the SRS schema. See Annex A for details.

The structure of an argument of data type A ARG TYPE RecordSchedule is an srs XML Document:

- Allowed XML declaration <?xml version="1.0" ?>
- <srs> is the root element.
- The <srs> element shall have zero or more <item> elements, each representing a recordSchedule object.
- Each <item> element has a set of property values describing the recordSchedule object. Each property is expressed either as the content of an XML element or as the value of an XML attribute.
- See [26] for more details on the structure. The ScheduledRecording service-defined names for metadata are described in Annex B.

Note that since the SRS format of an argument of data type A_ARG_TYPE_RecordSchedule is XML, it needs to be escaped (using the normal XML rules: subclause 2.4 in [39]) before embedding in a SOAP response message.

5.3.15 A_ARG_TYPE_RecordTask

This required state variable is introduced to provide type information for various action arguments that contain a list of zero or more recordTask objects. All instances of this data type shall comply with the SRS schema. See Annex A for details.

The structure of an argument of data type A_ARG_TYPE_RecordTask is an *srs XML Document*:

- Allowed XML declaration `<?xml version="1.0" ?>`
- `<srs>` is the root element.
- The `<srs>` element shall have zero or more `<item>` elements, each representing a recordTask object.
- Each `<item>` element has a set of property values describing the recordTask object. Each property is expressed either as the content of an XML element or as the value of an XML attribute.
- See [26] for more details on the structure. The ScheduledRecording service-defined names for metadata are described in Annex B.

Note that since the SRS format of an argument of data type A_ARG_TYPE_RecordTask is XML, it needs to be escaped (using the normal XML rules: subclause 2.4 in [39]) before embedding in a SOAP response message.

5.3.16 A_ARG_TYPE_RecordScheduleParts

This required state variable is introduced to provide type information for various action arguments that contain a single recordScheduleParts object. A recordScheduleParts object indicates the desired values for a subset of properties that provide a template for other recordSchedule objects. Typically, a recordScheduleParts is used to create new recordSchedule objects. All instances of this data type shall comply with the SRS schema. See Annex A for details.

The structure of an argument of data type A_ARG_TYPE_RecordScheduleParts is an *srs XML Document*:

- Allowed XML declaration `<?xml version="1.0" ?>`
- `<srs>` is the root element.
- The `<srs>` element shall have a single `<item>` element, representing the recordScheduleParts object.
- The `<item>` element has a set of property values describing the recordScheduleParts object. Each property is expressed either as the content of an XML element or as the value of an XML attribute.
- See [26] for more details on the structure. The ScheduledRecording service-defined names for metadata are described in Annex B.

Note that since the SRS format of an argument of data type A_ARG_TYPE_RecordScheduleParts is XML, it needs to be escaped (using the normal XML rules: subclause 2.4 in [39]) before embedding in a SOAP response message.

5.4 Eventing and Moderation

Table 10 — Eventing and Moderation

Variable Name	Evented	Moderated Event	Min Event Interval ^a (seconds)	Logical Combination	Min Delta per Event ^b
<u>SortCapabilities</u>	<u>NO</u>	<u>NO</u>			
<u>SortLevelCapability</u>	<u>NO</u>	<u>NO</u>			
<u>StateUpdateID</u>	<u>NO</u>	<u>NO</u>			
<u>LastChange</u>	<u>YES</u>	<u>YES</u>	0.2		
<u>A_ARG_TYPE_PropertyList</u>	<u>NO</u>	<u>NO</u>			
<u>A_ARG_TYPE_DataTypeID</u>	<u>NO</u>	<u>NO</u>			
<u>A_ARG_TYPE_ObjectID</u>	<u>NO</u>	<u>NO</u>			
<u>A_ARG_TYPE_ObjectIDList</u>	<u>NO</u>	<u>NO</u>			
<u>A_ARG_TYPE_PropertyInfo</u>	<u>NO</u>	<u>NO</u>			
<u>A_ARG_TYPE_Index</u>	<u>NO</u>	<u>NO</u>			
<u>A_ARG_TYPE_Count</u>	<u>NO</u>	<u>NO</u>			
<u>A_ARG_TYPE_SortCriteria</u>	<u>NO</u>	<u>NO</u>			
<u>A_ARG_TYPE_RecordSchedule</u>	<u>NO</u>	<u>NO</u>			
<u>A_ARG_TYPE_RecordTask</u>	<u>NO</u>	<u>NO</u>			
<u>A_ARG_TYPE_RecordScheduleParts</u>	<u>NO</u>	<u>NO</u>			
Non-standard state variables implemented by an UPnP vendor go here.	<u>TBD</u>	<u>TBD</u>	<u>TBD</u>	<u>TBD</u>	<u>TBD</u>

^a Max event rate is determined by N , where $Rate = 1/N$, where N is the Min Event Interval in seconds.

^b $(N) * (allowedValueRange Step)$.

5.5 Actions

5.5.1 Action Overview

Table 11 — Actions

Name	R/A ^a	Control Point R/A ^b
<u>GetSortCapabilities()</u>	<u>R</u>	<u>A</u>
<u>GetPropertyList()</u>	<u>R</u>	<u>A</u>
<u>GetAllowedValues()</u>	<u>R</u>	<u>R</u> ^c
<u>GetStateUpdateID()</u>	<u>R</u>	<u>A</u>
<u>BrowseRecordSchedules()</u>	<u>R</u>	<u>R</u> ^c
<u>BrowseRecordTasks()</u>	<u>R</u>	<u>R</u> ^c
<u>CreateRecordSchedule()</u>	<u>R</u>	<u>R</u> ^c
<u>DeleteRecordSchedule()</u>	<u>R</u>	<u>A</u>

Name	R/A a	Control Point R/A b
<u>GetRecordSchedule()</u>	<u>R</u>	<u>A</u>
<u>EnableRecordSchedule()</u>	<u>CR</u> ^d	<u>A</u>
<u>DisableRecordSchedule()</u>	<u>CR</u> ^d	<u>A</u>
<u>DeleteRecordTask()</u>	<u>A</u>	<u>A</u>
<u>GetRecordTask()</u>	<u>R</u>	<u>A</u>
<u>EnableRecordTask()</u>	<u>CR</u> ^d	<u>A</u>
<u>DisableRecordTask()</u>	<u>CR</u> ^d	<u>A</u>
<u>ResetRecordTask()</u>	<u>CR</u> ^d	<u>A</u>
<u>GetRecordScheduleConflicts()</u>	<u>CR</u> ^d	<u>A</u>
<u>GetRecordTaskConflicts()</u>	<u>CR</u> ^d	<u>A</u>
<i>Non-standard actions implemented by a UPnP vendor go here</i>		
a 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>). b 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>). c Required only if the control point implements interaction with the ScheduledRecording service. d 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.		

5.5.2 [GetSortCapabilities\(\)](#)

This required action returns a CSV list of property names that can be used in the [SortCriteria](#) argument of various actions.

5.5.2.1 Arguments

Table 12 — Arguments for [GetSortCapabilities\(\)](#)

Argument	Direction	relatedStateVariable
<u>SortCaps</u>	<u>OUT</u>	<u>SortCapabilities</u>
<u>SortLevelCap</u>	<u>OUT</u>	<u>SortLevelCapability</u>

5.5.2.1.1 [SortCaps](#)

This argument contains a CSV list of property names that the ScheduledRecording service can use to sort the information returned in the [Result](#) argument of various actions, such as [BrowseRecordSchedules\(\)](#) and [BrowseRecordTasks\(\)](#). The appropriate namespace prefixes (either “srs:” or “<vendor-defined namespace prefix>:”) shall be included with the returned property names (see subclause 4.3). An empty string indicates that the device does not support any kind of sorting. A wildcard “srs:*” indicates that any property within the srs namespace can be used for sorting. See also subclause 5.3.2.

5.5.2.1.2 SortLevelCap

This argument contains an integer that indicates the maximum number of property names that can be specified at the same time in the SortCriteria argument of various actions. See also subclause 5.3.3.

5.5.2.2 Dependency on State

None.

5.5.2.3 Effect on State

None.

5.5.2.4 Errors

Table 13 — Error Codes for GetSortCapabilities()

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].

5.5.3 GetPropertyList()

The required GetPropertyList() action provides a means to retrieve from a particular ScheduledRecording service implementation which properties are actually supported for a specific *property-set* data type. The GetPropertyList() action returns a CSV list of property names that may appear in action arguments of the *property-set* data type, specified in the DataTypeID input argument. This CSV list shall include property names of imported properties from other namespaces as well as any vendor-defined property names. For example, the ContentDirectory service imported properties (such as dc:title) that are included as part of the value of the cdsReference property, shall be returned.

The appropriate namespace prefixes shall be included with *all* property names (see subclause 4.3).

The set of allowed values for srs properties and vendor-defined properties (when used for the specified *property-set* data type) can be obtained via the GetAllowedValues() action. The set of allowed values for imported properties cannot be retrieved by the GetAllowedValues() action.

5.5.3.1 Arguments

Table 14 — Arguments for GetPropertyList()

Argument	Direction	relatedStateVariable
<u>DataTypeID</u>	<u>IN</u>	<u>A_ARG_TYPE_DataTypeID</u>
<u>PropertyList</u>	<u>OUT</u>	<u>A_ARG_TYPE_PropertyList</u>

5.5.3.1.1 DataTypeID

The DataTypeID argument identifies the *property-set* data type for which the set of property names is to be returned. See subclause 5.3.7 for details regarding its format. The set of allowed values is listed in Table 8.

5.5.3.1.2 PropertyList

The PropertyList argument contains the set of property names (including their namespace prefixes) that may appear in action arguments of the *property-set* data type, specified by the DataTypeID input argument.

5.5.3.2 Dependency on State

None.

5.5.3.3 Effect on State

None.

5.5.3.4 Errors

Table 15 — Error Codes for GetPropertyList()

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
711	Invalid DataTypeID	An invalid value has been specified in the <u>DataTypeID</u> input argument.

5.5.4 GetAllowedValues()

This required action is used to determine the allowed values and dependencies for srs properties that can appear within action arguments of the specified *property-set* data type. The set of allowed values that are returned is static and does not depend on the current state of the ScheduledRecording service. The property information is returned in an *AVDT XML Document* as defined in [2]. The set of properties for which information is returned is determined by the intersection of the property names in the Filter argument and the names of the properties supported by the implementation for the specified *property-set* data type in the DataTypeID argument. All property names shall belong either to the srs namespace or a vendor-defined namespace.

The set of allowed values for imported properties cannot be retrieved by the GetAllowedValues() action.

5.5.4.1 Arguments

Table 16 — Arguments for GetAllowedValues()

Argument	Direction	relatedStateVariable
<u>DataTypeID</u>	<u>IN</u>	<u>A_ARG_TYPE DataTypeID</u>
<u>Filter</u>	<u>IN</u>	<u>A_ARG_TYPE PropertyList</u>
<u>PropertyInfo</u>	<u>OUT</u>	<u>A_ARG_TYPE PropertyInfo</u>

5.5.4.1.1 DataTypeID

See subclause 5.5.3.1.1.

5.5.4.1.2 Filter

The Filter argument contains a CSV list of property names that indicates for which properties allowed value information is to be returned in the *AVDT XML Document*, contained in the PropertyInfo output argument. The Filter argument should only include property names that are returned in the PropertyList argument of the GetPropertyList() action when specifying the same value in the DataTypeID argument. ScheduledRecording service implementations shall gracefully ignore other property names. The “srs:” namespace prefix shall be included with srs property names in the Filter argument. Likewise, a namespace prefix shall be included with all vendor-defined property names in the Filter argument (see subclause 4.3).

If the Filter argument is set to “*:*”, then allowed values for all supported properties (including srs properties and vendor-defined properties, but excluding imported properties) for the specified *property-set* data type shall be returned. If the Filter argument is set to “srs:*”, then allowed values for all supported properties in the srs namespace shall be returned. If the Filter argument is set to “<vendor-defined namespace prefix>:*”, then allowed values for all vendor-defined properties in that namespace shall be returned. If the Filter argument is set to the empty string, no information is provided (an *AVDT XML Document* with an empty root element is returned).

Examples of valid Filter argument values include:

- “srs:@id,srs:priority@orderedValue”
- “srs:title,srs:class”
- “*:*”
- “srs:*”

5.5.4.1.3 PropertyInfo

The PropertyInfo argument shall only include allowed value and dependency information on properties that are specified in the Filter argument. The PropertyInfo argument shall be properly escaped as defined in [39]. The particular *AVDT XML Document* that is returned in the PropertyInfo argument depends on the *property-set* data type, specified in the DataTypeID input argument. See Annex A for further details.

5.5.4.2 Dependency on State

None.

5.5.4.3 Effect on State

None.

5.5.4.4 Errors

Table 17 — Error Codes for GetAllowedValues()

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
711	Invalid DataTypeID	An invalid value has been specified in the <u>DataTypeID</u> input argument.

5.5.5 GetStateUpdateID()

This required action returns the current value of the StateUpdateID state variable in the Id output argument. This action can be used to poll the ScheduledRecording service for any change in the service that might have occurred since the last time this action was invoked. If the returned Id value is different from the value that was returned the last time this action was invoked, then there has been a change in one or more recordSchedule or recordTask objects in the ScheduledRecording service. See subclause 5.3.4 for more information.

5.5.5.1 Arguments**Table 18 — Arguments for GetStateUpdateID()**

Argument	Direction	Related State Variable
<u>Id</u>	<u>OUT</u>	<u>StateUpdateID</u>

5.5.5.1.1 Id

The Id argument contains the current value of the StateUpdateID state variable.

5.5.5.2 Dependency on State

None.

5.5.5.3 Effect on State

None.

5.5.5.4 Errors**Table 19 — Error Codes for GetStateUpdateID()**

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].

5.5.6 BrowseRecordSchedules()

This required action is used to browse the set of recordSchedule objects in the ScheduledRecording service.

5.5.6.1 Arguments**Table 20 — Arguments for BrowseRecordSchedules()**

Argument	Direction	relatedStateVariable
<u>Filter</u>	<u>IN</u>	<u>A_ARG_TYPE_PropertyList</u>
<u>StartingIndex</u>	<u>IN</u>	<u>A_ARG_TYPE_Index</u>
<u>RequestedCount</u>	<u>IN</u>	<u>A_ARG_TYPE_Count</u>
<u>SortCriteria</u>	<u>IN</u>	<u>A_ARG_TYPE_SortCriteria</u>
<u>Result</u>	<u>OUT</u>	<u>A_ARG_TYPE_RecordSchedule</u>
<u>NumberReturned</u>	<u>OUT</u>	<u>A_ARG_TYPE_Count</u>

Argument	Direction	relatedStateVariable
<u>TotalMatches</u>	<u>OUT</u>	<u>A_ARG_TYPE_Count</u>
<u>UpdateID</u>	<u>OUT</u>	<u>StateUpdateID</u>

5.5.6.1.1 Filter

The Filter argument contains a CSV list of property names that indicates which properties are to be returned in the *srs XML Document*, contained in the Result output argument. Namespace prefixes shall be included with all property names, specified in the Filter argument (see subclause 4.3).

The Filter argument has no impact on the *number* of objects returned in the Result argument. Instead, the Filter argument allows control points to control the *complexity* of the object metadata that is returned in the *srs XML Document* for each object. It allows a control point to specify a subset of the supported properties for inclusion in the *srs XML Document*. Properties that are required by the SRS Schema shall always be returned. Compliant ScheduledRecording service implementations shall not return allowed properties unless they are explicitly requested in the Filter input argument or are needed to create a valid XML document. For example, specifying a dependent property in the Filter argument, such as priority@orderedValue, will cause its associated independent property, priority, to be included in the *srs XML Document*.

In all cases, a compliant ScheduledRecording service implementation shall always respond to query requests with the smallest, valid *srs XML Document* in the Result argument that satisfies the Filter input argument. If the Filter argument is set to the empty string (""), then only the required properties are returned.

If the Filter argument is equal to "*:*", then all supported properties for all supported namespaces shall be returned. If the Filter argument is equal to "<namespace prefix>:*", then all of the required srs properties and all of the supported properties within that single namespace shall be returned. For example, "srs:*" is equivalent to listing all srs namespace properties supported by the device.

Properties defined in the ContentDirectory service shall only be imported through the multi-valued cdsReference property. Therefore, if the Filter argument contains property names from namespaces defined in the ContentDirectory service specification, the appropriate cdsReference property values shall be included in the Result output argument and those values shall be filtered, according to what is specified in the Filter argument but also preserving the validity of the *DIDL-Lite XML Document*, returned in the cdsReference property.

Examples of valid Filter argument values include:

- "srs:@id,srs:priority@orderedValue"
- "srs:title,dc:title"
- "*:*"
- "upnp:*,dc:*,didl_lite:*"

A compliant ScheduledRecording service implementation shall also ignore allowed properties requested in the Filter input argument which are not actually present in the matching objects. For example, a BrowseRecordSchedules() Filter input argument of the form "srs:activePeriod" is successful and returns a Result value that complies with the other BrowseRecordSchedules() input arguments, even in the case where the objects represented in the Result argument do not have an activePeriod property defined.

5.5.6.1.2 StartingIndex and RequestedCount

This action returns a specified number of recordSchedule objects from the list as indicated by the RequestedCount argument and starting from a specified index in the list, as indicated by the StartingIndex argument. The first recordSchedule in the list shall be indexed by an index value of 0. Specifying 0 in the RequestedCount argument is not allowed. If the range indicated by the StartingIndex and RequestedCount arguments reaches beyond the end of the list, then the ScheduledRecording service shall return all recordSchedule objects up to the end of the list and starting from the specified StartingIndex.

5.5.6.1.3 SortCriteria

The order of the recordSchedule objects in the Result argument is determined by the SortCriteria argument. When an empty string is specified in the SortCriteria argument, then the order is device dependent. Additionally, this device dependent ordering shall remain constant unless the UpdateID argument value has changed since the last BrowseRecordSchedules() action. In other words, any two objects that appear in a Result argument shall always appear in the same relative order as long as the UpdateID argument value (and therefore the StateUpdateID state variable) did not change.

The SortCriteria argument contains a CSV list of property names (namespace prefixes shall always be included). Each property name shall be prefixed by either a "+" or a "-" sort modifier. The "+" and "-" modifiers indicate that the sort is in ascending or descending order, respectively, with regard to the value of its associated property.

The ScheduledRecording service shall not accept any property name in the SortCriteria argument that is not included in the SortCapabilities state variable.

The objects are first sorted on the value of the first property in the SortCriteria argument. If all values differ in the first property, the sort is finished. If any values of the first property are equal, each subset of equal values is then sorted based on the next property in the SortCriteria argument. This process repeats iteratively until there are no more subsets of equal values or the SortCriteria argument list is exhausted.

For example, a value for the SortCriteria argument of the BrowseRecordSchedules() action of:

```
" +srs:scheduledStartTime,-
srs:scheduledChannelID,+srs:matchingName"
```

would sort the returned recordSchedule instances first by start date&time in ascending order, then for each date&time, the instances would be sorted by descending channel ID and finally, for each channel ID, the instances would be sorted by ascending program name.

Sorting rules for each property depend on that property's semantics. Sorts for individual properties can be any of: numeric sort, lexical sort, lexical numeric sort, Boolean sort, sequenced sort, type relationship sort, or *property specific*, according to an explicit ordering of values defined individually for that property. The definition of each kind of sort can be found in subclause 3.2.29. The specific sort order rules that shall be used for each property are given in Annex B.

When a SortCriteria argument contains property names of allowed and/or multi-valued properties, the rules a) and b) below apply:

a) If the property is prefixed by "+" then:

- Objects that do not have a value for the property are returned first in their group.
- Objects that have at least one value for the property are returned next in their group. Objects that have multiple values for the property (either multi-valued or CSV list) are sorted based on the property value that would cause the object to appear earliest in the list.

b) If the property is prefixed by “-” then:

- Objects that have at least one value for the property are returned first in their group. Objects that have multiple values (either multi-valued or CSV list) for the property are sorted based on the property value that would cause the object to appear earliest in the list.
- Objects that do not have a value for the property are returned last in their group.

Example:

Assume a ScheduledRecording service contains the following items and the current date is Tuesday, June 21, 2005:

```
<item id="1">
  ...
  <scheduledStartDateTime>2006-02-
07T15:30:00</ScheduledStartDateTime>
  ...
</item>
<item id="2">
  ...
  <scheduledStartDateTime>MONT15:30:00</ScheduledStartDateTime>
  <scheduledStartDateTime>WEDT15:30:00</ScheduledStartDateTime>
  ...
</item>
<item id="3">
  ...
  <scheduledStartDateTime>MON-FRIT16:00:00</ScheduledStartDateTime>
  ...
</item>
<item id="4">
  ...
  No <scheduledStartDateTime> property
  ...
</item>
```

A value for the SortCriteria argument of the BrowseRecordSchedules() action of:

```
“+srs:scheduledStartDateTime”
```

would sort the returned recordSchedule instances on Tuesday, June 21, 2005 as follows:

```
<item id="4"/>
<item id="2"/>
<item id="3"/>
<item id="1"/>
```

because:

- `<item id="4"/>` has no [srs:scheduledStartDateTime](#) property, it therefore appears first.
- `<item id="2"/>` [srs:scheduledStartDateTime](#) property resolves to Wednesday, 2005-06-22T15:30:00 since this is the earliest date&time in the list. It therefore appears second.
- `<item id="3"/>` [srs:scheduledStartDateTime](#) property resolves to Wednesday, 2005-06-22T16:00:00. It therefore appears third.
- `<item id="1"/>` [srs:scheduledStartDateTime](#) property resolves to Tuesday, 2006-02-07T15:30:00. It therefore appears last.

Sorting on ContentDirectory service imported properties is not supported.

5.5.6.1.4 [Result](#)

The [Result](#) output argument contains an XML escaped *srs XML Document* (see [26]). This document contains a set of zero or more [recordSchedule](#) objects as described in Annex A. Each of the returned [recordSchedule](#) objects shall not have properties other than those specified in the [Filter](#) argument unless they are needed to create a valid *srs XML Document*. The ScheduledRecording service implementation shall ignore unknown properties specified in the [Filter](#) argument. If `“*.*”` is specified in the [Filter](#) argument, then all supported properties for which the ScheduledRecording service has meaningful values shall be returned. The required properties (for example, [@id](#), [title](#), [class](#), ...) shall always be included even if not specified in the [Filter](#) argument (the *srs XML Document* shall be valid). The ScheduledRecording service implementation shall ensure that the information returned in this argument is always consistent. In other words, if during the information gathering process, certain updates occur, the ScheduledRecording service implementation shall re-examine the already gathered information to verify that this information is still accurate before returning from the action invocation.

5.5.6.1.5 [NumberReturned](#)

The [NumberReturned](#) argument shall indicate the actual number of returned objects.

5.5.6.1.6 [TotalMatches](#)

The [TotalMatches](#) argument shall indicate the total number of [recordSchedule](#) objects that exist in the ScheduledRecording service.

5.5.6.1.7 [UpdateID](#)

The returned [UpdateID](#) argument shall be the value of the [StateUpdateID](#) state variable at the time the returned data has been completely and consistently collected. In other words, if during the information gathering process, certain updates occur, the ScheduledRecording service implementation shall re-examine the already gathered information to verify that this information is still accurate before returning from the action invocation. Refer to subclause 5.3.4 for additional information.

The [UpdateID](#) argument is used to verify whether the returned information in the [Result](#) argument has not become stale. After the action completes, if the value of the [StateUpdateID](#) state variable is different from the value returned in the [UpdateID](#) argument, then the information returned in the [Result](#) argument might be stale. In this case, the control point should invoke the appropriate action to refresh its copy of the desired information (for example, via the [BrowseRecordSchedules\(\)](#) or [GetRecordSchedule\(\)](#) action).

5.5.6.2 Dependency on State

None.

5.5.6.3 Effect on State

None.

5.5.6.4 Errors**Table 21 — Error Codes for BrowseRecordSchedules()**

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
709	Unsupported or invalid sort criteria	The sort criteria specified are not supported or are invalid.
720	Cannot process the request	Cannot process the request in a reasonable amount of time.

5.5.7 BrowseRecordTasks()

This required action is used to browse the list of recordTask objects associated with a single recordSchedule. In addition, it can be used to browse the entire list of all recordTask objects available in the entire ScheduledRecording service, independent of their parent recordSchedule.

The Result argument contains an XML escaped *srs XML Document* that contains a set of recordTask objects. When the RecordScheduleID input argument contains the @id value of an existing recordSchedule, then the Result argument returns an XML escaped *srs XML Document* that contains the set of recordTask objects associated with that particular recordSchedule. When the RecordScheduleID input argument is set to the empty string (""), then the Result argument returns an XML escaped *srs XML Document* that contains a list of all available recordTask objects in the entire ScheduledRecording service.

5.5.7.1 Arguments**Table 22 — Arguments for BrowseRecordTasks()**

Argument	Direction	relatedStateVariable
<u>RecordScheduleID</u>	<u>IN</u>	<u>A_ARG_TYPE_ObjectID</u>
<u>Filter</u>	<u>IN</u>	<u>A_ARG_TYPE_PropertyList</u>
<u>StartingIndex</u>	<u>IN</u>	<u>A_ARG_TYPE_Index</u>
<u>RequestedCount</u>	<u>IN</u>	<u>A_ARG_TYPE_Count</u>
<u>SortCriteria</u>	<u>IN</u>	<u>A_ARG_TYPE_SortCriteria</u>
<u>Result</u>	<u>OUT</u>	<u>A_ARG_TYPE_RecordTask</u>
<u>NumberReturned</u>	<u>OUT</u>	<u>A_ARG_TYPE_Count</u>
<u>TotalMatches</u>	<u>OUT</u>	<u>A_ARG_TYPE_Count</u>
<u>UpdateID</u>	<u>OUT</u>	<u>StateUpdateID</u>

The syntax and semantics of the arguments (the RecordScheduleID argument not included) of the BrowseRecordTasks() action are identical to those of the

[BrowseRecordSchedules\(\)](#) action, except that the objects returned by this action are [recordTask](#) objects instead of [recordSchedule](#) objects.

5.5.7.1.1 [RecordScheduleID](#)

The [RecordScheduleID](#) input argument contains the object ID of the [recordSchedule](#) for which all associated [recordTask](#) instances are returned in the [Result](#) argument. If the [RecordScheduleID](#) input argument contains the empty string (""), then all available [recordTask](#) instances in the entire ScheduledRecording service are returned.

5.5.7.1.2 [Filter](#)

See subclause 5.5.6.1.1.

5.5.7.1.3 [StartingIndex](#) and [RequestedCount](#)

See subclause 5.5.6.1.2.

5.5.7.1.4 [SortCriteria](#)

See subclause 5.5.6.1.3.

5.5.7.1.5 [Result](#)

See subclause 5.5.6.1.4. However, the returned objects are [recordTask](#) objects instead of [recordSchedule](#) objects.

5.5.7.1.6 [NumberReturned](#)

See subclause 5.5.6.1.5.

5.5.7.1.7 [TotalMatches](#)

When the [RecordScheduleID](#) input argument contains the [@id](#) value of an existing [recordSchedule](#), then the [TotalMatches](#) argument shall indicate the total number of [recordTask](#) objects that exist in the ScheduledRecording service for the indicated [recordSchedule](#). When the [RecordScheduleID](#) input argument is set to the empty string (""), then the [TotalMatches](#) argument shall indicate the total number of [recordTask](#) objects that exist in the entire ScheduledRecording service, independent of their parent [recordSchedule](#).

5.5.7.1.8 [UpdateID](#)

See subclause 5.5.6.1.7.

5.5.7.2 Dependency on State

None.

5.5.7.3 Effect on State

None.

5.5.7.4 Errors

Table 23 — Error Codes for [BrowseRecordTasks\(\)](#)

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
704	No such recordSchedule ID	The specified <u>recordSchedule</u> does not exist.
709	Unsupported or invalid sort criteria	The sort criteria specified is not supported or is invalid.
720	Cannot process the request	Cannot process the request in a reasonable amount of time.

5.5.8 [CreateRecordSchedule\(\)](#)

This required action creates a [recordSchedule](#) (that is: a scheduled recording list entry) for some media content (for example, broadcast content, analog input content, etc). This action creates a new object of a class, derived from the [recordSchedule](#) class. Control points that want to schedule a recording invoke the [CreateRecordSchedule\(\)](#) action.

If the [CreateRecordSchedule\(\)](#) action returns successfully, then a new [recordSchedule](#) object is added to the list of Record Schedules maintained by the ScheduledRecording service. This list can be consulted through the [BrowseRecordSchedules\(\)](#) action. The ScheduledRecording service may also instantiate one or more [recordTask](#) objects to represent the discrete recording tasks that are associated with the high level schedule, defined by the [recordSchedule](#). The instantiation of [recordTask](#) objects may happen after the [CreateRecordSchedule\(\)](#) action returns successfully. However, if the created [recordSchedule](#) would lead to the instantiation of one or more [recordTask](#) objects, these [recordTask](#) objects shall be created by the ScheduledRecording service as soon as possible and within a reasonable amount of time. If any of these spawned [recordTask](#) objects end up in a state that indicates that these [recordTask](#) objects are already supposed to be recording, then the ScheduledRecording service shall ensure that these recordings start as soon as possible and within a reasonable amount of time (this will most likely result in a partial recording). If a ScheduledRecording service implementation can not ensure that these recordings start as soon as possible, then the [CreateRecordSchedule\(\)](#) action shall return with error code 720 without any change.

5.5.8.1 Arguments

Table 24 — Arguments for [CreateRecordSchedule\(\)](#)

Argument	Direction	relatedStateVariable
<u>Elements</u>	<u>IN</u>	<u>A_ARG_TYPE_RecordScheduleParts</u>
<u>RecordScheduleID</u>	<u>OUT</u>	<u>A_ARG_TYPE_ObjectID</u>
<u>Result</u>	<u>OUT</u>	<u>A_ARG_TYPE_RecordSchedule</u>
<u>UpdateID</u>	<u>OUT</u>	<u>StateUpdateID</u>

5.5.8.1.1 [Elements](#)

The [Elements](#) input argument contains an XML escaped srs XML Document (see [26]). This document contains a single [recordScheduleParts](#). The [recordScheduleParts](#) object identifies the desired property values for the [recordSchedule](#) object to be created. The

new recordSchedule will be an instance of a specific recordSchedule class. Each class defines its set of member properties, some of which are required, and some of which are allowed. See Annex C for details. All required member properties shall be specified. If a control point omits supported allowed member properties from the Elements argument, then the ScheduledRecording service shall create the recordSchedule with the appropriate default value for those omitted member properties. If unsupported properties or unknown properties are specified in the Elements argument, the ScheduledRecording service shall gracefully accept these. If an unsupported value is specified for a supported member property, the ScheduledRecording service shall detect this and return error code 703.

5.5.8.1.2 RecordScheduleID

If the ScheduledRecording service accepts the recordSchedule in the Elements input argument, then the ScheduledRecording service shall provide a value in this output argument. The returned RecordScheduleID value shall be a unique value within the ScheduledRecording service. RecordScheduleID values are assumed to be opaque values without special meaning. Although a ScheduledRecording service may choose to use a RecordScheduleID value that was previously assigned (and later removed from the active list of recordSchedule instances), this specification recommends that the RecordScheduleID value be unique in time as well.

5.5.8.1.3 Result

The Result output argument contains an XML escaped *srs XML Document* (see [26]). This document contains the newly created recordSchedule object as described in Annex A. Any properties specified in the input Elements argument shall have the same values in the output recordSchedule. The ScheduledRecording service shall return *all* supported member properties for which it has meaningful values. This complete set allows a control point to see the default values of those properties that it did not specify in the input Elements argument. Note that some properties such as scheduleState are defined as required for an output recordSchedule and shall be included in the returned document. Refer to Annex C.1.1 for the support level of each property.

The ScheduledRecording service implementation shall ensure that the information returned in this argument is always consistent. In other words, if during the information gathering process, certain updates occur, the ScheduledRecording service implementation shall re-examine the already gathered information to verify that this information is still accurate before returning from the action invocation.

5.5.8.1.4 UpdateID

See subclause 5.5.6.1.7.

5.5.8.2 Dependency on State

None.

5.5.8.3 Effect on State

The value of the StateUpdateID state variable is changed and the LastChange state variable is updated.

5.5.8.4 Errors

Table 25 — Error Codes for CreateRecordSchedule()

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
701	Invalid Syntax	The <u>recordSchedule</u> in the <u>Elements</u> argument has invalid syntax. This includes malformed XML in the <u>Elements</u> input argument or a general schema violation.
703	Invalid Value	One or more properties in the input <u>recordSchedule</u> (in the <u>Elements</u> argument) have an invalid value.
707	Read only Property	Specifying a read only property is not allowed.
708	Required Property	Omitting a required property is not allowed
720	Cannot Process the Request	Cannot process the request in a reasonable amount of time.
730	Conflict	The specified <u>recordSchedule</u> is conflicting with one or more existing <u>recordSchedule</u> objects. The ScheduledRecording service may reject a conflicting <u>recordSchedule</u> and return with this error code.
731	Protected Contents	The specified contents are copy protected. The ScheduledRecording service may reject a <u>recordSchedule</u> that specifies copy protected contents and return with this error code.
732	No Media	The specified removable media is not inserted.
733	Media Write Protect	The specified removable media is write-protected.
734	Media No Space	The specified media does not have sufficient capacity.
735	Media Error	Error related to the specified destination media.
736	Too Many recordSchedules	The maximum number of <u>recordSchedule</u> objects is reached.
737	Resource Error	Error related to an application resource.

5.5.9 DeleteRecordSchedule()

The required DeleteRecordSchedule() action is used to delete a specific recordSchedule. When the recordSchedule is deleted, all of the associated recordTask objects shall also be deleted. The list of Record Schedules and their associated recordScheduleID currently maintained by the ScheduledRecording service can be retrieved through the BrowseRecordSchedules() action.

A recordSchedule can only be deleted when all of its associated recordTask objects are in the “IDLE” or the “DONE” phase. If any of the associated recordTask objects are in the “ACTIVE” phase, then the ScheduledRecording service shall return with error code 705 (active recordTask) without any change. A control point that wants to recover from this error scenario can first delete the associated active recordTask objects by invoking the DeleteRecordTask() action on these objects and then delete the recordSchedule. The active recordTask objects can be retrieved by properly invoking the BrowseRecordTasks() action.

Note that a ScheduledRecording service can delete a recordSchedule without control point intervention. For example, a non-recurring recordSchedule that has completed its last recordTask may (allowedly) be automatically deleted along with its associated

recordTask objects. However, it is recommended that a ScheduledRecording service implementation retains completed recordSchedule instances and their associated recordTask instances for a reasonable amount of time so that the user can examine potential error information after recording is completed.

5.5.9.1 Arguments

Table 26 — Arguments for DeleteRecordSchedule()

Argument	Direction	relatedStateVariable
<u>RecordScheduleID</u>	<u>IN</u>	<u>A_ARG_TYPE_ObjectID</u>

5.5.9.1.1 RecordScheduleID

The RecordScheduleID argument contains the object ID of the recordSchedule to be deleted.

5.5.9.2 Dependency on State

None.

5.5.9.3 Effect on State

The value of the StateUpdateID state variable is changed and the LastChange state variable is updated.

5.5.9.4 Errors

Table 27 — Error Codes for DeleteRecordSchedule()

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
704	No such recordSchedule ID	The specified <u>recordSchedule</u> does not exist.
705	Active <u>recordTask</u>	One or more <u>recordTask</u> instances are actively recording.
720	Cannot process the request	Cannot process the request in a reasonable amount of time.

5.5.10 GetRecordSchedule()

This required action is used to retrieve a single recordSchedule from the ScheduledRecording service.

5.5.10.1 Arguments

Table 28 — Arguments for GetRecordSchedule()

Argument	Direction	relatedStateVariable
<u>RecordScheduleID</u>	<u>IN</u>	<u>A_ARG_TYPE_ObjectID</u>
<u>Filter</u>	<u>IN</u>	<u>A_ARG_TYPE_PropertyList</u>
<u>Result</u>	<u>OUT</u>	<u>A_ARG_TYPE_RecordSchedule</u>

Argument	Direction	relatedStateVariable
<u>UpdateID</u>	<u>OUT</u>	<u>StateUpdateID</u>

5.5.10.1.1 RecordScheduleID

The RecordScheduleID contains the object ID of the recordSchedule for which information is to be returned.

5.5.10.1.2 Filter

See subclause 5.5.6.1.1.

5.5.10.1.3 Result

The Result output argument contains an XML escaped srs XML Document that contains a single recordSchedule identified by the @id value specified in the RecordScheduleID argument. For further details, see subclause 5.5.6.1.4.

5.5.10.1.4 UpdateID

See subclause 5.5.6.1.7.

5.5.10.2 Dependency on State

None.

5.5.10.3 Effect on State

None.

5.5.10.4 Errors

Table 29 — Error Codes for GetRecordSchedule()

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
704	No such recordSchedule ID	The specified <u>recordSchedule</u> does not exist.
720	Cannot process the request	Cannot process the request in a reasonable amount of time.

5.5.11 EnableRecordSchedule()

This conditionally required action shall be implemented if the DisableRecordSchedule() action is implemented, that is, these two actions shall be implemented as a combination. The action is used to enable a previously disabled recordSchedule. Enabling a recordSchedule is allowed in any state except for the "COMPLETED" state. In this case, the action shall return with error code 740.

The invocation of the EnableRecordSchedule() action enables all the associated recordTask objects in the "IDLE" or "ACTIVE" phase (see subclause 5.5.15) except for those which were disabled individually at the recordTask level via the DisableRecordTask() action. Disabling at the recordTask level always takes precedence. If any of the associated recordTask objects end up in a state that indicates that these

recordTask objects are already supposed to be recording, then the ScheduledRecording service shall ensure that these recordings start as soon as possible and within a reasonable amount of time (this will most likely result in a partial recording). If a ScheduledRecording service implementation can not ensure that these recordings start as soon as possible, then the EnableRecordSchedule() action shall return with error code 720. If the ScheduledRecording service can not enable some of the recordTask objects in the “IDLE” or “ACTIVE” phase, it shall return error code 740 without any change.

Enabling a recordSchedule shall not affect its recordTask objects in the “DONE” phase. These recordTask objects shall not cause error code 739 to be generated.

5.5.11.1 Arguments

Table 30 — Arguments for EnableRecordSchedule()

Argument	Direction	relatedStateVariable
<u>RecordScheduleID</u>	<u>IN</u>	<u>A_ARG_TYPE_ObjectID</u>

5.5.11.1.1 RecordScheduleID

The RecordScheduleID argument contains the object ID of the recordSchedule to be enabled.

5.5.11.2 Dependency on State

None.

5.5.11.3 Effect on State

The value of the StateUpdateID state variable is changed and the LastChange state variable is updated (the scheduleState@currentErrors property and some taskState@xxx error properties might be updated).

5.5.11.4 Errors

Table 31 — Error Codes for EnableRecordSchedule()

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
704	No such recordSchedule ID	The specified <u>recordSchedule</u> does not exist.
720	Cannot process the request	Cannot process the request in a reasonable amount of time.
739	Cannot enable/disable recordSchedule	One or more of the associated <u>recordTask</u> objects could not be enabled or disabled.
740	recordSchedule “COMPLETED”	The <u>recordSchedule</u> has already completed and cannot be enabled or disabled.

5.5.12 DisableRecordSchedule()

This conditionally required action shall be implemented if the EnableRecordSchedule() action is implemented, that is, these two actions shall be implemented as a combination.

The action is used to disable a recordSchedule. Disabling a recordSchedule is allowed in any state except for the “COMPLETED” state. In this case, the action shall return with error code 740.

The invocation of the DisableRecordSchedule() action disables all associated recordTask objects in the “IDLE” phase (see subclause 5.5.16) except for those which were enabled individually at the recordTask level via the EnableRecordTask() action. Enabling at the recordTask level always takes precedence. If the ScheduledRecording service can not disable some of the recordTask objects in the “IDLE” phase, it shall return error code 739 without any change.

The DisableRecordSchedule() action has no impact on recordTask objects already in the “ACTIVE” phase. These recordTask objects complete as planned.

Also, disabling a recordSchedule shall not affect its recordTask objects in the “DONE” phase. These recordTask objects shall not cause error code 739 to be generated. A disabled recordSchedule shall continue to generate new recordTask objects but they shall all be disabled. This allows control points to understand which recordTask objects will become active, once the RecordSchedule is re-enabled. This also provides the means for a control point to enable individual recordTask objects, even when the recordSchedule is disabled.

5.5.12.1 Arguments

Table 32 — Arguments for DisableRecordSchedule()

Argument	Direction	relatedStateVariable
<u>RecordScheduleID</u>	<u>IN</u>	<u>A_ARG_TYPE_ObjectID</u>

5.5.12.1.1 RecordScheduleID

The RecordScheduleID argument contains the object ID of the recordSchedule to be disabled.

5.5.12.2 Dependency on State

None.

5.5.12.3 Effect on State

The value of the StateUpdateID state variable is changed and the LastChange state variable is updated (the scheduleState@currentErrors property and some taskState@xxx error properties might be updated).

5.5.12.4 Errors

Table 33 — Error Codes for DisableRecordSchedule()

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
704	No such recordSchedule ID	The specified <u>recordSchedule</u> does not exist.

ErrorCode	errorDescription	Description
720	Cannot process the request	Cannot process the request in a reasonable amount of time.
739	Cannot enable/disable recordSchedule	One or more of the associated <u>recordTask</u> objects could not be enabled or disabled.
740	recordSchedule "COMPLETED"	The <u>recordSchedule</u> has already completed and cannot be enabled or disabled.

5.5.13 DeleteRecordTask()

This allowed action is used to delete a recordTask. For any existing recordTask, this action shall always succeed. The recordTask object is removed from the list of recordTask objects that is maintained by the ScheduledRecording service for the (parent) recordSchedule and any ongoing recording for this recordTask shall stop immediately. The associated recorded content for that recordTask shall not be deleted as a result of this action.

5.5.13.1 Arguments

Table 34 — Arguments for DeleteRecordTask()

Argument	Direction	relatedStateVariable
<u>RecordTaskID</u>	<u>IN</u>	<u>A_ARG_TYPE_ObjectID</u>

5.5.13.1.1 RecordTaskID

The RecordTaskID argument contains the object ID of the recordTask to be deleted.

5.5.13.2 Dependency on State

None.

5.5.13.3 Effect on State

The value of the StateUpdateID state variable is changed and the LastChange state variable is updated.

5.5.13.4 Errors

Table 35 — Error Codes for DeleteRecordTask()

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
713	No such <u>recordTask</u> ID	The specified <u>recordTask</u> does not exist.

5.5.14 GetRecordTask()

This required action is used to retrieve a single recordTask from the ScheduledRecording service.

5.5.14.1 Arguments

Table 36 — Arguments for GetRecordTask()

Argument	Direction	relatedStateVariable
<u>RecordTaskID</u>	<u>IN</u>	<u>A_ARG_TYPE_ObjectID</u>
<u>Filter</u>	<u>IN</u>	<u>A_ARG_TYPE_PropertyList</u>
<u>Result</u>	<u>OUT</u>	<u>A_ARG_TYPE_RecordTask</u>
<u>UpdateID</u>	<u>OUT</u>	<u>StateUpdateID</u>

5.5.14.1.1 RecordTaskID

The RecordTaskID argument contains the object ID of the recordTask for which information is to be returned.

5.5.14.1.2 Filter

See subclause 5.5.6.1.1.

5.5.14.1.3 Result

The Result output argument contains an XML escaped srs XML Document that contains a single recordTask instance, identified by the @id value specified in the RecordTaskID argument. The Result argument is identical to the Result argument of the BrowseRecordTasks() action. See subclause 5.5.7.1.5 for further details.

5.5.14.1.4 UpdateID

See subclause 5.5.6.1.7.

5.5.14.2 Dependency on State

None.

5.5.14.3 Effect on State

None.

5.5.14.4 Errors

Table 37 — Error Codes for GetRecordTask()

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
713	No such <u>recordTask</u> ID	The specified <u>recordTask</u> does not exist.
720	Cannot process the request	Cannot process the request in a reasonable amount of time.

5.5.15 EnableRecordTask()

This conditionally required action shall be implemented if the DisableRecordTask() or the ResetRecordTask() action are implemented, that is, these three actions shall be

implemented as a combination. The action is used to first de-synchronize the recordTask enable/disable behavior from the (parent) recordSchedule and then individually enable the recordTask, if not already enabled.

- A recordTask that is enabled in the “IDLE” phase will record content in the future unless the occurrence of an error prevents that.
- A recordTask that is enabled in the “ACTIVE” phase shall start recording content as soon as possible and within a reasonable amount of time unless the occurrence of an error prevents that. In that case, it shall return error code 720 without any change.

Invoking EnableRecordTask() on a recordTask in the “DONE” phase shall not affect the state of the recordTask and shall fail with error code 741.

Enabling a recordTask always takes persistent precedence over enabling/disabling activities performed at the (parent) recordSchedule level. A recordTask that is enabled by invoking EnableRecordTask() remains enabled until explicitly disabled by invoking DisableRecordTask() on that recordTask. Invoking EnableRecordSchedule() or DisableRecordSchedule() on the (parent) recordSchedule does not affect the recordTask anymore. A recordTask enable/disable behavior can be re-synchronised to the (parent) recordSchedule by invoking the ResetRecordTask() action. From that point onwards, a recordTask will follow any enabling/disabling activities performed at the (parent) recordSchedule level again.

5.5.15.1 Arguments

Table 38 — Arguments for EnableRecordTask()

Argument	Direction	relatedStateVariable
<u>RecordTaskID</u>	<u>IN</u>	<u>A_ARG_TYPE_ObjectID</u>

5.5.15.1.1 RecordTaskID

The RecordTaskID argument contains the object ID of the recordTask to be enabled.

5.5.15.2 Dependency on State

None.

5.5.15.3 Effect on State

The value of the StateUpdateID state variable is changed and the LastChange state variable is updated.

5.5.15.4 Errors

Table 39 — Error Codes for EnableRecordTask()

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
713	No such recordTask ID	The specified <u>recordTask</u> does not exist.

ErrorCode	errorDescription	Description
720	Cannot process the request	Cannot process the request in a reasonable amount of time.
741	recordTask in "DONE" phase	A <u>recordTask</u> in the "DONE" phase cannot be enabled or disabled.

5.5.16 DisableRecordTask()

This conditionally required action shall be implemented if the EnableRecordTask() or the ResetRecordTask() action are implemented, that is, these three actions shall be implemented as a combination. The action is used to first de-synchronize the recordTask enable/disable behavior from the (parent) recordSchedule and then individually disable the recordTask, if not already disabled. A disabled recordTask shall behave identical to an enabled recordTask, except for a) and b) below:

- A disabled recordTask in the "IDLE" phase shall report error code 101 (Disabled) in the taskState@pendingErrors property.
- A disabled recordTask in the "ACTIVE" phase shall not record content and it shall report error code 101 (Disabled) in the taskState@currentErrors and taskState@errorHistory properties.

When a recordTask in the "ACTIVE" phase is disabled, it shall stop recording immediately. If that is not possible, it shall return error code 720 without any change. Invoking DisableRecordTask() on a recordTask in the "DONE" phase shall not affect the state of the recordTask and shall fail with error code 741.

Disabling a recordTask always takes persistent precedence over enabling/disabling activities performed at the (parent) recordSchedule level. A recordTask that is disabled by invoking DisableRecordTask() remains disabled until explicitly re-enabled by invoking EnableRecordTask() on that recordTask. Invoking EnableRecordSchedule() or DisableRecordSchedule() on the (parent) recordSchedule does not affect the recordTask anymore. A recordTask enable/disable behavior can be re-synchronised to the (parent) recordSchedule by invoking the ResetRecordTask() action. From that point onwards, a recordTask will follow any enabling/disabling activities performed at the (parent) recordSchedule level again.

5.5.16.1 Arguments

Table 40 — Arguments for DisableRecordTask()

Argument	Direction	relatedStateVariable
<u>RecordTaskID</u>	<u>IN</u>	<u>A_ARG_TYPE_ObjectID</u>

5.5.16.1.1 RecordTaskID

The RecordTaskID argument contains the object ID of the recordTask to be disabled.

5.5.16.2 Dependency on State

None.

5.5.16.3 Effect on State

The value of the StateUpdateID state variable is changed and the LastChange state variable is updated.

5.5.16.4 Errors

Table 41 — Error Codes for DisableRecordTask()

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
713	No such recordTask ID	The specified <u>recordTask</u> does not exist.
720	Cannot process the request	Cannot process the request in a reasonable amount of time.
741	recordTask in "DONE" phase	A <u>recordTask</u> in the "DONE" phase cannot be enabled or disabled.

5.5.17 ResetRecordTask()

This conditionally required action shall be implemented if the EnableRecordTask() or the DisableRecordTask() action are implemented, that is, these three actions shall be implemented as a combination. The action is used to force a previously enabled or disabled recordTask to follow any enabling/disabling activities performed at the (parent) recordSchedule level again.

If the (parent) recordSchedule is in the "ENABLED" state, then the effect of invoking the ResetRecordTask() action on an associated recordTask is identical to invoking the EnableRecordTask() action on that recordTask and from that point onwards, following any enabling/disabling activities performed at the (parent) recordSchedule level again for that recordTask.

If the (parent) recordSchedule is in the "DISABLED" state, then the effect of invoking the ResetRecordTask() action on an associated recordTask is identical to invoking the DisableRecordTask() action on that recordTask and from that point onwards, following any enabling/disabling activities performed at the (parent) recordSchedule level again for that recordTask.

5.5.17.1 Arguments

Table 42 — Arguments for ResetRecordTask()

Argument	Direction	relatedStateVariable
<u>RecordTaskID</u>	<u>IN</u>	<u>A_ARG_TYPE_ObjectID</u>

5.5.17.1.1 RecordTaskID

The RecordTaskID argument contains the object ID of the recordTask to be reset.

5.5.17.2 Dependency on State

None.

5.5.17.3 Effect on State

The value of the StateUpdateID state variable is changed and the LastChange state variable is updated.

5.5.17.4 Errors

Table 43 — Error Codes for ResetRecordTask()

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
713	No such recordTask ID	The specified <u>recordTask</u> does not exist.
720	Cannot process the request	Cannot process the request in a reasonable amount of time.

5.5.18 GetRecordScheduleConflicts()

This conditionally required action shall be supported if the ScheduledRecording service implementation allows conflicting recordSchedule instances to be created. The action returns a CSV list of recordSchedule objects that conflict with the recordSchedule indicated by the RecordScheduleID argument.

5.5.18.1 Arguments

Table 44 — Arguments for GetRecordScheduleConflicts()

Argument	Direction	relatedStateVariable
<u>RecordScheduleID</u>	<u>IN</u>	<u>A_ARG_TYPE_ObjectID</u>
<u>RecordScheduleConflictIDList</u>	<u>OUT</u>	<u>A_ARG_TYPE_ObjectIDList</u>
<u>UpdateID</u>	<u>OUT</u>	<u>StateUpdateID</u>

5.5.18.1.1 RecordScheduleID

The RecordScheduleID argument contains the object ID of the recordSchedule for which all conflicting recordSchedule object ID values are to be returned in the RecordScheduleConflictIDList output argument.

5.5.18.1.2 RecordScheduleConflictIDList

This output argument contains the CSV list of recordSchedule object IDs that conflict with the recordSchedule, indicated by the RecordScheduleID argument.

5.5.18.1.3 UpdateID

The returned UpdateID argument shall contain the most recent value of the StateUpdateID state variable *before* the action began collecting information to create the value returned in the RecordScheduleConflictIDList argument. This ensures that any changes that occur during the gathering of information can be detected by comparing the value of the UpdateID argument to the updateID attribute value in the most recent LastChange event. Refer to subclause 5.3.4 for more detailed information on the use of this argument.

5.5.18.2 Dependency on State

None.

5.5.18.3 Effect on State

None.

5.5.18.4 Errors**Table 45 — Error Codes for GetRecordScheduleConflicts()**

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
704	No such recordSchedule ID	The specified <u>recordSchedule</u> does not exist.
720	Cannot process the request	Cannot process the request in a reasonable amount of time.

5.5.19 GetRecordTaskConflicts()

This conditionally required action shall be supported if the ScheduledRecording service implementation allows conflicting recordTask instances to be created. The action returns a CSV list of @id values of all the recordTask instances that conflict with the recordTask indicated by the RecordTaskID argument.

5.5.19.1 Arguments**Table 46 — Arguments for GetRecordTaskConflicts()**

Argument	Direction	relatedStateVariable
<u>RecordTaskID</u>	<u>IN</u>	<u>A_ARG_TYPE_ObjectID</u>
<u>RecordTaskConflictIDList</u>	<u>OUT</u>	<u>A_ARG_TYPE_ObjectIDList</u>
<u>UpdateID</u>	<u>OUT</u>	<u>StateUpdateID</u>

5.5.19.1.1 RecordTaskID

The RecordTaskID argument contains the object ID of the recordTask for which all conflicting recordTask object ID values are to be returned in the RecordTaskConflictIDList output argument.

5.5.19.1.2 RecordTaskConflictIDList

This output argument contains the CSV list of recordTask object IDs that conflict with the recordTask, indicated by the RecordTaskID argument.

5.5.19.1.3 UpdateID

The returned UpdateID argument shall contain the most recent value of the StateUpdateID state variable *before* the action began collecting information to create the value returned in the RecordTaskConflictIDList argument. This ensures that any changes that occur during the gathering of information can be detected by comparing the value of the UpdateID argument to the updateID attribute value in the most recent LastChange event. Refer to subclause 5.3.4 for more detailed information on the use of this argument.

5.5.19.2 Dependency on State

None.

5.5.19.3 Effect on State

None.

5.5.19.4 Errors**Table 47 — Error Codes for GetRecordTaskConflicts()**

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
713	No such recordTask ID	The specified <u>recordTask</u> does not exist.
720	Cannot process the request	Cannot process the request in a reasonable amount of time.

5.5.20 Common Error Codes

Table 48 lists error codes common to actions for this service type. If an action results in multiple errors, the most specific error shall be returned.

Table 48 — Common Error Codes

ErrorCode	errorDescription	Description
400-499	TBD	See clause 3 in the UPnP Device Architecture [14].
500-599	TBD	See clause 3 in the UPnP Device Architecture [14].
600-699	TBD	See clause 3 in the UPnP Device Architecture [14].
700		Reserved for future extensions.
701	Invalid Syntax	The <u>recordSchedule</u> in the <u>Elements</u> argument has invalid syntax. This includes malformed XML in the <u>Elements</u> input argument or a general schema violation.
702		Reserved for future extensions.
703	Invalid Value	One or more properties in the input <u>recordSchedule</u> (in the <u>Elements</u> argument) have an invalid value.
704	No such recordSchedule ID	The specified <u>recordSchedule</u> does not exist.
705	Active recordTask	One or more <u>recordTask</u> instances are actively recording.
706		Reserved for future extensions.
707	Read-only property	Unable to specify read-only property.
708	Required property	Omitting a required property is not allowed.
709	Unsupported or invalid sort criteria	The sort criteria specified are not supported or are invalid.
710		Reserved for future extensions.
711	Invalid DataTypeID	An invalid value has been specified in the <u>DataTypeID</u> input argument.

ErrorCode	errorDescription	Description
712		Reserved for future extensions.
713	No such recordTask ID	The specified <u>recordTask</u> does not exist.
714-719		Reserved for future extensions.
720	Cannot process the request	Cannot process the request in a reasonable amount of time.
721-729		Reserved for future extensions.
730	Conflict	The specified <u>recordSchedule</u> is conflicting with one or more existing <u>recordSchedule</u> objects. The ScheduledRecording service may reject a conflicting <u>recordSchedule</u> and return with this error code.
731	Protected Contents	The specified contents are copy protected. The ScheduledRecording service may reject a <u>recordSchedule</u> that specifies copy protected contents and return with this error code.
732	No Media	The specified removable media is not inserted.
733	Media Write Protect	The specified removable media is write-protected.
734	Media No Space	The specified media does not have sufficient capacity.
735	Media Error	Error related to the specified destination media.
736	Too many record schedules	The maximum number of <u>recordSchedule</u> objects is reached.
737	Resource Error	Error related to an application resource.
738		Reserved for future extensions.
739	Cannot enable/disable recordSchedule	One or more of the associated <u>recordTask</u> objects could not be enabled or disabled.
740	recordSchedule "COMPLETED"	The <u>recordSchedule</u> has already completed and cannot be enabled or disabled.
741	recordTask in "DONE" phase	A <u>recordTask</u> in the "DONE" phase cannot be enabled or disabled.

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

5.6 State Diagram of recordTask

In the ScheduledRecording service, the state of each recordTask is represented by its state properties (that is: taskState and its associated properties taskState@xxx). The definitions are described in Annex B.16. Additionally, the state behavior of a recordTask is illustrated by a state diagram to give a visual description of each state and the state transitions. State diagrams are provided for informational purposes. Whenever there is a discrepancy between the state diagram and the textual description of state and state transition, the normative textual description takes precedence.

5.6.1 A Full-Featured State Diagram

As described above, the taskState property reflects the current state of the recordTask. Its value changes over time as the recordTask progresses through its life-cycle. The following state transition diagram in Figure 5 shows the possible states and state transitions that a given recordTask may take throughout its life time. It is assumed that all (required and allowed) normative states and attributes of a recordTask are supported by the device. Further, it is assumed that a device is able to resume recording in the middle

of the “**ACTIVE**” phase., The [GetAllowedValues\(\)](#) action can be used to determine if a device supports all states and attributes.

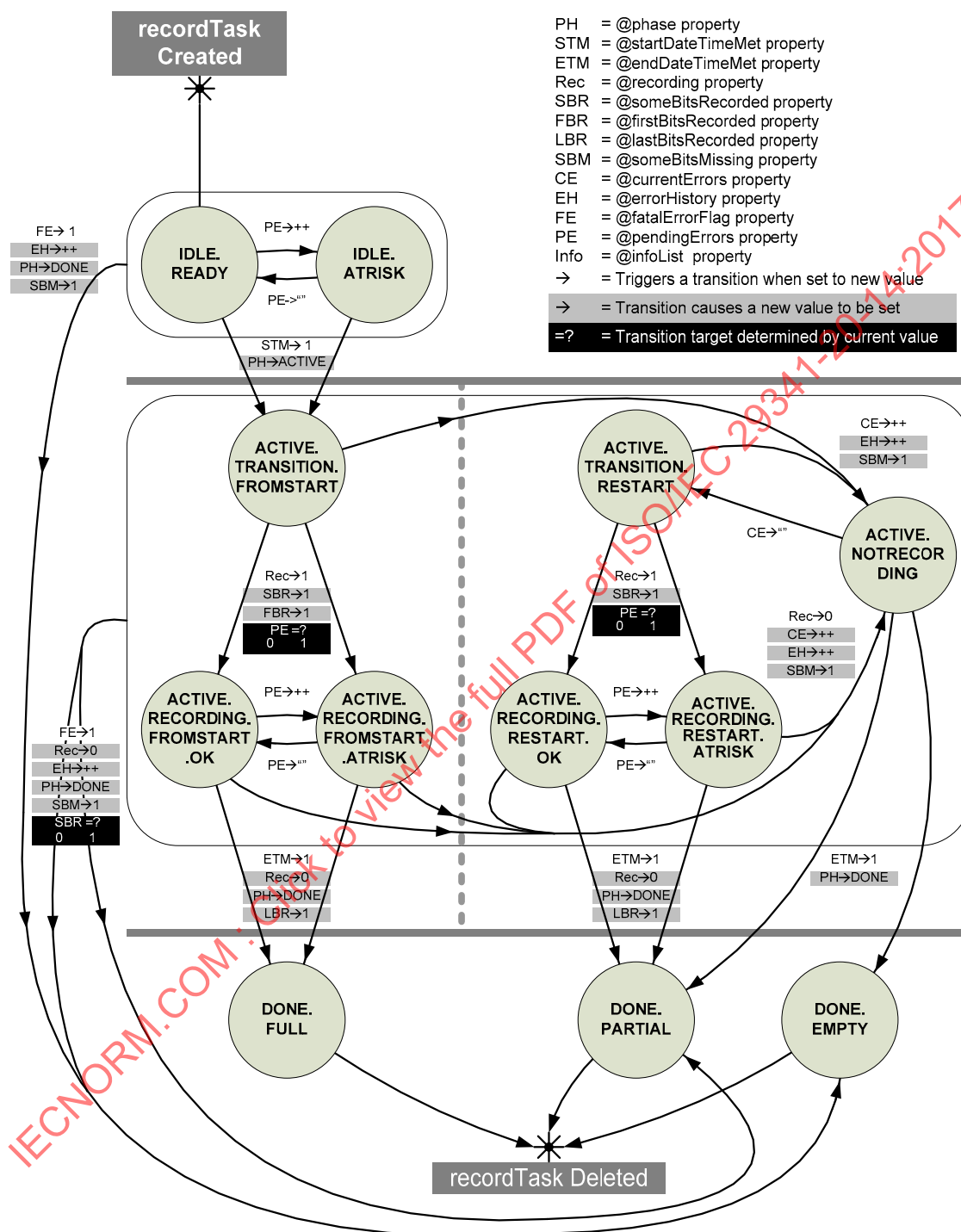


Figure 5 — A Full-Featured State Diagram

5.6.1.1 “IDLE” Phase

The states in this phase indicate that the recordTask's start time has not yet been reached and that the target content is not yet available for recording. The recordTask will remain in the “IDLE” phase (that is: in any of the IDLE states), until either the recordTask's start time is reached or a fatal error is detected. If/when the start time is reached, the recordTask will transition to one of the states in the “ACTIVE” phase. If a fatal error is detected, the recordTask will transition directly to the “DONE.EMPTY” state within the “DONE” phase.

5.6.1.1.1 “IDLE.READY” State

This state indicates that the recordTask is waiting for the start time to be reached and that no error conditions (either fatal or non-fatal) have been detected. If/when the start time is reached, the recordTask will transition to one of the states in the “ACTIVE” phase. If, while waiting for the start time, a non-fatal error is detected, the recordTask will transition to the “IDLE.ATRISK” state indicating that the recordTask is at risk of not completing successfully due to some non-fatal error condition.

5.6.1.1.2 “IDLE.ATRISK” State

This state indicates that the recordTask is waiting for the start time to be reached, but that at least one non-fatal error condition has been detected. If/when the start time is reached, the recordTask will transition to one of the states in the “ACTIVE” phase. If, while waiting for the start time, the non-fatal error is resolved, the recordTask will transition back to the “IDLE.READY” state.

5.6.1.2 “ACTIVE” Phase

The states in this phase indicate that the recordTask's start time has been reached and that the target content is available for recording. While in this phase (that is: in one of these states), the device will attempt to record the content. The recordTask will remain in this phase until either the recordTask's end time is reached (that is: the content is no longer available) or until a fatal error is detected. If/when the end time is reached, the recordTask will transition to the appropriate “DONE” state based on how much of the content was recorded (that is: all – “DONE.FULL”, part – “DONE.PARTIAL”, or none – “DONE.EMPTY”). If a fatal error is detected, the recordTask will transition to either the “DONE.PARTIAL” or the “DONE.EMPTY” state, depending on how much of the content was recorded (that is: part or none).

5.6.1.2.1 “ACTIVE.TRANSITION.FROMSTART” State

This state indicates that the recordTask is attempting to begin recording the recordTask's content from the beginning of the designated start time. The recordTask remains in this state until either the device actually begins recording data to the media or until a non-fatal or fatal error occurs. If the device actually starts to record data to the media, the recordTask will transition to “ACTIVE.RECORDING.FROMSTART” states where the content continues to be recorded. If the initial recording attempt fails due to a non-fatal error, the recordTask transitions to the “ACTIVE.NOTRECORDING” state where one or more attempts is made to resolve the problem and re-start the recording. If a fatal error is detected, the recordTask will transition to either the “DONE.PARTIAL” or the “DONE.EMPTY” state, depending on how much of the content was actually recorded (that is: part or none).

Although the recordTask remains in this state for a relatively short period of time, this state bridges an inherent discontinuity between the “IDLE” states and the “ACTIVE” states. Specifically, at the instant when the recordTask's start time is reached, the

recordTask (by definition) shall transition out of the “IDLE” phase and into the “ACTIVE” phase. However, since the device has not yet attempted to record any content data on to the media, it is unknown which “ACTIVE” state the recordTask shall transition to. Firstly, it is not appropriate to transition to any of the “ACTIVE.RECORDING.xxx” states because the device has not yet actually recorded any content data. Secondly, it is not appropriate to transition to the “ACTIVE.NOTRECORDING” state because this state (by definition) means that a non-fatal error has occurred resulting in the loss of content. Since no other “ACTIVE” states are appropriate at this instant in time, the “ACTIVE.TRANSITION.xxx” states exist as a brief transition point while the true disposition of the recordTask is determined.

5.6.1.2.2 “ACTIVE.TRANSITION.RESTART” State

This state indicates that the recordTask is attempting to re-start the recording of the recordTask's content some time after the beginning of the designated start time. This implies that either the initial recording attempt failed or that the initial recording attempt succeeded, but was later disrupted due to a non-fatal error. The recordTask remains in this state until either the device actually begins recording data to the media or until a non-fatal or fatal error occurs. If the device actually starts to record data to the media, the recordTask will transition to “ACTIVE.RECORDING.RESTART” states where the content continues to be recorded. If the initial recording attempt fails due to a non-fatal error, the recordTask transitions to the “ACTIVE.NOTRECORDING” state where one or more attempts is made to resolve the problem and re-attempt to start the recording. If a fatal error is detected, the recordTask will transition to either the “DONE.PARTIAL” or the “DONE.EMPTY” state, depending on how much of the content was recorded (that is: part of none).

Although the recordTask remains in this state for a relatively short period of time, this state bridges an inherent discontinuity between the “ACTIVE.NOTRECORDING” state and the “ACTIVE.RECORDING.xxx” states. Specifically, at the instant when a current non-fatal error has been resolved, the recordTask (by definition) shall transition out of the “ACTIVE.NOTRECORDING” state and into one of the other “ACTIVE” states. However, since the device has not yet attempted to restart the recording of content data on to the media, it is unknown which “ACTIVE” state the recordTask shall transition to. Firstly, it is not appropriate to transition to any of the “ACTIVE.RECORDING.xxx” states because the device has not yet actually (re)started to record any content data. Secondly, it is not appropriate to transition back to the “ACTIVE.NOTRECORDING” state because there are no unresolved non-fatal errors. Since no other “ACTIVE” states are appropriate at this instant in time, the “ACTIVE.TRANSITION.xxx” states exists as a brief transition point while the true disposition of the recordTask is determined.

5.6.1.2.3 “ACTIVE.RECORDING.FROMSTART.OK” State

This state indicates that the recordTask has reached its start time and that all of the target content has been recorded continuously from the beginning. Additionally, no non-fatal or fatal errors have occurred or have been detected which would otherwise threaten the future continuity of the recording. The recordTask remains in this state until either the recordTask's end time is reached or until a non-fatal or fatal error occurs or a pending non-fatal or fatal error is detected.

If the recordTask reaches its end time, the recordTask halts the recording and transitions to the “DONE.FULL” state indicating that the entire target content was recorded uninterrupted. If a non-fatal error actually occurs, the recording has already halted and the recordTask transitions to the “ACTIVE. NOTRECORDING” state where one or more attempts are made to resolve the problem and restart the recording. If a fatal error actually occurs, the recording has already halted and the recordTask transitions directly to the “DONE.PARTIAL” state indicating that part of the target content was recorded. If a

pending non-fatal or fatal error is detected (but has not yet occurred), the recordTask transitions to the “ACTIVE.RECORDING.FROMSTART.ATRISK” state indicating that the target content has been recorded continuously from the beginning, but a pending error has been detected that threatens the remainder of the recording.

5.6.1.2.4 “ACTIVE.RECORDING.FROMSTART.ATRISK” State

This state indicates that the recordTask has reached its start time and that all of the target content has been recorded continuously from the beginning. Although no non-fatal or fatal errors have occurred, one or more pending non-fatal or fatal errors have been detected that threaten the future continuity of the recording. The recordTask remains in this state until either the recordTask's end time is reached or until all of the pending non-fatal and fatal errors have been resolved or until a non-fatal or fatal error actually occurs.

If the recordTask reaches its end time, the recordTask halts the recording and transitions to the “DONE.FULL” state indicating that the entire target content was recorded uninterrupted. If all of the pending errors have been resolved, the recordTask transitions to the “ACTIVE.RECORDING.FROMSTART.OK” state indicating that the target content has been recorded continuously from the beginning and that no pending non-fatal or fatal errors have been detected. If a non-fatal error actually occurs, the recording has already halted and the recordTask transitions to the “ACTIVE. NOTRECORDING” state where one or more attempts are made to resolve the problem and restart the recording. If a fatal error actually occurs, the recording has already halted and the recordTask transitions directly to the “DONE.PARTIAL” state indicating that part of the target content was recorded.

5.6.1.2.5 “ACTIVE.RECORDING.RESTART.OK” State

This state indicates that the recordTask has reached its start time and that the target content data is being recorded onto the media. However, at some point in the past, the recording was disrupted either at the beginning or somewhere in the middle so that part of the content was not recorded. Fortunately, no pending non-fatal or fatal errors have been detected which would otherwise threaten the future continuity of the recording. The recordTask remains in this state until either the recordTask's end time is reached or until a non-fatal or fatal actually occurs or a pending non-fatal or fatal error is detected.

If the recordTask reaches its end time, the recordTask halts the recording and transitions to the “DONE.PARTIAL” state indicating that part, but not all, of the target content was recorded. If a non-fatal error actually occurs, the recording has already halted and the recordTask transitions to the “ACTIVE. NOTRECORDING” state where one or more attempts are made to resolve the problem and again restart the recording. If a fatal error actually occurs, the recording has already halted and the recordTask transitions directly to the “DONE.PARTIAL” state indicating that part of the target content was recorded. If a pending non-fatal or fatal error is detected (but has not yet occurred), the recordTask transitions to the “ACTIVE.RECORDING.RESTART.ATRISK” state indicating that part of the target content has been recorded and that additional non-fatal or fatal errors are pending which threaten the remainder of the recording.

5.6.1.2.6 “ACTIVE.RECORDING.RESTART.ATRISK” State

This state indicates that the recordTask has reached its start time and that the target content data is being recorded onto the media. However, at some point in the past, the recording was disrupted either at the beginning or somewhere in the middle so that part of the content was not recorded. Additionally, one or more pending non-fatal or fatal errors have been detected that threaten the future continuity of the recording. The recordTask remains in this state until either the recordTask's end time is reached or until

all of the pending non-fatal and fatal errors have been resolved or until a non-fatal or fatal actually occurs.

If the recordTask reaches its end time, the recordTask halts the recording and transitions to the "DONE.PARTIAL" state indicating that part, but not all, of the target content was recorded. If all of the pending errors have been resolved, the recordTask transitions to the "ACTIVE.RECORDING.RESTART.OK" state indicating that the target content continues to be recorded, but with some content missing, and that no pending non-fatal or fatal errors have been detected. If a non-fatal error actually occurs, the recording has already halted and the recordTask transitions to the "ACTIVE.NOTRECORDING" state where one or more attempts are made to resolve the problem and again restart the recording. If a fatal error actually occurs, the recording has already halted and the recordTask transitions directly to the "DONE.PARTIAL" state indicating that part of the target content was recorded.

5.6.1.2.7 "ACTIVE.NOTRECORDING" State

This state indicates that a non-fatal error has occurred while the device was recording the target content or while the device was attempting to start recording the target content. The recordTask remains in this state until either the recordTask's end time is reached or until all of the current non-fatal errors are resolved, or until a fatal error actually occurs.

If the recordTask reaches its end time, the recordTask transitions to either the "DONE.PARTIAL" or "DONE.EMPTY" depending on how much of the content was actually recorded (that is: part or none). If all of the current non-fatal errors have been resolved, the recordTask transitions to the "ACTIVE.TRANSITION.RESTART" state where one or more attempts are made to restart the recording. If a fatal error is detected, the recordTask transitions to either the "DONE.PARTIAL" or the "DONE.EMPTY" state depending on how much of the content was actually recorded (that is: part or none).

5.6.1.3 "DONE" Phase

The states in this phase indicate that the device is finished with this recordTask. Each "DONE" state indicates the success or failure of the recordTask based on how much of the target content was actually recorded. Once the recordTask reaches one of the "DONE" states, it remains in that state until the recordTask is deleted and none of the recordTask's property values change.

5.6.1.3.1 "DONE.FULL" State

This state indicates that all of the recordTask's target content was recorded in its entirety without any interruptions. No error occurred while recording the target content. The recordTask remains in this state until the recordTask is deleted.

5.6.1.3.2 "DONE.PARTIAL" State

This state indicates that part of the recordTask's target content was recorded, but not all of it. One or more errors occurred while recording the target content that prevented part of that content from being recorded. The recordTask remains in this state until the recordTask is deleted.

5.6.1.3.3 "DONE.EMPTY" State

This state indicates that none of the recordTask's target content was recorded. One or more errors occurred that prevented the recording from even getting started. The recordTask remains in this state until the recordTask is deleted.

5.6.2 A Minimal-Implementation State Diagram

The simplest state diagram based on the minimum required state related properties is illustrated below to show the behavior of such a device and the progression of its state. The support level of these state related properties is defined in Annex C.3.2. This example only uses the set of required allowed values for the *taskState* property. In the example below, it is assumed that the device is unable to resume recording once the “**ACTIVE**” phase is entered. By definition, any device shall support at least the following 5 illustrated states.

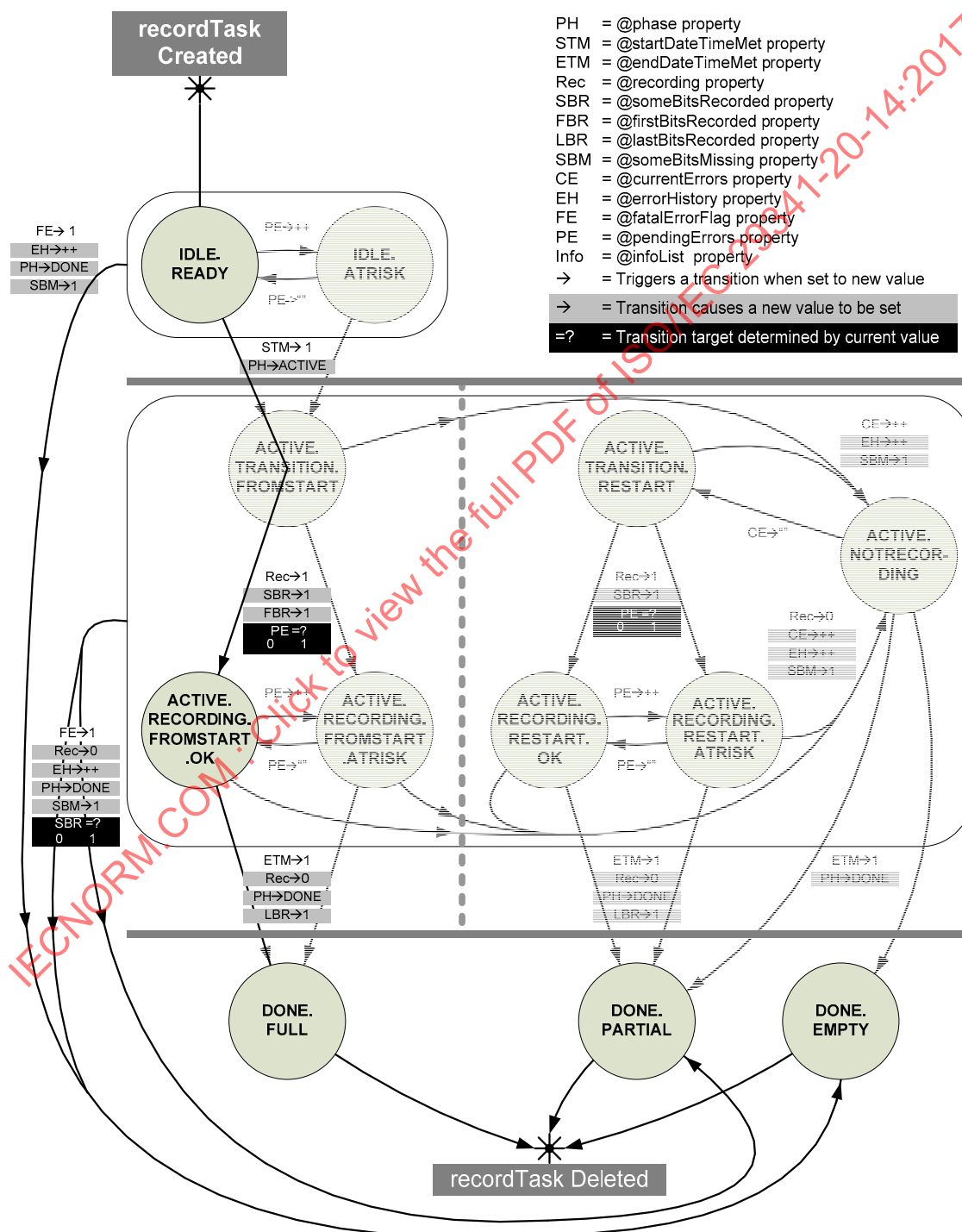


Figure 6 — A Minimal-Implementation State Diagram

5.6.2.1 “IDLE” Phase

In this phase, the device is not able to detect pending errors (that is: taskState@pendingErrors shall be empty); therefore, once the start time is reached, the device will go to the “ACTIVE.RECORDING.FROMSTART.OK” state and start recording. If the device can not start recording, it is treated as a fatal error, and the recordTask will transition directly to the “DONE.EMPTY” state. Also, anytime during the “IDLE” phase, a fatal error can occur, and the recordTask will transition directly to the “DONE.EMPTY” state.

5.6.2.1.1 “IDLE.READY” State

Because there is no error detecting mechanism (that is: taskState@pendingErrors) supported, this state indicates that the recordTask is waiting for the start time to be reached and that no errors conditions (either fatal or non-fatal) have been detected. If/when the start time is reached, the recordTask will attempt to record immediately.

5.6.2.1.2 “IDLE.ATRISK” State

Because there is no error detecting mechanism (that is: taskState@pendingErrors) supported, this state is not supported.

5.6.2.2 “ACTIVE” Phase

Because there is no pending error (that is: taskState@pendingErrors) detection mechanism supported, nor is an interrupted “ACTIVE” recording or late recording (that is: the start time is missed) able to resume recording (due to device limitations), only one state shall be supported in the “ACTIVE” phase, that is: “ACTIVE.RECORDING.FROMSTART.OK”. It indicates a perfect recording condition.

5.6.2.2.1 “ACTIVE.TRANSITION.FROMSTART” State

This state is not supported.

5.6.2.2.2 “ACTIVE.TRANSITION.RESTART” State

This state is not supported.

5.6.2.2.3 “ACTIVE.RECORDING.FROMSTART.OK” State

This is the only state that shall be supported in the “ACTIVE” phase. It indicates the perfect recording condition. The recordTask has reached its start time and all of the target content has been recorded continuously from the beginning. The recordTask remains in this state until either the recordTask's end time is reached or until a fatal error is detected.

If the recordTask reaches its end time, the recordTask halts the recording and transitions to the “DONE.FULL” state indicating that the entire target content was recorded uninterrupted. If the recording is interrupted for any reason, it is treated as a fatal error, and the recordTask immediately transitions to either the “DONE.PARTIAL” or the “DONE.EMPTY” state.

5.6.2.2.4 “ACTIVE.RECORDING.FROMSTART.ATRISK” State

This state is not supported since the device does not support pending errors.

5.6.2.2.5 “ACTIVE.RECORDING.RESTART.OK” State

This state is not supported since the device can not resume an interrupted recording or catch a late recording that misses the beginning.

5.6.2.2.6 “ACTIVE.RECORDING.RESTART.ATRISK” State

This state is not supported since the device does not support pending errors.

5.6.2.2.7 “ACTIVE.NOTRECORDING” State

This state is not supported since the device can not resume interrupted recording. Any interruptions during the middle of recording will cause a transition to the “DONE” phase.

5.6.2.3 “DONE” Phase

The states in this phase indicate that the device is finished with this recordTask. Each “DONE” state indicates the success or failure of the recordTask based on how much of the target content was actually recorded.

5.6.2.3.1 “DONE.FULL” State

This state indicates a perfect recording. The recordTask's target content was recorded in its entirety without any interruptions.

5.6.2.3.2 “DONE.PARTIAL” State

This state indicates that part of the recordTask's target content was recorded, but not all of it. This state is reached from an “ACTIVE” recordTask due to a fatal error.

5.6.2.3.3 “DONE.EMPTY” State

This state indicates that none of the recordTask's target content was recorded. It is a result of a recording that has never been started due to a fatal error.

5.6.3 recordTask State Example

The following example illustrates the use of state attributes. In this example, it is assumed that a device is able to resume a recording after it is interrupted.

The events occurs at:

- T0: Sytem is idle.
- T1: Error 1 (for example, DRM protected is being broadcast) and Error 3 (for example, conflicted-loser) are predicted.
- T2: The recordSchedule reaches the scheduled start time, but Error 1 prevents the recording from starting.
- T3: Suddenly, a new Error 2 occurs (for example, disabled)
- T4: Error 1 is fixed (for example, the protected part ends.), but Error 3 is still predicted.
- T5: Error 2 is fixed (for example, enabled by user), but Error 3 is still predicted.
- T6: Error 3 occurs (for example, other prioritized program starts)
- T7: Error 3 is fixed (for example, the prioritized program ends)
- T8: The recordSchedule reached the scheduled end time

Table 49 — recordTask State Timeline

Time Line	Recording Schedule	Error 1	Error 2	Error 3	<u>taskState</u>	<u>@phase</u>	<u>@recording</u>	<u>@someBitsRecorded</u>	<u>@someBitsMissing</u>	<u>@startDateTimeMet</u>	<u>@endDateTimeMet</u>	<u>@firstBitsRecorded</u>	<u>@lastBitsRecorded</u>	<u>@fatalError</u>	<u>@currentErrors</u>	<u>@pendingErrors</u>	<u>@errorHistory</u>
T0					" <u>IDLE.READY</u> "	" <u>IDLE</u> "	0	0	0	0	0	0	0	0	0	0	0
T1					" <u>IDLE.ATRISK</u> "	" <u>IDLE</u> "	0	0	0	0	0	0	0	0	0	1,3	0
T2					" <u>ACTIVE.NOTRECORDING</u> "	" <u>ACTIVE</u> "	0	0	1	1	0	0	0	0	1	3	1
T3					" <u>ACTIVE.NOTRECORDING</u> "	" <u>ACTIVE</u> "	0	0	1	1	0	0	0	0	1,2	3	1,2
T4					" <u>ACTIVE.NOTRECORDING</u> "	" <u>ACTIVE</u> "	0	0	1	1	0	0	0	0	2	3	1,2
T5					" <u>ACT.RECORDING.RESTART.ATRISK</u> "	" <u>ACTIVE</u> "	1	1	1	1	0	0	0	0	0	3	1,2
T6					" <u>ACTIVE.NOTRECORDING</u> "	" <u>ACTIVE</u> "	0	1	1	1	0	0	0	0	3	0	1,2,3
T7					" <u>ACT.RECORDING.RESTART.OK</u> "	" <u>ACTIVE</u> "	1	1	1	1	0	0	0	0	0	0	1,2,3
T8					" <u>DONE.PARTIAL</u> "	" <u>DONE</u> "	0	1	1	1	1	0	1	0	0	0	1,2,3

5.7 ScheduledRecording Service Priority Model

5.7.1 Introduction of the ScheduledRecording Service Priority Model

The ScheduledRecording service priority model allows control points to provide desired priority information in order to help the ScheduledRecording service prioritize conflicting recordTask instances that were generated by different recordSchedule instances. The ScheduledRecording service priority model does not remove these conflicts from the system, but it does help the ScheduledRecording service make scheduling decisions that more closely match the desires of the end-user.

The ScheduledRecording service priority model is based on a "priority level" system in which each recordSchedule is assigned a specific priority level. The recordTask inherits the priority of its parent recordSchedule. In other words, the recordTask instances generated by a recordSchedule of a higher priority level are given higher priority than those recordTask instances generated by a recordSchedule of a lower priority level. Except for those ScheduledRecording service implementations that support "ordered priority" (described below), all of the recordTask instances generated by any of the recordSchedule instances assigned to the same priority level will have the same priority. If conflicts arise between any of these (same priority) recordTask instances, the ScheduledRecording service may give preference to any of these recordTask instances in a device-dependant manner.

The number of distinct priority levels supported by a ScheduledRecording service is vendor-dependent. Each priority level is identified by its name which shall have the form "L<x>" where "L" is an abbreviation for "Level" and <x> is a number ranging from 1 to some device-specific maximum value n where n is the total number of distinct priority levels supported by the ScheduledRecording service.

For example, a ScheduledRecording service that supports 5 distinct priority levels will have the following priority levels named as follows:

- “L1” (Highest priority level)
- “L2”
- “L3”
- “L4”
- “L5” (Lowest priority level)

The list of priority levels supported by a ScheduledRecording service is obtainable via the [GetAllowedValues\(\)](#) action by examining the allowed value list of the [priority](#) property. Each existing [recordSchedule](#) (on a given ScheduledRecording service) shall be assigned one of these supported priority levels. The [priority](#) property of each [recordSchedule](#) indicates the current priority level assigned to that [recordSchedule](#) which can be retrieved via the [BrowseRecordSchedules\(\)](#) action.

5.7.2 Ordered Priority within Each Priority Level

In addition to supporting one or more priority levels, some ScheduledRecording service implementations are able to prioritize the [recordSchedule](#) instances within each priority level. When ordered priority is supported, each [recordSchedule](#) (in addition to its assigned priority level) is also assigned a unique “ordered priority slot” ranging from 1 to <n> where <n> is the total number of [recordSchedule](#) instances within the ScheduledRecording service. A value of 1 represents the highest priority [recordSchedule](#) within the ScheduledRecording service; that is: the highest priority [recordSchedule](#) within the highest priority level “L1”. The value <n> represents the lowest priority [recordSchedule](#) within the ScheduledRecording service; that is: the lowest [recordSchedule](#) within the lowest priority level. The ordered priority slot assigned to each [recordSchedule](#) can be obtained via the [recordSchedule](#)’s [priority@orderedValue](#) property. A ScheduledRecording service that support ordered priority shall expose this property for each of their [recordSchedule](#) instances. Conversely, a ScheduledRecording service that does not support this capability shall not expose the [priority@orderedValue](#) property. Within a given ScheduledRecording service, each ordered priority slot is assigned to exactly one [recordSchedule](#).

As a natural consequence, the [recordSchedule](#) instances assigned to a higher priority level will always have a higher ordered priority than the [recordSchedule](#) instances assigned to a lower priority levels.

The following examples shows a ScheduledRecording service that supports ordered priority values within each of its 5 priority levels. The first example shows a ScheduledRecording service with fewer [recordSchedule](#) instances than the number of priority levels supported by that ScheduledRecording service. The second example shows a ScheduledRecording service with more [recordSchedule](#) instances than the number of priority levels supported by the ScheduledRecording service.

Of particular note, [recordSchedule](#) instances do not need to be evenly distributed between the different priority levels. Ordered priority slots are contiguously assigned starting with the highest priority [recordSchedule](#) down to the lowest priority [recordSchedule](#).

Table 50 — Example 1: Fewer [recordSchedule](#) instances than the Number of Supported Priority Levels.

Priority Level	RecordScheduleID	Ordered Priority Slot
“ <u>L1</u> ” (highest priority level)	RS-A	1
“ <u>L2</u> ”		

" <u>L3</u> "	RS-C RS-B	2 3
" <u>L4</u> "		
" <u>L5</u> " (lowest priority level)		

Table 51 — Example 2: More recordSchedule instances than the Number of Supported Priority Levels.

Priority Level	<u>RecordScheduleID</u>	Ordered Priority Slot
" <u>L1</u> " (highest priority level)	RS-A	1
" <u>L2</u> "	RS-F	2
" <u>L3</u> "	RS-C RS-B	3 4
" <u>L4</u> "	RS-E	5
" <u>L5</u> " (lowest priority level)	RS-G RS-D	6 7

5.7.3 Setting the Initial Priority Level of a recordSchedule

The initial priority level of a recordSchedule is determined by the ScheduledRecording service when the recordSchedule is created. When determining the initial priority level, the ScheduledRecording service shall examine the recordSchedule's incoming desiredPriority property, and if provided, set the recordSchedule's initial priority level as indicated. If the desiredPriority property is not set, then the ScheduledRecording service shall assign the recordSchedule to one of the supported priority levels based on some device-dependent assignment algorithm. As described below, the desiredPriority property can be set to one of many different values which allow control points to express the desired priority in a number of different ways. The GetAllowedValues() action can be used to determine which values a ScheduledRecording service allows for its desiredPriority property.

The desiredPriority property has an associated desiredPriority@type property that shall be set to "PREDEF" except when an object ID is specified in the desiredPriority property. In this case the desiredPriority@type property shall be set to "OBJECTID" (see below for details).

In the simplest case, the incoming desiredPriority property is set to the name of one of the supported priority levels. This value indicates that the recordSchedule shall be assigned to the specified priority level. If the ScheduledRecording service is not able to complete the assignment, then it shall fail the creation request.

If a control point does not have a desired priority for a recordSchedule that it is about to create, the control point may set the incoming desiredPriority property to the value "DEFAULT". This value indicates that the control point is willing to accept the ScheduledRecording service's default priority level assignment.

If the ScheduledRecording service supports ordered priority (that is: the ScheduledRecording service supports the priority@orderedValue property), the ScheduledRecording service shall also support some additional values for its desiredPriority property. Firstly, the ScheduledRecording service shall support a value with the following format (without the double-quotes): "<@id>" where <@id> is the @id property value of an already existing recordSchedule. (The associated desiredPriority@type property shall be set to "OBJECTID" in this case). This value indicates that the new recordSchedule shall be assigned to the same priority level as the

existing recordSchedule identified by <@id>. Furthermore, the new recordSchedule shall be assigned the ordered priority slot of the existing recordSchedule with the existing recordSchedule and all other lower priority recordSchedule instances shifted to the next lower ordered priority slot. (See examples below.)

Additionally, when ordered priority is supported, the ScheduledRecording service shall also support a number of convenience values corresponding to the highest and lowest ordered priority slots within each of its supported priority level. These convenience values shall have the form "L<x> HI" or "L<x> LOW" where "L" is an abbreviation for "Level", <x> is a number ranging from 1 to some device-specific maximum value n where n is the total number of distinct priority levels supported by the ScheduledRecording service. For example, a ScheduledRecording service that supports 5 priority levels and also ordered priority shall support the values "L1 HI", "L1 LOW", "L2 HI", "L2 LOW", "L3 HI", "L3 LOW", "L4 HI", "L4 LOW", "L5 HI", "L5 LOW" for the desiredPriority property. Furthermore, the ScheduledRecording service shall also support two additional convenience values corresponding to the highest and lowest priority within the ScheduledRecording service. These two additional convenience values are "HIGHEST" (which is equivalent to the highest ordered priority slot in the highest priority level "L1 HI"), and "LOWEST" (which is equivalent to the lowest priority slot within the lowest priority level "L<n> LOW" when n is the total number of priority slots supported by the ScheduledRecording service).

All of these additional convenience values behave just like a "<@id>" value. The primary benefit of the convenience values is that they can be used to specify a specific ordered priority slot without having to determine the @id of the existing recordSchedule currently assigned to that slot. Additionally, as with a "<@id>" value, the existing recordSchedule already assigned to that desired ordered priority slot and those recordSchedule instances assigned to lower priority slots, are shifted to the next lower slot. However, all recordSchedule instances remain within their same priority level.

In the following examples, the ScheduledRecording service supports 3 priority levels and also supports ordered priority. The examples begin with the following recordSchedule priorities already assigned.

Table 52 — Existing recordSchedule Priorities

Priority Level	<u>RecordScheduleID</u>	Ordered Priority Value
" <u>L1</u> " (highest priority level)	RS-A	1
" <u>L2</u> "	RS-C	2
" <u>L3</u> " (lowest priority level)	RS-B	3

Then the CreateRecordSchedule() action is invoked with the desiredPriority property set to "RS-C". After the action completes, a new recordSchedule is created with the @id property set to "RS-D". The set of recordSchedule instances is now prioritized as follows:

Table 53 — desiredPriority Property Set to "RS-C"

Priority Level	<u>RecordScheduleID</u>	Priority
" <u>L1</u> " (highest priority level)	RS-A	1
" <u>L2</u> "	RS-D RS-C	2 3
" <u>L3</u> " (lowest priority level)	RS-B	4

Next the CreateRecordSchedule() action is invoked with the desiredPriority property set to "HIGHEST", "L1 HI", or "RS-A" (all values have the same effect). After the action

completes, a new recordSchedule is created with the @id property set to “RS-E”. The set of recordSchedule instances is now prioritized as follows:

Table 54 — desiredPriority Property Set to “HIGHEST”, “L1 HI”, or “RS-A”

Priority Level	<u>RecordScheduleID</u>	Ordered Priority Value
“L1” (highest priority level)	RS-E	1
	RS-A	2
“L2”	RS-D	3
	RS-C	4
“L3” (lowest priority level)	RS-B	5

Now the CreateRecordSchedule() action is invoked with the desiredPriority property set to “LOWEST”, “L3 LOW”, or “RS-B” (all values have the same effect). After the action completes, a new recordSchedule is created with the @id property set to “RS-F”. The set of recordSchedule instances is now prioritized as follows:

Table 55 — desiredPriority Property Set to “LOWEST”, “L3 LOW”, or “RS-B”

Priority Level	<u>RecordScheduleID</u>	Ordered Priority Value
“L1” (highest priority level)	RS-E	1
	RS-A	2
“L2”	RS-D	3
	RS-C	4
“L3” (lowest priority level)	RS-B	5
	RS-F	6

Finally, the CreateRecordSchedule() action is invoked with the desiredPriority property set to “RS-C”. After the action completes, a new recordSchedule is created with the @id property set to “RS-G”. The set of recordSchedule instances is now prioritized as follows:

Table 56 — desiredPriority Property Set to “RS-C”

Priority Level	<u>RecordScheduleID</u>	Ordered Priority Value
“L1” (highest priority level)	RS-E	1
	RS-A	2
“L2”	RS-D	3
	RS-G	4
	RS-C	5
“L3” (lowest priority level)	RS-B	6
	RS-F	7

5.7.4 Sorting recordSchedule Instances Based on their Current Priority Settings

Control points can obtain the list of recordSchedule instances sorted either by their current priority level or by their ordered priority slot. In order to sort the list of recordSchedule instances by their current priority level (in descending order; that is: highest priority level recordSchedule instances listed first), control points can invoke the BrowseRecordSchedules() action with the SortCriteria argument set to “+srs:priority”. In order to sort the list of recordSchedule instances sorted by their current ordered priority slot number (in descending order with the lowest ordered priority slot; that is: the highest slot number listed first), the control point can invoke the BrowseRecordSchedules() action with the SortCriteria argument set to “-srs:priority@OrderedValue”.

5.8 Theory of Operation

5.8.1 Introduction

The following subclauses walk through several scenarios to illustrate the various actions supported by the ScheduledRecording service. Note that these scenarios are for example purposes only and do not have any normative value. Vendors can combine the described components in a variety of ways.

Note: For easy readability, The *srs XML Documents* of the examples presented below are shown before XML-escaping to improve readability. However, they need to be escaped before embedding in a SOAP message. Also, a shorthand notation method is used to describe the actions. The SOAP envelope is omitted in the examples and replaced by a shorthand notation.

5.8.2 Checking the Capabilities of a ScheduledRecording Service

The following examples illustrate how to check the capabilities of the ScheduledRecording service by using the [GetSortCapabilities\(\)](#), [GetPropertyList\(\)](#), and [GetAllowedValues\(\)](#) actions.

5.8.2.1 Checking the Sort Capabilities

Assume that the ScheduledRecording service supports sorting on [title](#), [scheduledStartDateTime](#), and [priority](#) only. Then the request:

Request:

```
GetSortCapabilities()
```

will result in the following response:

Response:

```
GetSortCapabilities("srs:title,srs:scheduledStartDateTime,srs:priority")
```

5.8.2.2 Checking Supported Properties and their Allowed Values

A number of properties are allowed and therefore, vendors are free to decide whether or not to support those properties for their particular ScheduledRecording implementations. The [GetPropertyList\(\)](#) and [GetAllowedValues\(\)](#) actions provide the means for a control point to determine which properties a particular ScheduledRecording service supports ([GetPropertyList\(\)](#) action) and also what the allowed values are for these properties ([GetAllowedValues\(\)](#) action). Since the set of supported properties and their allowed values may depend on the context within which these properties are used, the [GetPropertyList\(\)](#) and [GetAllowedValues\(\)](#) actions allow the control point to specify the *property-set* data type for which the control point wants to retrieve support level information.

5.8.2.2.1 Minimal Implementation Example

As a first example, assume that this particular ScheduledRecording service is a truly minimal implementation (only the [object.recordSchedule.direct.cdsNonEPG](#) class is supported and only required properties are supported).

Assume further that the control point wants to determine which properties it can specify in the [Elements](#) input argument of the [CreateRecordSchedule\(\)](#) action of this minimal

ScheduledRecording implementation. It first issues the following request (The Elements input argument of the CreateRecordSchedule() action is of data type A_ARG_TYPE_RecordScheduleParts):

Note: This A_ARG_TYPE_RecordScheduleParts example is marked by a white background for better reader orientation.

Request:

```
GetPropertyList("A_ARG_TYPE_RecordScheduleParts")
```

Then the following response will be generated:

Response:

```
GetPropertyList(
"srs:@id,srs:title,srs:class,srs:scheduledCDSObjectID,
srs:scheduledStartDateTime,srs:scheduledDuration")
```

If the control point then wants to investigate further what values it is allowed to use for those properties when building a recordSchedule, it can retrieve that information using the following request:

Note: specifying "*" in the Filter argument is equivalent to specifying the complete list of property names that was returned in the PropertyList argument of the GetPropertyList() action with the DataTypeID argument set to "A_ARG_TYPE_RecordScheduleParts".

Request:

```
GetAllowedValues("A_ARG_TYPE_RecordScheduleParts", "*:*")
```

The following response will be generated:

Response:

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

  <contextID>
    uuid:device-UUID::urn:schemas-upnp-org:service:ScheduledRecording:1
  </contextID>

  <dataStructType>A_ARG_TYPE_RecordScheduleParts</dataStructType>

  <fieldTable>
    <field>
      <name>srs:@id</name>
      <dataType>xsd:string</dataType>
      <minCountTotal>1</minCountTotal>
      <allowedValueDescriptor>
        <allowAny></allowAny>
      </allowedValueDescriptor>
    </field>
```

```

<field>
  <name>srs:title</name>
  <dataType>xsd:string</dataType>
  <minCountTotal>1</minCountTotal>
  <allowedValueDescriptor>
    <allowAny></allowAny>
  </allowedValueDescriptor>
</field>

<field>
  <name>srs:class</name>
  <dataType>xsd:string</dataType>
  <minCountTotal>1</minCountTotal>
  <allowedValueDescriptor>
    <allowedValueList>
      <allowedValue>
        OBJECT.RECORDSCHEDULE.DIRECT.CDSNONEPP
      </allowedValue>
    </allowedValueList>
  </allowedValueDescriptor>
</field>

<field>
  <name>srs:scheduledCDSObjectID</name>
  <dataType>xsd:string</dataType>
  <minCountTotal>1</minCountTotal>
  <allowedValueDescriptor>
    <allowAny></allowAny>
  </allowedValueDescriptor>
</field>

<field>
  <name>srs:scheduledStartDateTime</name>
  <dataType>xsd:string</dataType>
  <minCountTotal>1</minCountTotal>
  <allowedValueDescriptor>
    <allowAny></allowAny>
  </allowedValueDescriptor>
</field>

<field>
  <name>srs:scheduledDuration</name>
  <dataType>xsd:string</dataType>
  <minCountTotal>1</minCountTotal>
  <allowedValueDescriptor>
    <allowAny></allowAny>
  </allowedValueDescriptor>
</field>

</fieldTable>
</AVDT>")

```

Assume further that the control point wants to determine which properties it can expect to get returned in the Result output argument of the CreateRecordSchedule() action of that same minimal ScheduledRecording implementation. It issues the following request (The

Result argument of the CreateRecordSchedule() action is of data type A_ARG_TYPE_RecordSchedule:

Note: This A_ARG_TYPE_RecordSchedule example is marked by a grey background for better reader orientation.

Request:

```
GetPropertyList("A_ARG_TYPE_RecordSchedule")
```

The following response will be generated:

Response:

```
GetPropertyList(
"srs:@id,srs:title,srs:class,srs:priority,
srs:recordDestination,srs:recordDestination@mediaType,
srs:recordDestination@preference,
srs:scheduledCDSObjectID,
srs:scheduledStartDateTime,srs:scheduledDuration
srs:scheduleState,srs:scheduleState@currentErrors,
srs:abnormalTasksExist,srs:currentRecordTaskCount")
```

If the control point then wants to investigate further what values it may expect for some of those properties when browsing a recordSchedule, it can retrieve that information using the following request (the Filter argument contains only a subset of the possible properties in this example):

Note: specifying “*:.” in the Filter argument is again equivalent to specifying the complete list of properties returned in the PropertyList argument of the GetPropertyList() action with the DataTypeID argument set to “A_ARG_TYPE_RecordSchedule”.

Request:

```
GetAllowedValues("A_ARG_TYPE_RecordSchedule",
"srs:recordDestination,srs:recordDestination@mediaType,
srs:scheduleState,srs:scheduleState@currentErrors,
srs:abnormalTasksExist,srs:currentRecordTaskCount")
```

The following response will be generated:

Response:

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

<contextID>
    uuid:device-UUID::urn:schemas-upnp-org:service:ScheduledRecording:1
</contextID>
```

```

<dataStructType>A ARG TYPE RecordSchedule</dataStructType>

<fieldTable>
  <field>
    <name>srs:recordDestination</name>
    <dataType>xsd:string</dataType>
    <minCountTotal>1</minCountTotal>
    <allowedValueDescriptor>
      <allowedValueList>
        <allowedValue>Hard Disk</allowedValue>
      </allowedValueList>
    </allowedValueDescriptor>
  </field>

  <field>
    <name>srs:recordDestination@mediaType</name>
    <dataType>xsd:string</dataType>
    <allowedValueDescriptor>
      <dependentField>
        <name>srs:recordDestination</name>
        <anyValue></anyValue>
      </dependentField>
      <minCount>1</minCount>
      <allowedValueList>
        <allowedValue>HDD</allowedValue>
      </allowedValueList>
    </allowedValueDescriptor>
  </field>

  <field>
    <name>srs:scheduleState</name>
    <dataType>xsd:string</dataType>
    <minCountTotal>1</minCountTotal>
    <allowedValueDescriptor>
      <allowedValueList>
        <allowedValue>OPERATIONAL</allowedValue>
        <allowedValue>ERROR</allowedValue>
        <allowedValue>COMPLETED</allowedValue>
      </allowedValueList>
    </allowedValueDescriptor>
  </field>

  <field>
    <name>srs:scheduleState@currentErrors</name>
    <dataType>xsd:int</dataType>
    <allowedValueDescriptor>
      <dependentField>
        <name>srs:scheduleState</name>
        <anyValue></anyValue>
      </dependentField>
      <minCount>1</minCount>
      <allowedValueList>
        <allowedValue></allowedValue>
        <allowedValue>100</allowedValue>
      </allowedValueList>
    </allowedValueDescriptor>
  </field>

```

```

    <field>
      <name>srs:abnormalTasksExist</name>
      <dataType>xsd:boolean</dataType>
      <minCountTotal>1</minCountTotal>
      <allowedValueDescriptor>
        <allowAny></allowAny>
      </allowedValueDescriptor>
    </field>

    <field>
      <name>srs:currentRecordTaskCount</name>
      <dataType>xsd:unsignedInt</dataType>
      <minCountTotal>1</minCountTotal>
      <allowedValueDescriptor>
        <allowAny></allowAny>
      </allowedValueDescriptor>
    </field>

  </fieldTable>
</AVDT>")

```

Assume further that the control point wants to determine which properties it can expect to get returned in the Result output argument of the GetRecordTask() action of that same minimal ScheduledRecording implementation. It issues the following request (The Result argument of the GetRecordTask() action is of data type A_ARG_TYPE_RecordTask):

Note: This A_ARG_TYPE_RecordTask example is marked by a light turquoise background for better reader orientation.

Request:

```
GetPropertyList("A_ARG_TYPE_RecordTask")
```

The following response will be generated:

Response:

```

GetPropertyList(
"srs:@id,srs:title,srs:class,srs:priority,
srs:recordDestination,srs:recordDestination@mediaType,
srs:recordDestination@preference,
srs:recordScheduleID,
srs:taskChannelID,srs:taskChannelID@type,srs:taskStartDateTime,
srs:taskDuration,srs:recordQuality,srs:recordQuality@type,
srs:taskState,srs:taskState@phase,
srs:taskState@recording,srs:taskState@someBitsRecorded,
srs:taskState@someBitsMissing,srs:taskState@fatalError,
srs:taskState@currentErrors,srs:taskState@errorHistory,
srs:taskState@pendingErrors,srs:taskState@infoList")

```

If the control point then wants to investigate further what values it may expect for some of those properties when browsing a recordTask, it can retrieve that information using the following request (the Filter argument contains only a subset of the possible properties in this example):

Note: specifying “*:*” in the *Filter* argument is again equivalent to specifying the complete list of properties returned in the *PropertyList* argument of the *GetPropertyList()* action with the *DataTypeID* argument set to “*A_ARG_TYPE_RecordTask*”.

Request:

```
GetAllowedValues("A_ARG_TYPE_RecordTask",
"srs:recordDestination,srs:recordDestination@mediaType,
srs:taskState,srs:taskState@currentErrors")
```

The following response will be generated:

Response:

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

  <contextID>
    uuid:device-UUID::urn:schemas-upnp-org:service:ScheduledRecording:1
  </contextID>

  <dataStructType>A_ARG_TYPE_RecordTask</dataStructType>

  <fieldTable>
    <field>
      <name>srs:recordDestination</name>
      <dataType>xsd:string</dataType>
      <minCountTotal>1</minCountTotal>
      <allowedValueDescriptor>
        <allowedValueList>
          <allowedValue>Hard Disk</allowedValue>
        </allowedValueList>
      </allowedValueDescriptor>
    </field>

    <field>
      <name>srs:recordDestination@mediaType</name>
      <dataType>xsd:string</dataType>
      <allowedValueDescriptor>
        <dependentField>
          <name>srs:recordDestination</name>
          <anyValue></anyValue>
        </dependentField>
        <minCount>1</minCount>
        <allowedValueList>
          <allowedValue>HDD</allowedValue>
        </allowedValueList>
      </allowedValueDescriptor>
```

```

</field>

<field>
  <name>srs:taskState</name>
  <dataType maxSize="64">xsd:string</dataType>
  <minCountTotal>1</minCountTotal>
  <allowedValueDescriptor>
    <allowedValueList>
      <allowedValue>IDLE.READY</allowedValue>
      <allowedValue>
        ACTIVE.RECORDING.FROMSTART.OK
      </allowedValue>
      <allowedValue>
        ACTIVE.RECORDING.FROMSTART.ATRISK
      </allowedValue>
      <allowedValue>DONE.FULL</allowedValue>
      <allowedValue>DONE.PARTIAL</allowedValue>
      <allowedValue>DONE.EMPTY</allowedValue>
    </allowedValueList>
  </allowedValueDescriptor>
</field>

<field>
  <name>srs:taskState@currentErrors</name>
  <dataType>xsd:string</dataType>
  <allowedValueDescriptor>
    <dependentField>
      <name>srs:taskState</name>
      <anyValue></anyValue>
    </dependentField>
    <minCount>1</minCount>
    <allowedValueList>
      <allowedValue></allowedValue>
      <allowedValue>100</allowedValue>
    </allowedValueList>
  </allowedValueDescriptor>
</field>

</fieldTable>
</AVDT>")

```

5.8.2.2.2 Full-fledged Implementation Example

In this example, it is assumed that this particular ScheduledRecording service supports all allowed functionalities, offered by the ScheduledRecording service specification.

Assume that the control point wants to determine which properties it can specify in the Elements input argument of the CreateRecordSchedule() action of this full-fledged ScheduledRecording implementation. It issues the following request (The Elements input argument of the CreateRecordSchedule() action is of data type A_ARG_TYPE_RecordScheduleParts):

Note: This A_ARG_TYPE_RecordScheduleParts example is marked by a white background for better reader orientation.

Request:

```
GetPropertyList("A_ARG_TYPE_RecordScheduleParts")
```

Then the following response will be generated:

Response:

```
GetPropertyList(  
  "srs:@id,  
  srs:title,  
  srs:class,  
  srs:desiredPriority,  
  srs:desiredPriority@type,  
  srs:recordDestination,  
  srs:recordDestination@mediaType,  
  srs:recordDestination@targetURL,  
  srs:recordDestination@preference,  
  srs:desiredRecordQuality,  
  srs:desiredRecordQuality@type,  
  srs:scheduledCDSObjectID,  
  srs:scheduledChannelID,  
  srs:scheduledChannelID@type,  
  srs:scheduledStartDateTime,  
  srs:scheduledDuration,  
  srs:scheduledProgramCode,  
  srs:scheduledProgramCode@type,  
  srs:matchingName,  
  srs:matchingName@type,  
  srs:matchingName@subStringMatch,  
  srs:matchingID,  
  srs:matchingID@type,  
  srs:matchingChannelID,  
  srs:matchingChannelID@type,  
  srs:matchingStartDateTimeRange,  
  srs:matchingDurationRange,  
  srs:matchingRatingLimit,  
  srs:matchingRatingLimit@type,  
  srs:matchingEpisodeType,  
  srs:totalDesiredRecordTasks,  
  srs:scheduledStartDateTimeAdjust,  
  srs:scheduledDurationAdjust,  
  srs:activePeriod,  
  srs:durationLimit,  
  srs:durationLimit@effect,  
  srs:channelMigration,  
  srs:timeMigration,  
  srs:allowDuplicates,  
  srs:persistedRecordings,  
  srs:persistedRecordings@latest,  
  srs:persistedRecordings@preAllocation,  
  srs:persistedRecordings@storedLifetime")
```

If the control point then wants to investigate further what values it may use when building a recordSchedule, it can retrieve that information using the following request:

Request:

```
GetAllowedValues("A_ARG_TYPE_RecordScheduleParts", "*:.*")
```

The following response will be generated:

Response:

See Annex G.3 for a complete response message.

Assume further that the control point wants to determine which properties it can expect to get returned in the Result output argument of the CreateRecordSchedule() action of that same full-fledged ScheduledRecording implementation. It issues the following request (The Result output argument of the CreateRecordSchedule() action is of data type A_ARG_TYPE_RecordSchedule):

Note: This A_ARG_TYPE_RecordSchedule example is marked by a grey background for better reader orientation.

Request:

```
GetPropertyList("A_ARG_TYPE_RecordSchedule")
```

The following response will be generated:

Response:

```
GetPropertyList(
"srs:id,
srs:title,
srs:class,
srs:additionalStatusInfo,
srs:cdsReference,
srs:cdsReference@link,
srs:priority,
srs:priority@orderedValue,
srs:desiredPriority,
srs:desiredPriority@type,
srs:recordDestination,
srs:recordDestination@mediaType,
srs:recordDestination@targetURL,
srs:recordDestination@preference,
srs:desiredRecordQuality,
srs:desiredRecordQuality@type,
srs:scheduledCDSObjectID,
srs:scheduledCDSObjectID@link,
srs:scheduledChannelID,
srs:scheduledChannelID@type,
srs:scheduledStartDateTime,
srs:scheduledDuration,
srs:scheduledProgramCode,
srs:scheduledProgramCode@type,
srs:matchingName,
srs:matchingName@type,
srs:matchingName@subStringMatch,
srs:matchingID,
srs:matchingID@type,
srs:matchingChannelID,
srs:matchingChannelID@type,
srs:matchingStartDateTimeRange,
srs:matchingDurationRange,
srs:matchingRatingLimit,
srs:matchingRatingLimit@type,
srs:matchingEpisodeType,
srs:totalDesiredRecordTasks,
srs:scheduledStartDateTimeAdjust,
srs:scheduledDurationAdjust,
```

```
srs:activePeriod,
srs:durationLimit,
srs:durationLimit@effect,
srs:channelMigration,
srs:timeMigration,
srs:allowDuplicates,
srs:persistedRecordings,
srs:persistedRecordings@latest,
srs:persistedRecordings@preAllocation,
srs:persistedRecordings@storedLifetime,
srs:scheduleState,
srs:scheduleState@currentErrors,
srs:abnormalTasksExist,
srs:currentRecordTaskCount,
srs:totalCreatedRecordTasks,
srs:totalCompletedRecordTasks")
```

If the control point then wants to investigate further what values it may expect for all of those properties when browsing a [recordSchedule](#), it can retrieve that information using the following (The [Result](#) output argument of the [CreateRecordSchedule\(\)](#) action is of data type [A_ARG_TYPE_RecordSchedule](#)):

Request:

```
GetAllowedValues("A_ARG_TYPE_RecordSchedule", "*:~")
```

The following response will be generated:

Response:

See Annex G.1 for a complete response message.

Assume further that the control point wants to determine which properties it can expect to get returned in the [Result](#) output argument of the [BrowseRecordTasks\(\)](#) action of that same full-fledged ScheduledRecording implementation. It issues the following request (The [Result](#) output argument of the [BrowseRecordTasks\(\)](#) action is of data type [A_ARG_TYPE_RecordTask](#)):

Note: This [A_ARG_TYPE_RecordTask](#) example is marked by a light turquoise background for better reader orientation.

Request:

```
GetPropertyList("A_ARG_TYPE_RecordTask")
```

The following response will be generated:

Response:

```
GetPropertyList(
"srs:@id,
srs:title,
srs:class,
srs:additionalStatusInfo,
srs:cdsReference,
srs:cdsReference@link,
srs:priority,
srs:priority@orderedValue,
srs:desiredPriority,
```

```

srs:desiredPriority@type,
srs:recordDestination,
srs:recordDestination@mediaType,
srs:recordDestination@targetURL,
srs:recordDestination@preference,
srs:desiredRecordQuality,
srs:desiredRecordQuality@type,
srs:recordScheduleID,
srs:recordedCDSObjectID,
srs:recordedCDSObjectID@link
srs:taskCDSObjectID,
srs:taskCDSObjectID@link,
srs:taskChannelID,
srs:taskChannelID@type,
srs:taskStartDateTime,
srs:taskDuration,
srs:taskProgramCode,
srs:taskProgramCode@type,
srs:recordQuality,
srs:recordQuality@type,
srs:matchedName,
srs:matchedName@type,
srs:matchedID,
srs:matchedID@type,
srs:matchedRating,
srs:matchedRating@type,
srs:matchedEpisodeType,
srs:taskStartDateTimeAdjust,
srs:taskDurationAdjust,
srs:taskDurationLimit,
srs:taskDurationLimit@effect,
srs:taskChannelMigration,
srs:taskTimeMigration,
srs:taskState,
srs:taskState@phase,
srs:taskState@startDateTimeMet,
srs:taskState@endDateTimeMet,
srs:taskState@recording,
srs:taskState@someBitsRecorded,
srs:taskState@someBitsMissing,
srs:taskState@firstBitsRecorded,
srs:taskState@lastBitsRecorded,
srs:taskState@fatalError,
srs:taskState@currentErrors,
srs:taskState@errorHistory,
srs:taskState@pendingErrors,
srs:taskState@infoList")

```

If the control point then wants to investigate further what values it may expect for all of those properties when browsing a [recordTask](#), it can retrieve that information using the following (The [Result](#) output argument of the [BrowseRecordTasks\(\)](#) action is of data type [A_ARG_TYPE_RecordTask](#)):

Request:

```
GetAllowedValues("A_ARG_TYPE_RecordTask", "*:.*")
```

The following response will be generated:

Response :

See Annex G.2 for a complete response message.

5.8.3 Adding a Scheduled Recording Entry to the List

The following examples illustrate how to create a recordSchedule entry in the list of recordSchedule instances by invoking the CreateRecordSchedule() action, using the different available recordSchedule classes. It is assumed that the implementation used in the examples that follow supports the allowed values for the desiredRecordQuality and desiredRecordQuality@type properties as indicated in Table B.9 and for the recordQuality and recordQuality@type properties as indicated in Table B.33..

5.8.3.1 object.recordSchedule.direct classes

The object.recordSchedule.direct classes are used when the control point has all the necessary information available to uniquely identify the content to be recorded. The ScheduledRecording service does not have to perform searches or matching to determine what content is eligible for recording. Note that the control point might need to interact with external databases (like EPG information) to allow the user to make a selection of the content that he wants to record. Once the content is selected however, all information is available to set up the recordSchedule unambiguously.

5.8.3.1.1 Creating a object.recordSchedule.direct.manual Class recordSchedule

The object.recordSchedule.direct.manual class is used when the control point has access to the three basic components of information that are needed to uniquely identify the content to record:

- The scheduled channel that is used for broadcast of the content (*where*)
- The scheduled start date and time of the recording (*when*)
- The scheduled duration of the recording (*how long*)

It is assumed that the control point has some out-of-band means to retrieve this information. It passes this information into the recordSchedule using the required properties scheduledChannelID and scheduledChannelID@type, scheduledStartDateTime, and scheduledDuration.

The control point creates a properly escaped *srs XML Document* that shall contain all the **required** properties necessary to create the object.recordSchedule.direct.manual class recordSchedule. The control point can add any **allowed** property that is applicable to the object.recordSchedule.direct.manual class.

As an example, the control point wants to create a recurring recordSchedule to record the BBC news that is broadcast for one hour every evening at 7 pm on channel 47. Assume that the current date&time is Tuesday, June 28, 2005, 9:15 pm. If possible, the control point would like this recording to be stored on the internal hard disk, but if, for some reason, the hard disk is not available at the time of recording, the DVD+R drive can also be used as a secondary destination. The control point further specifies that this recording will be encoded using a low record quality setting of standard definition ("*SD*"). If that is not possible, any other record quality will be used ("*AUTO*"). A pre-roll time of two and a half minutes and a post-roll time of five minutes are also specified. The control point further instructs the ScheduledRecording service to keep at least the latest three recordings around. Older recordings can be discarded and no preallocation is desired.

To achieve the behavior specified above, the control point needs to provide the following *srs XML Document* in the *Elements* input argument of the *CreateRecordSchedule()* action:

Request:

```
CreateRecordSchedule ("
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="">
    <title>BBC News at 7pm</title>
    <class>OBJECT.RECORDSCHEDULE.DIRECT.MANUAL</class>
    <desiredPriority type="PREDEF">L2</desiredPriority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <recordDestination mediaType="DVD+R" preference="2">
      DVD Recorder
    </recordDestination>
    <desiredRecordQuality type="DEFAULT">
      SD,AUTO
    </desiredRecordQuality>
    <scheduledChannelID type="ANALOG">47</scheduledChannelID>
    <scheduledStartDateTime>T19:00:00</scheduledStartDateTime>
    <scheduledDuration>P01:00:00</scheduledDuration>
    <totalDesiredRecordTasks>0</totalDesiredRecordTasks>
    <scheduledStartDateTimeAdjust>
      -P00:02:30
    </scheduledStartDateTimeAdjust>
    <scheduledDurationAdjust>
      +P00:05:00
    </scheduledDurationAdjust>
    <activePeriod>NOW/INFINITY</activePeriod>
    <persistedRecordings
      latest="1"
      preAllocation="0"
      storedLifetime="ANY">
      3
    </persistedRecordings>
  </item>
</srs>")
```

If the creation of the *recordSchedule* is successful, the *CreateRecordSchedule()* action returns the following *srs XML Document* in the *Result* output argument. The ScheduledRecording service shall add unspecified supported allowed properties to convey default settings (Note that this *srs XML Document* shall be properly escaped). One or more *recordTask* instances can be created as a result of the *recordSchedule* creation. In this example, it is assumed that 2 *recordTask* instances are spawned immediately and it is also assumed that 2 new items are created in the associated ContentDirectory service that will hold the recorded content once the recordings are made (object IDs "rec00001" and "rec00002" are assigned).

Response:

ISO/IEC 29341-20:14:2017(E)

```
CreateRecordSchedule("s101", "  
<?xml version='1.0' encoding='UTF-8'?>  
<srs  
  xmlns='urn:schemas-upnp-org:av:srs'  
  xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'  
  xsi:schemaLocation='  
    urn:schemas-upnp-org:av:srs  
    http://www.upnp.org/schemas/av/srs.xsd'  
  <item id='s101'>  
    <title>BBC News at 7pm</title>  
    <class>OBJECT.RECORDSCHEDULE.DIRECT.MANUAL</class>  
    <priority>L2</priority>  
    <desiredPriority type='PREDEF'>L2</desiredPriority>  
    <recordDestination mediaType='HDD' preference='1'>  
      Hard Disk  
    </recordDestination>  
    <recordDestination mediaType='DVD+R' preference='2'>  
      DVD Recorder  
    </recordDestination>  
    <desiredRecordQuality type='DEFAULT'>  
      SD,AUTO  
    </desiredRecordQuality>  
    <scheduledChannelID type='ANALOG'>47</scheduledChannelID>  
    <scheduledStartDateTime>T19:00:00</scheduledStartDateTime>  
    <scheduledDuration>P01:00:00</scheduledDuration>  
    <totalDesiredRecordTasks>0</totalDesiredRecordTasks>  
    <scheduledStartDateTimeAdjust>  
      -P00:02:30  
    </scheduledStartDateTimeAdjust>  
    <scheduledDurationAdjust>  
      +P00:05:00  
    </scheduledDurationAdjust>  
    <activePeriod>NOW/INFINITY</activePeriod>  
    <persistedRecordings  
      latest='1'  
      preAllocation='0'  
      storedLifetime='ANY'>  
      3  
    </persistedRecordings>  
    <scheduleState  
      currentErrors=''>  
      OPERATIONAL  
    </scheduleState>  
    <abnormalTasksExist>0</abnormalTasksExist>  
    <currentRecordTaskCount>2</currentRecordTaskCount>  
    <totalCreatedRecordTasks>2</totalCreatedRecordTasks>  
    <totalCompletedRecordTasks>0</totalCompletedRecordTasks>  
  </item>  
</srs>")
```

As another example, assume that the user is currently watching the news program on channel 47, which started 10 minutes ago at 7:00 pm, and decides he/she wants to record this program from the beginning. This use case is enabled by the fact that the device has a buffer onboard which allows transitory content to be temporarily preserved for recording. The ContentDirectory service implementation on the device indicates that the preservation of the content on channel 47 started at 6:45 pm (via the

[upnp:preservedTimeRange@startTime](#) property). For recording the entire program from the beginning, the control point sets the scheduled start time to 7:00 pm and chooses a duration which likely includes the end of the news program (for example 30 minutes, starting from 7:00 pm). No pre-roll and post-roll times are specified. The desired destination is the internal hard disk. Any recording quality can be used. To achieve this behavior, the control point needs to provide the following *srs XML Document* in the [Elements](#) input argument of the [CreateRecordSchedule\(\)](#) action:

Request:

```
CreateRecordSchedule("
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="">
    <title>BBC News at 7pm</title>
    <class>OBJECT.RECORDSCHEDULE.DIRECT.MANUAL</class>
    <desiredPriority type="PREDEF">L2</desiredPriority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <desiredRecordQuality type="DEFAULT">
      AUTO
    </desiredRecordQuality>
    <scheduledChannelID type="ANALOG">47</scheduledChannelID>
    <scheduledStartDateTime>
      2005-06-28T19:00:00
    </scheduledStartDateTime>
    <scheduledDuration>P00:30:00</scheduledDuration>
    <totalDesiredRecordTasks>1</totalDesiredRecordTasks>
    <activePeriod>PAST/INFINITY</activePeriod>
  </item>
</srs>")
```

Note that the value of the [activePeriod](#) property of "[PAST/INFINITY](#)" is used in this case, since the *actualScheduledStartDateTime* of the scheduled recording is conceptually in the past. If the creation of the [recordSchedule](#) is successful, the [CreateRecordSchedule\(\)](#) action returns the following *srs XML Document* in the [Result](#) output argument. One [recordTask](#) instance is spawned immediately.

Response:

```
CreateRecordSchedule("s101", "
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="s101">
    <title>BBC News at 7pm</title>
    <class>OBJECT.RECORDSCHEDULE.DIRECT.MANUAL</class>
    <priority>L2</priority>
```

```

    <desiredPriority type="PREDEF">L2</desiredPriority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <desiredRecordQuality type="DEFAULT">
      SD,AUTO
    </desiredRecordQuality>
    <scheduledChannelID type="ANALOG">47</scheduledChannelID>
    <scheduledStartDateTime>
      2005-06-28T19:00:00
    </scheduledStartDateTime>
    <scheduledDuration>P00:30:00</scheduledDuration>
    <totalDesiredRecordTasks>1</totalDesiredRecordTasks>
    <activePeriod>PAST/INFINITY</activePeriod>
    <scheduleState
      currentErrors="">
      OPERATIONAL
    </scheduleState>
    <abnormalTasksExist>0</abnormalTasksExist>
    <currentRecordTaskCount>1</currentRecordTaskCount>
    <totalCreatedRecordTasks>1</totalCreatedRecordTasks>
    <totalCompletedRecordTasks>0</totalCompletedRecordTasks>
  </item>
</srs>")

```

If there is a gap in the channel's preserved content in the specified recording time range, for instance because the user tuned away to another channel for a while, then this can be detected by the control point by the presence of the upnp:preservedTimeRange@endTime property. If the control point still decides to create a recordSchedule with a recording time range that encompasses multiple disjoint preserved content segments, then the recording behavior is vendor specified. Examples are: return an error, record the first segment, record the last segment, or record all segments. The control point can examine the created recordSchedule and recordTask(s) to determine how the device responded. Control points that want to record all the preserved segments can also create a separate recordSchedule for each segment.

5.8.3.1.2 Creating a object.recordSchedule.direct.cdsEPG Class recordSchedule

The object.recordSchedule.direct.cdsEPG class is used when the control point has access to a local ContentDirectory service EPG database. The content to be recorded is uniquely identified by an EPG item in the associated ContentDirectory service. The association between a ContentDirectory service and a ScheduledRecording service is established by having both services reside within the same UPnP MediaServer device.

In this case, the basic component of information that is needed to uniquely identify the content to record is the object ID of the EPG item (contains the *where*, *when* and *how long* information) that represents that content. The control point passes this information into the recordSchedule using the required scheduledCDSObjectID property.

The control point creates a properly escaped srs XML Document that shall contain all the **required** properties necessary to create the object.recordSchedule.direct.cdsEPG class recordSchedule. The control point can add any **allowed** property that is applicable to the object.recordSchedule.direct.cdsEPG class.

As an example, the control point wants to create a recordSchedule to record the "UPnP Awards Ceremony" that is broadcast for a marathon fifteen hours on April 1st, at 9 am on

channel 215. It finds this program in the EPG database of the associated ContentDirectory service and retrieves the object ID (value of the *didl-lite:@id* property of the EPG item). Due to the length of the program, the recording needs to be stored on the internal hard disk. If, for some reason, the hard disk is not available at the time of recording, the recording will be canceled. Further, if the recording would last longer than the anticipated 15 hours, the recording will be limited to 15 hours and the first part of the program discarded. The control point also specifies that this recording will be encoded using a low record quality setting of "Q3". If that is not possible, the recording will not be made. A pre-roll time of two minutes and a post-roll time of 15 minutes are also specified. The control point further instructs the ScheduledRecording service to keep track of this item in case the broadcaster decides to move it to a different channel and/or time.

To achieve the behavior specified above, the control point needs to provide the following *srs XML Document* in the *Elements* input argument of the *CreateRecordSchedule()* action:

Request:

```
CreateRecordSchedule("
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="">
    <title>UPnP Awards Ceremony</title>
    <class>OBJECT.RECORDSCHEDULE.DIRECT.CDSEPG</class>
    <desiredPriority type="PREDEF">L1</desiredPriority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <desiredRecordQuality type="QLEVEL">
      Q3
    </desiredRecordQuality>
    <scheduledCDSObjectID>
      epg_2005-04-01T09:00:00_P15:00:00
    </scheduledCDSObjectID>
    <totalDesiredRecordTasks>1</totalDesiredRecordTasks>
    <scheduledStartDateTimeAdjust>
      -P00:02:00
    </scheduledStartDateTimeAdjust>
    <scheduledDurationAdjust>
      +P00:15:00
    </scheduledDurationAdjust>
    <activePeriod>NOW/INFINITY</activePeriod>
    <durationLimit effect="LAST">P15:00:00</durationLimit>
    <channelMigration>1</channelMigration>
    <timeMigration>1</timeMigration>
    <persistedRecordings
      latest="1"
      preAllocation="0"
      storedLifetime="ANY">
      1
    </persistedRecordings>
  </item>
</srs>")
```

If the creation of the recordSchedule is successful, the CreateRecordSchedule() action returns the following srs XML Document in the Result output argument. The ScheduledRecording service shall add unspecified supported allowed properties to convey default settings (Note that this srs XML Document shall be properly escaped). One recordTask instance can be created as a result of the recordSchedule creation. In this example, it is assumed that the recordTask instance is spawned immediately.

Response:

```
CreateRecordSchedule("s102", "  
<?xml version="1.0" encoding="UTF-8"?>  
<srs  
  xmlns="urn:schemas-upnp-org:av:srs"  
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"  
  xsi:schemaLocation="  
    urn:schemas-upnp-org:av:srs  
    http://www.upnp.org/schemas/av/srs.xsd">  
  <item id="s102">  
    <title>UPnP Awards Ceremony</title>  
    <class>OBJECT.RECORDSCHEDULE.DIRECT.CDSEPG</class>  
    <priority>L1</priority>  
    <desiredPriority type="PREDEF">L1</desiredPriority>  
    <recordDestination mediaType="HDD" preference="1">  
      Hard Disk  
    </recordDestination>  
    <desiredRecordQuality type="QLEVEL">  
      Q3  
    </desiredRecordQuality>  
    <scheduledCDSObjectID>  
      epg_2005-04-01T09:00:00_P15:00:00  
    </scheduledCDSObjectID>  
    <totalDesiredRecordTasks>1</totalDesiredRecordTasks>  
    <scheduledStartDateTimeAdjust>  
      -P00:02:00  
    </scheduledStartDateTimeAdjust>  
    <scheduledDurationAdjust>  
      +P00:15:00  
    </scheduledDurationAdjust>  
    <activePeriod>NOW/INFINITY</activePeriod>  
    <durationLimit effect="LAST">P15:00:00</durationLimit>  
    <channelMigration>1</channelMigration>  
    <timeMigration>1</timeMigration>  
    <persistedRecordings  
      latest="1"  
      preAllocation="0"  
      storedLifetime="ANY">  
        1  
    </persistedRecordings>  
    <scheduleState  
      currentErrors="">  
      OPERATIONAL  
    </scheduleState>  
    <abnormalTasksExist>0</abnormalTasksExist>  
    <currentRecordTaskCount>1</currentRecordTaskCount>  
    <totalCreatedRecordTasks>1</totalCreatedRecordTasks>  
    <totalCompletedRecordTasks>0</totalCompletedRecordTasks>
```

```

    </item>
  </srs>")

```

As another example, the control point wants to record the program “The Best of UPnP”, which started in the past at 8:30 am. The device is capable of temporarily preserving the program content and indicates that this program has been preserved from the beginning (via the [upnp:programPreserved](#) property). The control point then knows that it can expect the entire program to be recorded, even though the record schedule is created past the program’s scheduled start time. To indicate that it wants to record the entire program, the control point needs to provide the following *srs XML Document* in the [Elements](#) input argument of the [CreateRecordSchedule\(\)](#) action:

Request:

```

CreateRecordSchedule("
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="">
    <title>The Best of UPnP</title>
    <class>OBJECT.RECORDSCHEDULE.DIRECT_CDSEPG</class>
    <desiredPriority type="PREDEF">L1</desiredPriority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <desiredRecordQuality type="QLEVEL">
      Q3
    </desiredRecordQuality>
    <scheduledCDSObjectID>
      epg_2005-04-01T08:30:00_P00:30:00
    </scheduledCDSObjectID>
    <totalDesiredRecordTasks>1</totalDesiredRecordTasks>
    <activePeriod>PAST/INFINITY</activePeriod>
  </item>
</srs>")

```

If the creation of the [recordSchedule](#) is successful, the [CreateRecordSchedule\(\)](#) action returns the following *srs XML Document* in the [Result](#) output argument. One [recordTask](#) instance can be created as a result of the [recordSchedule](#) creation. In this example, it is assumed that the [recordTask](#) instance is spawned immediately.

Response:

```

CreateRecordSchedule("s103", "
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="s103">
    <title>UPnP Awards Ceremony</title>
    <class>OBJECT.RECORDSCHEDULE.DIRECT_CDSEPG</class>

```

```

<priority>L1</priority>
<desiredPriority type="PREDEF">L1</desiredPriority>
<recordDestination mediaType="HDD" preference="1">
  Hard Disk
</recordDestination>
<desiredRecordQuality type="QLEVEL">
  Q3
</desiredRecordQuality>
<scheduledCDSObjectID>
  epg_2005-04-01T08:30:00_P00:30:00
</scheduledCDSObjectID>
<totalDesiredRecordTasks>1</totalDesiredRecordTasks>
<activePeriod>PAST/INFINITY</activePeriod>
<scheduleState
  currentErrors="">
  OPERATIONAL
</scheduleState>
<abnormalTasksExist>0</abnormalTasksExist>
<currentRecordTaskCount>1</currentRecordTaskCount>
<totalCreatedRecordTasks>1</totalCreatedRecordTasks>
<totalCompletedRecordTasks>0</totalCompletedRecordTasks>
</item>
</srs>")

```

5.8.3.1.3 Creating a **object.recordSchedule.direct.cdsNonEPG** Class **recordSchedule**

The **object.recordSchedule.direct.cdsNonEPG** class is used when the control point has access to a local ContentDirectory service database that contains items that identify content that will be available for recording at the time the recording is scheduled to start.

A typical example of this is TV tuner that is represented as a **channelGroup** container, containing items of class **object.item.videoItem.videoBroadcast**, each representing a channel to which the tuner can be tuned (User Channel). The association between a ContentDirectory service and a ScheduledRecording service is established by having both services reside within the same UPnP MediaServer device.

In this case, the basic components of information that are needed to uniquely identify the content to record are:

- The object ID of the ContentDirectory service item that represents the User Channel that is used for broadcast of the content (*where*)
- The scheduled start date and time of the recording (*when*)
- The scheduled duration of the recording (*how long*)

It is assumed that the control point has some out-of-band means to retrieve this information. It passes this information into the **recordSchedule** using the required properties **scheduledCDSObjectID**, **scheduledStartDateTime**, and **scheduledDuration**.

The control point creates a properly escaped srs XML Document that shall contain all the **required** properties necessary to create the **object.recordSchedule.direct.cdsNonEPG** class **recordSchedule**. The control point can add any **allowed** property that is applicable to the **object.recordSchedule.direct.cdsNonEPG** class.

As an example, assume that today's date is Tuesday, June 28, 2005 and the control point wants to create a **recordSchedule** to record the show "Life of a Software Developer" that is broadcast on channel 5 every Monday evening at 7 pm, starting on July 4th. The show

lasts for an hour and runs for 13 episodes (until the end of September). The first fifteen minutes of each show are dedicated to a reading of the “Most Popular Software Code Quote of the Week”. The user found all this information in a printed TV Guide. The ContentDirectory service has no EPG data.

The control point finds the User Channel that represents channel 5 in the associated ContentDirectory service and retrieves its object ID (value of the *didl-lite:@id* property of the User Channel item). The recording needs to be stored on the internal hard disk. If, for some reason, the hard disk is not available at the time of recording, the recording can also be recorded on an external network storage device. All episodes (13) of the show need to be recorded. The control point also specifies that this recording will be encoded using a high record quality setting of High Definition (“HD”). The “Most Popular Software Code Quote of the Week” part of the show will be skipped but a pre-roll time of two minutes and a post-roll time of three minutes are also specified. All episodes will be preserved until deleted by the user.

To achieve the behavior specified above, the control point needs to provide the following *srs XML Document* in the *Elements* input argument of the *CreateRecordSchedule()* action:

Request:

```
CreateRecordSchedule("
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="">
    <title>Life of a Software Developer</title>
    <class>OBJECT.RECORDSCHEDULE.DIRECT.CDSNONEPG</class>
    <desiredPriority type="PREDEF">L1</desiredPriority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <recordDestination mediaType="HDD" preference="2"
      targetURL="http://192.168.0.12/MyNAS/RecordedTV">
      Shared Content
    </recordDestination>
    <desiredRecordQuality type="DEFAULT">
      HD
    </desiredRecordQuality>
    <scheduledCDSObjectID>
      User_Channel_5
    </scheduledCDSObjectID>
    <scheduledStartTime>
      MONT19:00:00
    </scheduledStartTime>
    <scheduledDuration>P01:00:00</scheduledDuration>
    <totalDesiredRecordTasks>13</totalDesiredRecordTasks>
    <scheduledStartDateTimeAdjust>
      +P00:13:00
    </scheduledStartDateTimeAdjust>
    <scheduledDurationAdjust>
      +P00:03:00
    </scheduledDurationAdjust>
    <activePeriod>NOW/09-30T23:59:59</activePeriod>
```

```

    <persistedRecordings
      latest="1"
      preAllocation="0"
      storedLifetime="INFINITY">
      13
    </persistedRecordings>
  </item>
</srs>")

```

If the creation of the recordSchedule is successful, the CreateRecordSchedule() action returns the following *srs XML Document* in the Result output argument. The ScheduledRecording service shall add unspecified supported allowed properties to convey default settings (Note that this *srs XML Document* shall be properly escaped). One or more recordTask instances can be created as a result of the recordSchedule creation. In this example, it is assumed that 2 recordTask instances are spawned immediately.

Response:

```

CreateRecordSchedule("s103", "
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="s103">
    <title>Life of a Software Developer</title>
    <class>OBJECT.RECORDSCHEDULE.DIRECT.CDSNONEPG</class>
    <priority>L1</priority>
    <desiredPriority type="PREDEF">L1</desiredPriority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <recordDestination mediaType="HDD" preference="2">
      targetURL="http://192.168.0.12/MyNAS/RecordedTV">
      Shared Content
    </recordDestination>
    <desiredRecordQuality type="DEFAULT">
      HD
    </desiredRecordQuality>
    <scheduledCDSObjectID>
      User_Channel_5
    </scheduledCDSObjectID>
    <scheduledStartDateTime>
      MONT19:00:00
    </scheduledStartDateTime>
    <scheduledDuration>P01:00:00</scheduledDuration>
    <totalDesiredRecordTasks>13</totalDesiredRecordTasks>
    <scheduledStartDateTimeAdjust>
      +P00:13:00
    </scheduledStartDateTimeAdjust>
    <scheduledDurationAdjust>
      +P00:03:00
    </scheduledDurationAdjust>
    <activePeriod>NOW/09-30T23:59:59</activePeriod>
  </item>
</srs>")

```

```

    <persistedRecordings
      latest="1"
      preAllocation="0"
      storedLifetime="INFINITY">
      13
    </persistedRecordings>
    <scheduleState
      currentErrors="">
      OPERATIONAL
    </scheduleState>
    <abnormalTasksExist>0</abnormalTasksExist>
    <currentRecordTaskCount>2</currentRecordTaskCount>
    <totalCreatedRecordTasks>2</totalCreatedRecordTasks>
    <totalCompletedRecordTasks>0</totalCompletedRecordTasks>
  </item>
</srs>")

```

5.8.3.1.4 Creating a [object.recordSchedule.direct.programCode](#) Class [recordSchedule](#)

The [object.recordSchedule.direct.programCode](#) class is used when the control point has access (via the user, most likely) to a program code. The content to be recorded is uniquely identified by this program code in the sense that the program code contains in encoded form all necessary information for recording the program item (*where*, *when* and *how long*). If the ScheduledRecording service supports a particular program code type, that implies that the ScheduledRecording service understands how to interpret and decode the program code into its *where*, *when* and *how long* components.

In this case, the basic component of information that is needed to uniquely identify the content to record is the program code of the program item that represents that content. The control point passes this information into the [recordSchedule](#) using the required properties [scheduledProgramCode](#) and [scheduledProgramCode@type](#).

The control point creates a properly escaped srs XML Document that shall contain all the **required** properties necessary to create the [object.recordSchedule.direct.programCode](#) class [recordSchedule](#). The control point can add any **allowed** property that is applicable to the [object.recordSchedule.direct.programCode](#) class.

As a hypothetical example, the control point wants to create a [recordSchedule](#) to record a program item, identified by a program code of type "upnpexample.com_upnpProgramCode" time. The upnpProgramCode type specifies the encoding to be simply:

program code = <channel number>_<StartDateTime>_<Duration>

The user retrieved the program code from some external source (a printed program guide) and the advertised title of the program is "Everything you ever wanted to know about SRS".

It is assumed that the ScheduledRecording service supports the "upnpexample.com_upnpProgramCode" program code type and therefore knows how to decode the program code into its basic *where*, *when* and *how long* components. The recording needs to be stored on the internal DVD+RW drive. If, for some reason, the DVD+RW drive is not available at the time of recording, the recording can be stored on the internal hard disk. The control point also specifies that this recording will be recorded using any available record quality setting. No pre-roll or post-roll times are specified.

To achieve the behavior specified above, the control point needs to provide the following *srs XML Document* in the *Elements* input argument of the *CreateRecordSchedule()* action:

Request:

```
CreateRecordSchedule ("
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="">
    <title>About SRS</title>
    <class>OBJECT.RECORDSCHEDULE.DIRECT.PROGRAMCODE</class>
    <desiredPriority type="PREDEF">L1</desiredPriority>
    <recordDestination mediaType="DVD+RW" preference="1">
      DVD Drive
    </recordDestination>
    <recordDestination mediaType="HDD" preference="2">
      Hard Disk
    </recordDestination>
    <desiredRecordQuality type="DEFAULT">
      AUTO
    </desiredRecordQuality>
    <scheduledProgramCode type="upnpexample.org_upnpProgramCode">
      2005-07-01_09:00:00_00:30:00
    </scheduledProgramCode>
    <totalDesiredRecordTasks>1</totalDesiredRecordTasks>
  </item>
</srs>")
```

If the creation of the *recordSchedule* is successful, the *CreateRecordSchedule()* action returns the following *srs XML Document* in the *Result* output argument. The ScheduledRecording service shall add unspecified supported allowed properties to convey default settings (Note that this *srs XML Document* shall be properly escaped). One *recordTask* instance can be created as a result of the *recordSchedule* creation. In this example, it is assumed that the *recordTask* instance is spawned immediately.

Response:

```
CreateRecordSchedule ("s104", "
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="s104">
    <title>About SRS</title>
    <class>OBJECT.RECORDSCHEDULE.DIRECT.PROGRAMCODE</class>
    <priority>L1</priority>
    <desiredPriority type="PREDEF">L1</desiredPriority>
    <recordDestination mediaType="DVD+RW" preference="1">
      DVD Drive
    </recordDestination>
```

```

<recordDestination mediaType="HDD" preference="2">
  Hard Disk
</recordDestination>
<desiredRecordQuality type="DEFAULT">
  AUTO
</desiredRecordQuality>
<scheduledProgramCode type="upnpexample.org_upnpProgramCode">
  2005-07-01_09:00:00_00:30:00
</scheduledProgramCode>
<totalDesiredRecordTasks>1</totalDesiredRecordTasks>
<scheduledStartDateTimeAdjust>
  +P00:00:00
</scheduledStartDateTimeAdjust>
<scheduledDurationAdjust>
  +P00:00:00
</scheduledDurationAdjust>
<activePeriod>NOW/INFINITY</activePeriod>
<durationLimit effect="LAST">INFINITY</durationLimit>
<persistedRecordings
  latest="1"
  preAllocation="0"
  storedLifetime="ANY">
  0
</persistedRecordings>
<scheduleState
  currentErrors="">
  OPERATIONAL
</scheduleState>
<abnormalTasksExist>0</abnormalTasksExist>
<currentRecordTaskCount>1</currentRecordTaskCount>
<totalCreatedRecordTasks>1</totalCreatedRecordTasks>
<totalCompletedRecordTasks>0</totalCompletedRecordTasks>
</item>
</srs>")

```

5.8.3.2 **object.recordSchedule.query** classes

The **object.recordSchedule.query** classes are used when the control point only has partial information to identify possible candidates for recording. The ScheduledRecording service needs to perform further (continuous) searching or matching to determine what content is eligible for recording. The ScheduledRecording service can consult with external databases (like EPG information or over-the-wire Service Information) to find content that matches all the criteria, specified in the **recordSchedule**. Every time a match is found, a new **recordTask** is created.

5.8.3.2.1 Creating a **object.recordSchedule.query.contentName** Class **recordSchedule**

The **object.recordSchedule.query.contentName** class is used when the control point has knowledge about the (partial) name of the content to be recorded. This could either be a series name or a program name. Other properties, specified in the **recordSchedule** are also used to further narrow down what will be recorded (**activePeriod**, **totalDesiredRecordTasks**, etc.). It is the responsibility of the ScheduledRecording service to continuously search available external databases (like EPG or Service Information) and create a **recordTask** instance for every complete match (all specified matching criteria are satisfied) it finds within those external databases.

In this case, the basic piece of information that is needed to identify the content to record is the (partial) program or series name of the program item or series. The control point passes this information into the recordSchedule using the required properties matchingName and matchingName@type.

The control point creates a properly escaped *srs XML Document* that shall contain all the **required** properties necessary to create the object.recordSchedule.query.contentName class recordSchedule. The control point can add any **allowed** property that is applicable to the object.recordSchedule.query.contentName class.

As an example, the control point wants to create a recordSchedule to record the series entitled "Meet the UPnP Guys" (exact title). The control point has no further information, except that the series is broadcast during summer season and the series finale is planned somewhere during the month of September.

The recordings need to be stored on the internal Hard Disk. If, for some reason, the Hard Disk is not available at the time of recording, the recording will be canceled. The control point also specifies that these recordings will be encoded using a low record quality ("SD"). If that is not possible, medium record quality ("ED") will also be used. If that is not possible, no recording will be made. No pre-roll or post-roll times are specified. If the broadcaster decides to change broadcast channel or date&time, the ScheduledRecording service is supposed to track.

To achieve the behavior specified above, the control point needs to provide the following *srs XML Document* in the Elements input argument of the CreateRecordSchedule() action:

Request:

```
CreateRecordSchedule("
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="">
    <title>Meet the UPnP Guys series</title>
    <class>OBJECT.RECORDSCHEDULE.QUERY.CONTENTNAME</class>
    <desiredPriority type="PREDEF">L1</desiredPriority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <desiredRecordQuality type="DEFAULT">
      SD,ED
    </desiredRecordQuality>
    <matchingName type="SERIES" subStringMatch="0">
      Meet the UPnP Guys
    </matchingName>
    <matchingStartDateTimeRange>
      NOW/09-30T23:59:59
    </matchingStartDateTimeRange>
    <totalDesiredRecordTasks>0</totalDesiredRecordTasks>
    <channelMigration>1</channelMigration>
    <timeMigration>1</timeMigration>
  </item>
</srs>")
```

If the creation of the recordSchedule is successful, the CreateRecordSchedule() action returns the following *srs XML Document* in the Result output argument. The ScheduledRecording service shall add unspecified supported allowed properties to convey default settings (Note that this *srs XML Document* shall be properly escaped). One or more recordTask instances can be created as a result of the recordSchedule creation. In this example, it is assumed that one recordTask instance is spawned immediately (12 remaining matches need to be found in the future, when new EPG data is available, for instance).

Response:

```
CreateRecordSchedule("s201", "
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="s201">
    <title>Meet the UPnP Guys series</title>
    <class>OBJECT.RECORDSCHEDULE.QUERY.CONTENTNAME</class>
    <priority>L1</priority>
    <desiredPriority type="PREDEF">L1</desiredPriority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <desiredRecordQuality type="DEFAULT">
      SD,ED
    </desiredRecordQuality>
    <matchingName type="SERIES" subStringMatch="0">
      Meet the UPnP Guys
    </matchingName>
    <matchingStartDateTimeRange>
      NOW/09-30T23:59:59
    </matchingStartDateTimeRange>
    <totalDesiredRecordTasks>0</totalDesiredRecordTasks>
    <scheduledStartDateTimeAdjust>
      +P00:00:00
    </scheduledStartDateTimeAdjust>
    <scheduledDurationAdjust>
      +P00:00:00
    </scheduledDurationAdjust>
    <activePeriod>NOW/INFINITY</activePeriod>
    <durationLimit effect="LAST">INFINITY</durationLimit>
    <persistedRecordings
      latest="1"
      preAllocation="0"
      storedLifetime="ANY">
      0
    </persistedRecordings>
    <scheduleState
      currentErrors="">
      OPERATIONAL
    </scheduleState>
    <abnormalTasksExist>0</abnormalTasksExist>
    <currentRecordTaskCount>1</currentRecordTaskCount>
    <totalCreatedRecordTasks>1</totalCreatedRecordTasks>
```

```

    <totalCompletedRecordTasks>0</totalCompletedRecordTasks>
  </item>
</srs>")

```

5.8.3.2.2 Creating a [object.recordSchedule.query.contentID](#) Class [recordSchedule](#)

The [object.recordSchedule.query.contentID](#) class is used when the control point has knowledge about the ID of the content to be recorded. This could either be a series ID or a program ID. Other properties, specified in the [recordSchedule](#) are also used to further narrow down what will be recorded ([activePeriod](#), [totalDesiredRecordTasks](#), etc.). It is the responsibility of the ScheduledRecording service to continuously search available external databases (like EPG or Service Information) and create a [recordTask](#) instance for every complete match (all specified matching criteria are satisfied) it finds within those external databases.

In this case, the basic piece of information that is needed to identify the content to record is the program ID or series ID of the program item or series. The control point passes this information into the [recordSchedule](#) using the required properties [matchingID](#) and [matchingID@type](#).

The control point creates a properly escaped *srs XML Document* that shall contain all the **required** properties necessary to create the [object.recordSchedule.query.contentID](#) class [recordSchedule](#). The control point can add any **allowed** property that is applicable to the [object.recordSchedule.query.contentID](#) class.

As an example, the control point wants to create a [recordSchedule](#) to record the program with program ID "123456" from service provider "MyLocalProvider.net". It has obtained this ID through means outside the scope of this specification. The control point has no further information.

The recordings need to be stored on the internal Hard Disk. If, for some reason, the Hard Disk is not available at the time of recording, the recording will be canceled. The control point also specifies that the recording will be encoded using a high record quality setting of "720p60". If that is not possible, no recording will be made. No pre-roll or post-roll times are specified. If the broadcaster decides to change broadcast channel or date&time, the ScheduledRecording service is supposed to track.

To achieve the behavior specified above, the control point needs to provide the following *srs XML Document* in the [Elements](#) input argument of the [CreateRecordSchedule\(\)](#) action:

Request:

```

CreateRecordSchedule("
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="">
    <title>My Program</title>
    <class>OBJECT.RECORDSCHEDULE.QUERY.CONTENTID</class>
    <desiredPriority type="PREDEF">L1</desiredPriority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <desiredRecordQuality type="ATSC">

```

```

        720p60
    </desiredRecordQuality>
    <matchingID type="MyLocalProvider.net">
        123456
    </matchingID>
    <totalDesiredRecordTasks>1</totalDesiredRecordTasks>
    <channelMigration>1</channelMigration>
    <timeMigration>1</timeMigration>
</item>
</srs>")

```

If the creation of the recordSchedule is successful, the CreateRecordSchedule() action returns the following *srs XML Document* in the Result output argument. The ScheduledRecording service shall add unspecified supported allowed properties to convey default settings (Note that this *srs XML Document* shall be properly escaped). One recordTask instance can be created as a result of the recordSchedule creation. In this example, it is assumed that the recordTask instance is spawned immediately.

Response:

```

CreateRecordSchedule("s202", "
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="s202">
    <title>My Program</title>
    <class>OBJECT.RECORDSCHEDULE.QUERY.CONTENTID</class>
    <priority>L1</priority>
    <desiredPriority type="PREDEF">L1</desiredPriority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <desiredRecordQuality type="ATSC">
      720p60
    </desiredRecordQuality>
    <matchingID type="MyLocalProvider.net">
      123456
    </matchingID>
    <totalDesiredRecordTasks>1</totalDesiredRecordTasks>
    <scheduledStartDateTimeAdjust>
      +P00:00:00
    </scheduledStartDateTimeAdjust>
    <scheduledDurationAdjust>
      +P00:00:00
    </scheduledDurationAdjust>
    <activePeriod>NOW/INFINITY</activePeriod>
    <durationLimit effect="LAST">INFINITY</durationLimit>
    <persistedRecordings
      latest="1"
      preAllocation="0"
      storedLifetime="ANY">
      0
    </persistedRecordings>
  </item>
</srs>")

```

```

<scheduleState
  currentErrors="">
    OPERATIONAL
</scheduleState>
<abnormalTasksExist>0</abnormalTasksExist>
<currentRecordTaskCount>1</currentRecordTaskCount>
<totalCreatedRecordTasks>1</totalCreatedRecordTasks>
<totalCompletedRecordTasks>0</totalCompletedRecordTasks>
</item>
</srs>")

```

5.8.4 Deleting a recordSchedule

A control point can delete a particular recordSchedule by invoking the DeleteRecordSchedule() action and specifying its object ID in the RecordScheduleID argument.

Assume that the recordSchedule to be deleted has its @id property set to "s301".

To delete this recordSchedule, the control point generates the following request:

Request:

```
DeleteRecordSchedule("s301")
```

Response:

```
---
```

5.8.5 Browsing recordSchedule and recordTask instances

A control point can investigate which recordSchedule and/or recordTask instances are currently present within a ScheduledRecording service implementation by invoking the BrowseRecordSchedules() and BrowseRecordTasks() actions.

For example purposes, it is assumed that the control point has invoked the CreateRecordSchedule() action once for each of the cases described in subclauses 5.8.3.1.1 through 5.8.3.1.4 and subclauses 5.8.3.2.1 and 5.8.3.2.2. As a result, six recordSchedule instances as specified in the subclauses above have been created. In addition, eight recordTask instances have been created so that the available recordSchedule and recordTask instances in this particular ScheduledRecording service implementation are as follows:

```

recordSchedule (@id = "s101", class = "OBJECT.RECORDSCHEDULE.DIRECT.MANUAL")
  recordTask (@id = "t101-001", class = "OBJECT.RECORDTASK")
  recordTask (@id = "t101-002", class = "OBJECT.RECORDTASK")
recordSchedule (@id = "s102", class = "OBJECT.RECORDSCHEDULE.DIRECT.CDSEPG")
  recordTask (@id = "t102-001", class = "OBJECT.RECORDTASK")
recordSchedule (@id = "s103", class = "OBJECT.RECORDSCHEDULE.DIRECT.CDSNONEPG")
  recordTask (@id = "t103-001", class = "OBJECT.RECORDTASK")
  recordTask (@id = "t103-002", class = "OBJECT.RECORDTASK")
recordSchedule (@id = "s104", class = "OBJECT.RECORDSCHEDULE.DIRECT.PROGRAMCODE")
  recordTask (@id = "t104-001", class = "OBJECT.RECORDTASK")
recordSchedule (@id = "s201", class = "OBJECT.RECORDSCHEDULE.QUERY.CONTENTNAME")
  recordTask (@id = "t201-001", class = "OBJECT.RECORDTASK")

```

recordSchedule (@id = "s202", class = "OBJECT.RECORDSCHEDULE.QUERY.CONTENTID")

recordTask (@id = "t202-001", class = "OBJECT.RECORDTASK")

5.8.5.1 Browsing recordSchedule instances

When a control point wants to gather detailed information on currently existing recordSchedule instances, it can do this by invoking the BrowseRecordSchedules() action. The following request:

Request:

```
BrowseRecordSchedules("", 0, 10, "+srs:title")
```

returns the following response (the result only returns the required properties (Filter argument is set to "") and is sorted according to the value of the title property):

Response:

```
BrowseRecordSchedules("
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="s104">
    <title>About SRS</title>
    <class>OBJECT.RECORDSCHEDULE.DIRECT.PROGRAMCODE</class>
    <priority>L1</priority>
    <recordDestination mediaType="DVD+RW" preference="1">
      DVD Drive
    </recordDestination>
    <recordDestination mediaType="HDD" preference="2">
      Hard Disk
    </recordDestination>
    <scheduledProgramCode type="upnpexample.org_upnpProgramCode">
      2005-07-01_09:00:00_00:30:00
    </scheduledProgramCode>
    <scheduleState
      currentErrors="">
      OPERATIONAL
    </scheduleState>
    <abnormalTasksExist>0</abnormalTasksExist>
    <currentRecordTaskCount>1</currentRecordTaskCount>
  </item>
  <item id="s101">
    <title>BBC News at 7pm</title>
    <class>OBJECT.RECORDSCHEDULE.DIRECT.MANUAL</class>
    <priority>L2</priority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <recordDestination mediaType="DVD+R" preference="2">
      DVD Recorder
    </recordDestination>
    <scheduledChannelID type="ANALOG">47</scheduledChannelID>
    <scheduledStartDateTime>T19:00:00</scheduledStartDateTime>
    <scheduledDuration>P01:00:00</scheduledDuration>
```

```

    <scheduleState
      currentErrors="">
        OPERATIONAL
    </scheduleState>
    <abnormalTasksExist>0</abnormalTasksExist>
    <currentRecordTaskCount>2</currentRecordTaskCount>
  </item>
  <item id="s103">
    <title>Life of a Software Developer</title>
    <class>OBJECT.RECORDSCHEDULE.DIRECT.CDSNONEPG</class>
    <priority>L1</priority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <recordDestination mediaType="HDD" preference="2"
      targetURL="http://192.168.0.12/MyNAS/RecordedTV">
      Shared Content
    </recordDestination>
    <scheduledCDSObjectID>
      User_Channel_5
    </scheduledCDSObjectID>
    <scheduledStartDateTime>
      MONT19:00:00
    </scheduledStartDateTime>
    <scheduledDuration>P01:00:00</scheduledDuration>
    <scheduleState
      currentErrors="">
        OPERATIONAL
    </scheduleState>
    <abnormalTasksExist>0</abnormalTasksExist>
    <currentRecordTaskCount>2</currentRecordTaskCount>
  </item>
  <item id="s201">
    <title>Meet the UPnP Guys series</title>
    <class>OBJECT.RECORDSCHEDULE.QUERY.CONTENTNAME</class>
    <priority>L1</priority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <matchingName type="SERIES" subStringMatch="0">
      Meet the UPnP Guys
    </matchingName>
    <scheduleState
      currentErrors="">
        OPERATIONAL
    </scheduleState>
    <abnormalTasksExist>0</abnormalTasksExist>
    <currentRecordTaskCount>1</currentRecordTaskCount>
  </item>
  <item id="s202">
    <title>My Program</title>
    <class>OBJECT.RECORDSCHEDULE.QUERY.CONTENTID</class>
    <priority>L1</priority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <matchingID type="MyLocalProvider.net">

```

```

        123456
    </matchingID>
    <scheduleState
        currentErrors="">
        OPERATIONAL
    </scheduleState>
    <abnormalTasksExist>0</abnormalTasksExist>
    <currentRecordTaskCount>1</currentRecordTaskCount>
</item>
<item id="s102">
    <title>UPnP Awards Ceremony</title>
    <class>OBJECT.RECORDSCHEDULE.DIRECT.CDSEPG</class>
    <priority>L1</priority>
    <recordDestination mediaType="HDD" preference="1">
        Hard Disk
    </recordDestination>
    <scheduledCDSObjectID>
        epg_2005-04-01T09:00:00_P15:00:00
    </scheduledCDSObjectID>
    <scheduleState
        currentErrors="">
        OPERATIONAL
    </scheduleState>
    <abnormalTasksExist>0</abnormalTasksExist>
    <currentRecordTaskCount>1</currentRecordTaskCount>
</item>
</srs>",
6, 6, 123456)

```

5.8.5.2 Browsing recordTask instances associated with a single recordSchedule

When a control point wants to gather detailed information on currently existing recordTask instances that are associated with a particular recordSchedule, it can do this by invoking the BrowseRecordTasks() action.

As an example, assume that the control point wants to browse all recordTask instances, associated with the recordSchedule with its @id property set to "s101". It wants to retrieve all supported properties (Filter argument set to ".*:") and sorting is not important (SortCriteria argument set to "").

The following request:

Request:

```
BrowseRecordTasks("s101", ".*:", 0, 10, "")
```

returns the following response:

Response:

```

BrowseRecordTasks("
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="t101-001">
    <title>BBC News at 7pm</title>

```

```
<class>OBJECT.RECORDTASK</class>
<cdsReference link="LINK1">
```

```
<!--
```

The following *DIDL-Lite XML Document* needs to be interpreted as a simple string and therefore needs to be properly escaped

```
-->
```

```
<?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">
    <dc:title>BBC News at 7pm</dc:title>
    <upnp:class>
      object.item.videoItem.videoBroadcast
    </upnp:class>
    <dc:creator>BBC</dc:creator>
  </item>
</DIDL-Lite>
```

```
<!-- End of DIDL-Lite XML Document -->
```

```
</cdsReference>
<priority>L2</priority>
<desiredPriority type="PREDEF">L2</desiredPriority>
<recordDestination mediaType="HDD" preference="1">
  Hard Disk
</recordDestination>
<recordDestination mediaType="DVD+R" preference="2">
  DVD Recorder
</recordDestination>
<desiredRecordQuality type="DEFAULT">
  SD,AUTO
</desiredRecordQuality>
<recordQuality type="DEFAULT">
  SD
</recordQuality>
<recordQuality type="ATSC">
  480i60
</recordQuality>
<recordQuality type="QLEVEL">
  Q3
</recordQuality>
<recordScheduleID>s101</recordScheduleID>
<recordedCDSObjectID link="LINK1">
  rec00001
</recordedCDSObjectID>
<taskChannelID type="ANALOG">47</taskChannelID>
<taskStartDateTime>
```

```

    2005-06-29T19:00:00
  </taskStartDateTime>
  <taskDuration>P01:00:00</taskDuration>
  <taskStartDateTimeAdjust>
    -P00:02:30
  </taskStartDateTimeAdjust>
  <taskDurationAdjust>
    +P00:05:00
  </taskDurationAdjust>
  <taskState
    phase="IDLE"
    startDateTimeMet="0"
    endDateTimeMet="0"
    recording="0"
    someBitsRecorded="0"
    someBitsMissing="0"
    firstBitsRecorded="0"
    lastBitsRecorded="0"
    fatalError="0"
    currentErrors=""
    errorHistory=""
    pendingErrors=""
    infoList="">
    IDLE.READY
  </taskState>
</item>
<item id="t101-002">
  <title>BBC News at 7pm</title>
  <class>OBJECT.RECORDTASK</class>
  <cdsReference link="LINK1">

```

<!--

The following *DIDL-Lite XML Document* needs to be interpreted as a simple string and therefore needs to be properly escaped

-->

```

  &lt;?xml version="1.0" encoding="UTF-8"?&gt;
  &lt;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"&gt;
    &lt;item id="18" parentID="13" restricted="0"&gt;
      &lt;dc:title&gt;BBC News at 7pm&lt;/dc:title&gt;
      &lt;upnp:class&gt;
        object.item.videoItem.videoBroadcast
      &lt;/upnp:class&gt;
      &lt;dc:creator&gt;BBC&lt;/dc:creator&gt;
    &lt;/item&gt;
  &lt;/DIDL-Lite&gt;

```

<!-- End of *DIDL-Lite XML Document* -->

```

    </cdsReference>
    <priority>L2</priority>
    <desiredPriority type="PREDEF">L2</desiredPriority>
    <recordDestination mediaType="HDD" preference="1">
      Hard Disk
    </recordDestination>
    <recordDestination mediaType="DVD+R" preference="2">
      DVD Recorder
    </recordDestination>
    <desiredRecordQuality type="LABEL">
      SD,AUTO
    </desiredRecordQuality>
    <recordQuality type="DEFAULT">
      HD
    </recordQuality>
    <recordQuality type="ATSC">
      1080i60
    </recordQuality>
    <recordQuality type="QLEVEL">
      Q1
    </recordQuality>
    <recordScheduleID>s101</recordScheduleID>
    <recordedCDSObjectID link="LINK1">
      rec00002
    </recordedCDSObjectID>
    <taskChannelID type="ANALOG">47</taskChannelID>
    <taskStartDateTime>
      2005-06-30T19:00:00
    </taskStartDateTime>
    <taskDuration>P01:00:00</taskDuration>
    <taskStartDateTimeAdjust>
      -P00:02:30
    </taskStartDateTimeAdjust>
    <taskDurationAdjust>
      +P00:05:00
    </taskDurationAdjust>
    <taskState
      phase="IDLE"
      startDateTimeMet="0"
      endDateTimeMet="0"
      recording="0"
      someBitsRecorded="0"
      someBitsMissing="0"
      firstBitsRecorded="0"
      lastBitsRecorded="0"
      fatalError="0"
      currentErrors=""
      errorHistory=""
      pendingErrors=""
      infoList="">
      IDLE.READY
    </taskState>
  </item>
</srs>",
2, 2, 123456)

```

5.8.6 Rating System

A ScheduledRecording service offers the allowed ability to impose rating limits on recordable content.

A ScheduledRecording service implementation can provide a list of supported ratings. The supported ratings can be retrieved by invoking the [GetAllowedValues\(\)](#) action and specifying the [matchingRatingLimit](#) property in the [Filter](#) argument.

In the United States, TV manufacturers are required to provide built-in support for the TV Parental Guidelines Monitoring Board rating system. (See <http://www.tvguidelines.org>.)

Motion picture content is rated on a voluntary basis by the Motion Picture Association of America. (See <http://www.mpa.org>.)

Since it is not a simple matter to determine the rating system applicable to recordable content, the control point should provide values for all applicable rating systems when specifying a rating limit.

For example if the control point was configured to limit content for children, it can provide the following rating limit properties.

```
<matchingRatingLimit type="TVGUIDELINES.ORG">
  TV-G
</matchingRatingLimit>
<matchingRatingLimit type="MPAA.ORG">
  G
</matchingRatingLimit>
```

Since the intent of the rating limit is a limiting value, the ScheduledRecording service shall exclude unrated content or content whose rating system does not match any of the rating types in the [matchingRatingLimit](#) properties provided by the control point.

Since rating limits are intended to preclude some (subset of) users from accessing content, it is up to the control point to identify users and apply the appropriate rating profile to individual users.

5.8.7 Conflict Detection and Resolution

Conflicts between [recordTask](#) instances arise when the recording events, associated with those recordTask instances, overlap in time and there are not enough resources available to record all of the requested recording events.

Conflict detection always happens at the [recordTask](#) level. It is possible that, at [recordSchedule](#) creation time, the ScheduledRecording service is not able to accurately indicate whether scheduling conflicts might arise in the future. Indeed, a ScheduledRecording service is not required or even capable (for a query-type [recordSchedule](#)) of generating all the [recordTask](#) instances that will ever be associated with the [recordSchedule](#). Furthermore, a ScheduledRecording service implementation is allowed to either reject the creation of a [recordSchedule](#) that creates a scheduling conflict (the [CreateRecordSchedule\(\)](#) action returns with error code 730, "Conflict") or accept such a [recordSchedule](#). A control point can therefore only rely on the occurrence of error code 401, "Conflicting Program Loser" or error code 402, "Conflicting Program Winner" in the [taskstate@currentErrors](#) property of all the [recordTask](#) instances to accurately determine whether scheduling conflicts exist. Note that the ScheduledRecording service always picks a Conflicting Program Winner, based upon priority settings and/or other vendor-defined criteria.

At this time, conflict resolution is not adequately supported by this specification. When one or more recordTask instances are conflicting, there is currently no straightforward way for a control point to change the Conflicting Program Winner. Instead, a control point may disable specific recordTask instances so that the intended recordTask becomes the Conflicting Program Winner. The drawback of this approach is that if the newly appointed Conflicting Program Winner changes over time (due to channel- or time migration, for instance), the disabled recordTask instances remain disabled and will not record, even if that would have become possible.

Alternatively, a control point may use the DeleteRecordSchedule() and CreateRecordSchedule() actions to reschedule the recordSchedule with a different priority level. The drawback of this approach is that all recordTask instances associated with the deleted recordSchedule are also deleted and any customization by the user that happened at the recordTask level will get lost as well.

A future version of this specification will address the conflict resolution issue in detail.

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>GetSortCapabilities</name>
      <argumentList>
        <argument>
          <name>SortCaps</name>
          <direction>out</direction>
          <relatedStateVariable>
            SortCapabilities
          </relatedStateVariable>
        </argument>
        <argument>
          <name>SortLevelCap</name>
          <direction>out</direction>
          <relatedStateVariable>
            SortLevelCapability
          </relatedStateVariable>
        </argument>
      </argumentList>
    </action>
    <action>
      <name>GetPropertyList</name>
      <argumentList>
        <argument>
          <name>DataTypeID</name>
          <direction>in</direction>
          <relatedStateVariable>
            A ARG TYPE DataTypeID
          </relatedStateVariable>
        </argument>
        <argument>
          <name>PropertyList</name>
          <direction>out</direction>
          <relatedStateVariable>
            A ARG TYPE PropertyList
          </relatedStateVariable>
        </argument>
      </argumentList>
    </action>
    <action>
      <name>GetAllowedValues</name>
      <argumentList>
        <argument>
          <name>DataTypeID</name>
          <direction>in</direction>
          <relatedStateVariable>

```

```

        A ARG TYPE DataTypeID
    </relatedStateVariable>
</argument>
<argument>
    <name>Filter</name>
    <direction>in</direction>
    <relatedStateVariable>
        A ARG TYPE PropertyList
    </relatedStateVariable>
</argument>
<argument>
    <name>PropertyInfo</name>
    <direction>out</direction>
    <relatedStateVariable>
        A ARG TYPE PropertyInfo
    </relatedStateVariable>
</argument>
</argumentList>
</action>

<action>
    <name>GetStateUpdateID</name>
    <argumentList>
        <argument>
            <name>Id</name>
            <direction>out</direction>
            <relatedStateVariable>
                StateUpdateID
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>

<action>
    <name>BrowseRecordSchedules</name>
    <argumentList>
        <argument>
            <name>Filter</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE PropertyList
            </relatedStateVariable>
        </argument>
        <argument>
            <name>StartingIndex</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE Index
            </relatedStateVariable>
        </argument>
        <argument>
            <name>RequestedCount</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE Count
            </relatedStateVariable>
        </argument>
    </argumentList>

```

```

<argument>
  <name>SortCriteria</name>
  <direction>in</direction>
  <relatedStateVariable>
    A ARG TYPE SortCriteria
  </relatedStateVariable>
</argument>
<argument>
  <name>Result</name>
  <direction>out</direction>
  <relatedStateVariable>
    A ARG TYPE RecordSchedule
  </relatedStateVariable>
</argument>
<argument>
  <name>NumberReturned</name>
  <direction>out</direction>
  <relatedStateVariable>
    A ARG TYPE Count
  </relatedStateVariable>
</argument>
<argument>
  <name>TotalMatches</name>
  <direction>out</direction>
  <relatedStateVariable>
    A ARG TYPE Count
  </relatedStateVariable>
</argument>
<argument>
  <name>UpdateID</name>
  <direction>out</direction>
  <relatedStateVariable>
    StateUpdateID
  </relatedStateVariable>
</argument>
</argumentList>
</action>

<action>
  <name>BrowseRecordTasks</name>
  <argumentList>
    <argument>
      <name>RecordScheduleID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE ObjectID
      </relatedStateVariable>
    </argument>
    <argument>
      <name>Filter</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE PropertyList
      </relatedStateVariable>
    </argument>
    <argument>
      <name>StartingIndex</name>

```

```

        <direction>in</direction>
        <relatedStateVariable>
            A ARG TYPE Index
        </relatedStateVariable>
    </argument>
    <argument>
        <name>RequestedCount</name>
        <direction>in</direction>
        <relatedStateVariable>
            A ARG TYPE Count
        </relatedStateVariable>
    </argument>
    <argument>
        <name>SortCriteria</name>
        <direction>in</direction>
        <relatedStateVariable>
            A ARG TYPE SortCriteria
        </relatedStateVariable>
    </argument>
    <argument>
        <name>Result</name>
        <direction>out</direction>
        <relatedStateVariable>
            A ARG TYPE RecordTask
        </relatedStateVariable>
    </argument>
    <argument>
        <name>NumberReturned</name>
        <direction>out</direction>
        <relatedStateVariable>
            A ARG TYPE Count
        </relatedStateVariable>
    </argument>
    <argument>
        <name>TotalMatches</name>
        <direction>out</direction>
        <relatedStateVariable>
            A ARG TYPE Count
        </relatedStateVariable>
    </argument>
    <argument>
        <name>UpdateID</name>
        <direction>out</direction>
        <relatedStateVariable>
            StateUpdateID
        </relatedStateVariable>
    </argument>
</argumentList>
</action>

<action>
    <name>CreateRecordSchedule</name>
    <argumentList>
        <argument>
            <name>Elements</name>
            <direction>in</direction>
            <relatedStateVariable>

```

```

        A ARG TYPE RecordScheduleParts
    </relatedStateVariable>
</argument>
<argument>
    <name>RecordScheduleID</name>
    <direction>out</direction>
    <relatedStateVariable>
        A ARG TYPE ObjectID
    </relatedStateVariable>
</argument>
<argument>
    <name>Result</name>
    <direction>out</direction>
    <relatedStateVariable>
        A ARG TYPE RecordSchedule
    </relatedStateVariable>
</argument>
<argument>
    <name>UpdateID</name>
    <direction>out</direction>
    <relatedStateVariable>
        StateUpdateID
    </relatedStateVariable>
</argument>
</argumentList>
</action>

<action>
    <name>DeleteRecordSchedule</name>
    <argumentList>
        <argument>
            <name>RecordScheduleID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE ObjectID
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>

<action>
    <name>GetRecordSchedule</name>
    <argumentList>
        <argument>
            <name>RecordScheduleID</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE ObjectID
            </relatedStateVariable>
        </argument>
        <argument>
            <name>Filter</name>
            <direction>in</direction>
            <relatedStateVariable>
                A ARG TYPE PropertyList
            </relatedStateVariable>
        </argument>
    </argumentList>
</action>

```

```

    <argument>
      <name>Result</name>
      <direction>out</direction>
      <relatedStateVariable>
        A ARG TYPE RecordSchedule
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>

<action>
  <name>EnableRecordSchedule</name>
  <argumentList>
    <argument>
      <name>RecordScheduleID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE ObjectID
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>

<action>
  <name>DisableRecordSchedule</name>
  <argumentList>
    <argument>
      <name>RecordScheduleID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE ObjectID
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>

<action>
  <name>DeleteRecordTask</name>
  <argumentList>
    <argument>
      <name>RecordTaskID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE ObjectID
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>

<action>

```

```

<name>GetRecordTask</name>
<argumentList>
  <argument>
    <name>RecordTaskID</name>
    <direction>in</direction>
    <relatedStateVariable>
      A ARG TYPE ObjectID
    </relatedStateVariable>
  </argument>
  <argument>
    <name>Filter</name>
    <direction>in</direction>
    <relatedStateVariable>
      A ARG TYPE PropertyList
    </relatedStateVariable>
  </argument>
  <argument>
    <name>Result</name>
    <direction>out</direction>
    <relatedStateVariable>
      A ARG TYPE RecordTask
    </relatedStateVariable>
  </argument>
  <argument>
    <name>UpdateID</name>
    <direction>out</direction>
    <relatedStateVariable>
      StateUpdateID
    </relatedStateVariable>
  </argument>
</argumentList>
</action>

<action>
  <name>EnableRecordTask</name>
  <argumentList>
    <argument>
      <name>RecordTaskID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE ObjectID
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>

<action>
  <name>DisableRecordTask</name>
  <argumentList>
    <argument>
      <name>RecordTaskID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE ObjectID
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>

```

```

</action>

<action>
  <name>ResetRecordTask</name>
  <argumentList>
    <argument>
      <name>RecordTaskID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE ObjectID
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>

<action>
  <name>GetRecordScheduleConflicts</name>
  <argumentList>
    <argument>
      <name>RecordScheduleID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE ObjectID
      </relatedStateVariable>
    </argument>
    <argument>
      <name>RecordScheduleConflictIDList</name>
      <direction>out</direction>
      <relatedStateVariable>
        A ARG TYPE ObjectIDList
      </relatedStateVariable>
    </argument>
    <argument>
      <name>UpdateID</name>
      <direction>out</direction>
      <relatedStateVariable>
        StateUpdateID
      </relatedStateVariable>
    </argument>
  </argumentList>
</action>

<action>
  <name>GetRecordTaskConflicts</name>
  <argumentList>
    <argument>
      <name>RecordTaskID</name>
      <direction>in</direction>
      <relatedStateVariable>
        A ARG TYPE ObjectID
      </relatedStateVariable>
    </argument>
    <argument>
      <name>RecordTaskConflictIDList</name>
      <direction>out</direction>
      <relatedStateVariable>
        A ARG TYPE ObjectIDList

```

```

        </relatedStateVariable>
    </argument>
    <argument>
        <name>UpdateID</name>
        <direction>out</direction>
        <relatedStateVariable>
            StateUpdateID
        </relatedStateVariable>
    </argument>
</argumentList>
</action>
</actionList>
<serviceStateTable>
    <stateVariable sendEvents="no">
        <name>SortCapabilities</name>
        <dataType>string</dataType>
    </stateVariable>

    <stateVariable sendEvents="no">
        <name>SortLevelCapability</name>
        <dataType>ui4</dataType>
    </stateVariable>

    <stateVariable sendEvents="no">
        <name>StateUpdateID</name>
        <dataType>ui4</dataType>
    </stateVariable>

    <stateVariable sendEvents="yes">
        <name>LastChange</name>
        <dataType>string</dataType>
    </stateVariable>

    <stateVariable sendEvents="no">
        <name>A ARG TYPE PropertyList</name>
        <dataType>string</dataType>
    </stateVariable>

    <stateVariable sendEvents="no">
        <name>A ARG TYPE DataTypeID</name>
        <dataType>string</dataType>
        <allowedValueList>
            <allowedValue>A ARG TYPE RecordSchedule</allowedValue>
            <allowedValue>A ARG TYPE RecordTask</allowedValue>
        </allowedValueList>
        <allowedValue>A ARG TYPE RecordScheduleParts</allowedValue>
        <allowedValue>Vendor-defined</allowedValue>
    </allowedValueList>
    </stateVariable>

    <stateVariable sendEvents="no">
        <name>A ARG TYPE ObjectID</name>
        <dataType>string</dataType>
    </stateVariable>

```

```

<stateVariable sendEvents="no">
  <name>A ARG TYPE ObjectIDList</name>
  <dataType>string</dataType>
</stateVariable>

<stateVariable sendEvents="no">
  <name>A ARG TYPE PropertyInfo</name>
  <dataType>string</dataType>
</stateVariable>

<stateVariable sendEvents="no">
  <name>A ARG TYPE Index</name>
  <dataType>ui4</dataType>
</stateVariable>

<stateVariable sendEvents="no">
  <name>A ARG TYPE Count</name>
  <dataType>ui4</dataType>
</stateVariable>

<stateVariable sendEvents="no">
  <name>A ARG TYPE SortCriteria</name>
  <dataType>string</dataType>
</stateVariable>

<stateVariable sendEvents="no">
  <name>A ARG TYPE RecordSchedule</name>
  <dataType>string</dataType>
</stateVariable>

<stateVariable sendEvents="no">
  <name>A ARG TYPE RecordTask</name>
  <dataType>string</dataType>
</stateVariable>

<stateVariable sendEvents="no">
  <name>A ARG TYPE RecordScheduleParts</name>
  <dataType>string</dataType>
</stateVariable>

</serviceStateTable>
</scpd>

```

7 Test

No semantic tests have been specified for this service.

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Annex A (normative)

srs XML Document

This Annex describes the *srs XML Document* that is used in action arguments of the *property-set* data type. Any *srs XML Document* shall conform to the SRS schema as defined in [26]. Each *srs XML Document* contains one of the following data types: *A_ARG_TYPE_RecordSchedule*, *A_ARG_TYPE_RecordTask* or *A_ARG_TYPE_RecordScheduleParts*. All *property-set* data types are based on properties in the *srs* namespace and are therefore based on the SRS schema.

Due to limitations of the XML Schema syntax, the SRS schema in itself is often not adequate to accurately describe the limitations and restrictions imposed by a particular ScheduledRecording service implementation. For example, the set of supported properties and their allowed values may vary among implementations.

To allow ScheduledRecording service implementations to indicate which properties and their allowed values they support, the concept of the AV Datastructure Template (AVDT) is introduced. A ScheduledRecording service implementation can provide very detailed information about supported properties and their allowed values by means of an *AVDT XML Document*. The *AVDT XML Document* shall conform to the AVDT schema as defined in [2].

An *AVDT XML Document* can be retrieved by invoking the *GetAllowedValues()* action. The *DataTypeID* input argument identifies the data structure to be described by the *AVDT XML Document*. Indeed, depending on the particular ScheduledRecording service implementation, the set of supported properties and their allowed values of a given *property-set* data type may vary. For example, the set of properties that can be specified in the *Elements* input argument (of data type *A_ARG_TYPE_RecordScheduleParts*) of the *CreateRecordSchedule()* action may differ substantially between implementations. Additionally, the set of properties supported by different data types will obviously vary as well.

At this time, this specification identifies three different *AVDT XML Document* manifestations, depending on the data type of the objects described in the *AVDT XML Document*:

- The *A_ARG_TYPE_RecordSchedule* *AVDT XML Document*
- The *A_ARG_TYPE_RecordTask* *AVDT XML Document*
- The *A_ARG_TYPE_RecordScheduleParts* *AVDT XML Document*

A.1 *A_ARG_TYPE_RecordSchedule* *AVDT XML Document*

This type of *AVDT XML Document* is used to describe the data structure of a *recordSchedule* object for a particular ScheduledRecording service implementation. Examples of action arguments that use this data type include the *Result* output argument of the *BrowseRecordSchedules()* and *GetRecordSchedule()* actions.

When using the *AVDT XML Document* in this context, the following rules apply:

- The <contextID> field shall be set to "uuid:device-UUID::urn:schemas-upnp-org:service:ScheduledRecording:1".
- The <dataStructType> field shall be set to "*A_ARG_TYPE_RecordSchedule*".

- The <fieldTable> field shall contain field elements for all the required properties of all the object.recordSchedule.xxx classes supported by the service. Refer to Table C.2, recordSchedule-related columns.
- The <fieldTable> field shall also contain field elements for all the supported allowed properties of all the object.recordSchedule.xxx classes implemented by the service. Refer to Table C.2, recordSchedule-related columns.

Field specific rules:

- There shall be one and only one field with the subelement <name> set to “class”
- The allowed values for this field shall only be derived from the object.recordSchedule virtual class.
- The <name> subelement of all <field> elements shall only contain names of recordSchedule properties.

For a full-fledged example of a A_ARG_TYPE_RecordSchedule AVDT XML Document, see Annex G.1.

A.2 A_ARG_TYPE_RecordTask AVDT XML Document

This type of AVDT XML Document is used to describe the data structure of a recordTask object for a particular ScheduledRecording service implementation. Examples of action arguments that use this data type include the Result output argument of the BrowseRecordTasks() and GetRecordTask() actions.

When using the AVDT XML Document in this context, the following rules apply:

- The <contextID> field shall be set to “uuid:device-UUID::urn:schemas-upnp-org:service:ScheduledRecording:1”.
- The <dataStructType> field shall be set to “A_ARG_TYPE_RecordTask”.
- The <fieldTable> field shall contain field elements for all the required properties of the object.recordTask class. Refer to Table C.2, recordTask-related column.
- The <fieldTable> field shall also contain field elements for all the supported allowed properties of the object.recordTask class. Refer to Table C.2, recordTask-related column.

Field specific rules:

- There shall be one and only one field with the subelement <name> set to “class”
- The allowed values for this field shall only be derived from the object.recordTask class.
- The <name> subelement of all <field> elements shall only contain names of recordTask properties.

For a full-fledged example of a A_ARG_TYPE_RecordTask AVDT XML Document, see Annex G.2.

A.3 A_ARG_TYPE_RecordScheduleParts AVDT XML Document

This This type of AVDT XML Document is used to describe the data structure of a recordScheduleParts object for a particular ScheduledRecording service implementation. Examples of action arguments that use this data type include the Elements input argument of the CreateRecordSchedule() action.

When using the *AVDT XML Document* in this context, the following rules apply:

- The <contextID> field shall be set to “uuid:*device-UUID*::urn:schemas-upnp-org:service:ScheduledRecording:1”.
- The <dataStructType> field shall be set to “*A_ARG_TYPE_RecordScheduleParts*”.
- The <fieldTable> field shall contain field elements for all the required properties of all the *object.recordSchedule.xxx* classes supported by the service. Refer to Table C.1, *recordSchedule*-related columns.
- The <fieldTable> field shall also contain field elements for all the supported allowed properties of all the *object.recordSchedule.xxx* classes implemented by the service. Refer to Table C.1, *recordSchedule*-related columns.

Field specific rules:

- There shall be one and only one field with the subelement <name> set to “class”
- The allowed values for this field shall only be derived from the *object.recordSchedule* virtual class.
- The <name> subelement of all <field> elements shall only contain names of *recordSchedule* properties.

For a full-fledged example of a *A_ARG_TYPE_RecordScheduleParts* AVDT XML Document, see Annex G.3.

Annex B (normative)

AV Working Committee Extended Properties

The The tables and subclauses below list all properties defined by the AV Working Committee. A property is expressed in XML as either an XML element or an XML attribute.

In the following subclauses, the definition of each property and its default value, if applicable, is described, followed by the specifics pertaining to INPUT and OUTPUT usage for this property. The INPUT usage indicates how the property is used in a [recordScheduleParts](#) object. The OUTPUT usage indicates how the property is used in a [recordSchedule](#) and/or [recordTask](#) object.

Note that the NS column in the tables contains the namespace prefix of the namespace to which the property name belongs. The M-Val column indicates whether the property is multi-valued (M-Val = [YES](#)) or single-valued (M-Val = [NO](#)). See subclauses 3.2.20 and 3.2.21.

B.1 Base Properties

Table B.1 — Base Properties Overview

Property Name	NS	Data Type	M-Val	Reference
@id	srs	xsd:string	NO	Annex B.1.1
title	srs	xsd:string	NO	Annex B.1.2
class	srs	xsd:string	NO	Annex B.1.3
additionalStatusInfo	srs	xsd:string	NO	Annex B.1.4
cdsReference	srs	xsd:string	YES	Annex B.1.5
cdsReference@link	srs	xsd:string	NO	Annex B.1.5.1

B.1.1 [@id](#)

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: [NO](#)

Description: The [@id](#) property identifies a [recordSchedule](#) or [recordTask](#) object. The value shall be unique in the ScheduledRecording service. The value shall be set by the ScheduledRecording service.

Default Value: N/A – Required on input.

Sort Order: Lexical or Lexical Numeric.

Each implementation should use the sort method most appropriate for its method of generating [@id](#) values. If [@id](#) values contain a numeric (sub)string that contains values that increment with each new object creation, then use Lexical Numeric; otherwise, use Lexical.

Input: When creating a new [recordSchedule](#) object, the [@id](#) property shall be specified to satisfy the SRS XML Schema and shall be set to the empty string.

Output: The unique object ID set by the ScheduledRecording service.

B.1.2 **title****Namespace:** srs**Property Data Type:** xsd:string**Multi-Valued:** NO

Description: Primary title of the object. The title property contains a friendly name to identify the object. This property can be either user-supplied or derived from the content name the object represents. This property is not to be confused with the matchingName or matchedName property. See also <http://dublincore.org/documents/dces>.

Default Value: N/A – Required on input.

Sort Order: Lexical.

Input: The desired setting.

Output: The current setting.

B.1.3 **class****Namespace:** srs**Property Data Type:** xsd:string**Multi-Valued:** NO

Description: The class property identifies the class of the object. A ScheduledRecording service implementation shall list all classes it supports. If some (vendor-defined) classes are derived from other classes, then both the derived classes and the parent classes shall be listed. See Annex C for details.

Default Value: N/A – Required on input.

Sort Order: Sequenced Lexical. Sequence subvalues are substrings separated by periods.

Input: The desired setting.

Output: The current setting.

Allowed Values:

Table B.2 — Allowed values for the class Property

Value	R/A	Description
<u>"OBJECT.RECORDSCHEDULE.DIRECT.MANUAL"</u>	<u>A</u>	Control points should support all predefined values in these rows.
<u>"OBJECT.RECORDSCHEDULE.DIRECT.CDSEPG"</u>	<u>A</u>	
<u>"OBJECT.RECORDSCHEDULE.DIRECT.CDSNONEPG"</u>	<u>R</u>	
<u>"OBJECT.RECORDSCHEDULE.DIRECT.PROGRAMCODE"</u>	<u>A</u>	
<u>"OBJECT.RECORDSCHEDULE.QUERY.CONTENTNAME"</u>	<u>A</u>	
<u>"OBJECT.RECORDSCHEDULE.QUERY.CONTENTID"</u>	<u>A</u>	
<u>"OBJECT.RECORDTASK"</u>	<u>A</u>	See Annex C.1 for rules on vendor-defined class extensions.
<u>vendor-defined.</u> Vendor-defined class names shall obey the rules set forth in Annex D.3.	<u>X</u>	

B.1.4 **additionalStatusInfo****Namespace:** srs**Property Data Type:** xsd:string**Multi-Valued:** NO

Description: The [additionalStatusInfo](#) property is a general-purpose property that can hold text-based additional status information.

Default Value: N/A – Output only.

Sort Order: Lexical.

Input: N/A.

Output: The current setting.

B.1.5 [cdsReference](#)

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: [YES](#)

Description: The [cdsReference](#) property shall only contain metadata of a ContentDirectory service object that is referenced (directly or indirectly) by a [recordSchedule](#) or [recordTask](#) object.

Note that this is a multi-valued property so that metadata of multiple referenced ContentDirectory service objects can be stored. A [recordSchedule](#) or [recordTask](#) object references ContentDirectory service objects through properties, such as the [scheduledCDSObjectID](#) property, [recordedCDSObjectID](#) property, etc. (collectively indicated by the notation: [xxxCDSObjectID](#) property). To indicate which [cdsReference](#) property is associated with which [xxxCDSObjectID](#) property, both properties have a dependent property, [cdsReference@link](#) and [xxxCDSObjectID@link](#) respectively, that shall contain the same unique, vendor-defined link identifier.

The [cdsReference](#) property shall contain a valid and properly escaped *DIDL-Lite XML Document*. The *DIDL-Lite XML Document* describes a device-dependent (sub)set of imported properties (metadata) of the ContentDirectory service object that is referenced by the linked [xxxCDSObjectID](#) property. See Annex B.17 for details.

Default Value: N/A – Output only.

Sort Order: Sorting on this property is meaningless and will be ignored.

Input: N/A.

Output: The current setting.

B.1.5.1 [cdsReference@link](#)

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: [NO](#)

Description: The [cdsReference@link](#) contains a unique, vendor-defined link identifier that unambiguously links its [cdsReference](#) property to a particular [xxxCDSObjectID](#) property within the same [recordSchedule](#) or [recordTask](#) object. See Annex B.17 for details.

Default Value: N/A – Output only.

Sort Order: Lexical or Lexical Numeric.

Each implementation should use the sort method most appropriate for its method of generating [cdsReference@link](#) values. If [cdsReference@link](#) values contain a numeric (sub)string that contains values that increment with each new object creation, then use Lexical Numeric; otherwise, use Lexical

Input: N/A.

Output: The current setting.

B.2 Priority Properties

Table B.3 — Priority Properties

Property Name	NS	Data Type	M-Val	Reference
<u>priority</u>	srs	xsd:string	<u>NO</u>	Annex B.2.1
<u>priority@orderedValue</u>	srs	xsd:unsignedInt	<u>NO</u>	Annex B.2.1.1
<u>desiredPriority</u>	srs	xsd:string	<u>NO</u>	Annex B.2.2

B.2.1 priority

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The priority property indicates the priority level of the associated object (a recordSchedule or a recordTask). The priority-value format syntax of the priority property is described in Annex D.

Example values for this property include: "L1", "L2", "L3", ... where "L1" represents the highest priority level with subsequent values representing progressively lower priority levels.

Note: Desired priority settings are specified via the desiredPriority property passed into the CreateRecordSchedule() action. See subclause 5.7 for details.

Default Value: N/A – Output only.

Sort Order: Property Specific, based on priority order. Ascending: lowest priority first.

Input: N/A.

Output: The current setting.

Allowed Values:

Table B.4 — Allowed values for the priority Property

Value	R/A	Description
" <u>L1</u> "	<u>R</u>	The highest priority level supported by the device.
" <u>L2</u> "	<u>A</u>	The next progressively lower priority level supported by the device.
" <u>L3</u> "	<u>A</u>	Progressively lower priority level supported by the device.
" <u>L<x></u> "	<u>A</u>	The lowest priority level supported by the device where <x> is the total number of distinct priority levels supported by the device.

Notes:

All devices shall support 1 or more priority levels.

If "L<x>" is supported, then all values between "L1" and "L<x>" shall be supported.

B.2.1.1 **priority@orderedValue****Namespace:** srs**Property Data Type:** xsd:unsignedInt**Multi-Valued:** NO

Description: The priority@orderedValue property indicates the relative numerical priority value of the associated object (a recordSchedule or a recordTask). A value of 1 indicates that this object is the highest priority object of that object type (that is: of all recordSchedule instances or all recordTask instances). Other ascending values indicate that the object has a progressively lower priority relative to the other objects of that type. A value of N (where N is the total number of objects of that type) indicates that the object is the lowest priority object of that type. No two objects of the same type will have the same value for this property.

Note: This property is not evented when the priority of the object changes (for example due to the creation of a new object with a higher priority).

Default Value: N/A – Output only.**Sort Order:** Numeric.**Input:** N/A.**Output:** The current setting.**B.2.2** **desiredPriority****Namespace:** srs**Property Data Type:** xsd:string**Multi-Valued:** NO

Description: The desiredPriority property specifies the desired priority level of the associated object (a recordSchedule or a recordTask). The `priority-value` format syntax of the desiredPriority property is defined in Annex D.

Except as noted below, the value for this property shall match one of the allowed values returned by the GetInputPropertyInfo action for this property. The allowed values shall comply with Table B.5 and Table B.6 below. Additionally, if the priority@orderedValue property is supported, the desiredPriority property can also be set to one of the allowed values listed in Table B.6.

Default Value: “DEFAULT”.**Sort Order:** Sorting on this property is meaningless and will be ignored.**Input:** The desired setting.**Output:** The current setting.**Allowed Values:****Table B.5 — Primary allowed values for the desiredPriority Property**

Value	R/A	Description
<u>“DEFAULT”</u>	<u>R</u>	No priority preference. The device itself will determine the object's priority.
<u>“L1”</u>	<u>A</u>	The highest priority level supported by the device.
<u>“L2”</u>	<u>A</u>	The next to highest priority level supported by the device.

...	<u>A</u>	Progressively lower priority levels between 1 and <x>, " <u>L3</u> ", " <u>L4</u> ", etc.
" <u>L<x></u> "	<u>A</u>	The lowest priority level supported by the device where <x> is the total number of distinct priority levels supported by the device.

Notes:

All devices shall support 1 or more priority levels.

If "L<x>" is supported, then all values between "L1" and "L<x>" shall be continuously supported; that is: a device shall not support only "L1", "L3", and "L5".

Additionally, if the device supports the priority@orderedValue property, then the device shall also support the following allowed values. Conversely, if any of these allowed values are supported, then the device shall support the priority@orderedValue property. These allowed values provide a mechanism for more precise prioritization control with those devices that support it.

Table B.6 — Additional allowed values for the desiredPriority Property

Value	R/A	Description
" <u>HIGHEST</u> "	<u>R</u>	The highest level possible. – Same as " <u>L1 HI</u> " defined below.
" <u>LOWEST</u> "	<u>R</u>	The lowest level possible. – Same as " <u>L<x> LOW</u> " defined below.
" <u>L1 HI</u> "	<u>R</u>	The highest priority possible within the highest priority level.
" <u>L1 LOW</u> "	<u>R</u>	The lowest priority possible within the highest priority level.
" <u>L2 HI</u> "	<u>R</u>	The highest priority possible within the next to highest priority level.
" <u>L2 LOW</u> "	<u>R</u>	The lowest priority possible within the next to highest priority level.
...	<u>R</u>	Progressively lower priority levels.
" <u>L<x> HI</u> "	<u>R</u>	The highest priority possible within the lowest priority level where <x> is the total number of distinct priority levels supported by the device.
" <u>L<x> LOW</u> "	<u>R</u>	The lowest priority possible, but within the lowest priority level where <x> is the total number of distinct priority levels supported by the device.
<@id>	<u>R</u>	The next highest priority "slot" immediately higher than (but within the same priority level of) the existing object whose <u>@id</u> is specified by <@id>.

Note that

1. If a device supports the priority@orderedValue property, then the device shall also support these conditionally required allowed values. Conversely, if any of these allowed values are supported, then the device shall support the priority@orderedValue property.
2. These allowed values provide a mechanism for more precise prioritization control with those devices that support it. If "L<x> LOW" is supported, then all values between "L1 HI" and "L<x> LOW" shall be continuously supported; that is: a

device shall not support only "L1_HI", "L1_LOW", "L3_HI", "L3_LOW", "L5_HI" and "L5_LOW" or only "L1_HI", "L2_HI", and "L3_HI".

B.2.2.1 desiredPriority@type

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: When the desiredPriority@type property is set to "PREDEF", it indicates that the desiredPriority property contains one of the predefined priority labels ("L1", "L2_LOW", etc.). When set to "OBJECTID", it indicates that the desiredPriority property contains an object ID (@id value).

Default Value: "PREDEF".

Sort Order: Sorting on this property is meaningless and will be ignored.

Input: The desired setting.

Output: The current setting.

Allowed Values:

Table B.7 — Allowed values for the desiredPriority@type Property

Value	R/A	Description
" <u>PREDEF</u> "	<u>R</u>	
" <u>OBJECTID</u> "	<u>R</u>	

B.3 Output Control Properties

Table B.8 — Output Control Properties

Property Name	NS	Data Type	M-Val	Reference
<u>recordDestination</u>	srs	xsd:string	<u>YES</u>	Annex B.3.1
<u>recordDestination@mediaType</u>	srs	CSV (xsd:string)	<u>NO</u>	Annex B.3.1.1
<u>recordDestination@targetURL</u>	srs	xsd:anyURI	<u>NO</u>	Annex B.3.1.2
<u>recordDestination@preference</u>	srs	xsd:unsignedInt	<u>NO</u>	Annex B.3.1.3
<u>desiredRecordQuality</u>	srs	xsd:string	<u>NO</u>	Annex B.3.2
<u>desiredRecordQuality@type</u>	srs	xsd:string	<u>NO</u>	Annex B.3.2.1

B.3.1 recordDestination

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: YES

Description: The recordDestination property identifies the storage unit to be used for the recording. This identifier, which is to be generated by the ScheduledRecording service, should be a user-friendly name for the storage unit so that its value is meaningful to a user when displayed.

This is a multi-valued property so that more than one record destination can be specified for a recording. The recordDestination@preference property allows the order of preference among multiple record destinations to be specified. If none of the specified record destinations is available at the time of recording, then the recording shall not take place.

Examples: “*Hard Disk Drive*”, “*DVD-1*”, “*LINE1*”, “*AUX-out*” etc.

Default Value: Vendor-defined.

Sort Order: Lexical.

Input: The desired setting.

Output: The current setting.

B.3.1.1 **recordDestination@mediaType**

Namespace: srs **Property Data Type:** CSV (xsd:string) **Multi-Valued:** NO

Description: The **recordDestination@mediaType** property indicates the type of media that is to be used for the recording.

If the media type of the specified record destination is fixed (not removable), then the value of the **recordDestination@mediaType** property shall match the actual physical media type of the record destination. This single value can be retrieved through the **GetAllowedValues()** action.

If the media of the specified record destination is manually removable (requires explicit user intervention) then the currently inserted physical media shall match one of the values in the **recordDestination@mediaType** property. In other words, the specified list of media types indicates those that are acceptable for the recording. If the current physical media does not match one of the acceptable media types, then the recording shall not take place on this record destination.

If the specified record destination supports automatic swapping of media, such as a jukebox recorder, then the **recordDestination@mediaType** property indicates which media type(s) shall be used for the recording. Recording shall occur on the available media type that appears earliest in the list. If none of the specified media types is available for recording, then the recording shall not take place on this record destination.

If recording can not take place as described above, then lower preference record destinations may be used (see Annex B.3.1.3). The set of allowed values for the **recordDestination@mediaType** property can be retrieved through the **GetAllowedValues()** action.

Examples: “*HDD*”, “*DVD-RW*”

Default Value: Vendor-defined.

Sort Order: Sequenced Lexical.

Input: The desired setting.

Output: The current setting.

Allowed Values: One of the allowed values for the **AVTransport::RecordStorageMedium** state variable shall be specified. Please refer to the AVTransport service specification for the table of allowed values.

B.3.1.2 **recordDestination@targetURL**

Namespace: srs **Property Data Type:** xsd:anyURI **Multi-Valued:** NO

Description: The [recordDestination@targetURL](#) property shall contain a URL that identifies the location, such as the location of a directory, where the recorded content is to be stored.

Examples:

```
"file:///D:/MyDocuments/MyVideos"
"http://10.0.0.1/MyDocuments/MyVideos"
```

Default Value: Vendor-defined.

Sort Order: Lexical.

Input: The desired setting.

Output: The current setting.

B.3.1.3 [recordDestination@preference](#)

Namespace: srs **Property Data Type:** xsd:unsignedInt **Multi-Valued:** NO

Description: The [recordDestination@preference](#) property is useful when multiple [recordDestination](#) properties are specified within the same [recordSchedule](#) or [recordTask](#) object. In this case, the values indicate the preference order of the multiple record destinations. Higher numbers indicate lower preference. The values do not have to be contiguous.

If multiple [recordDestination@preference](#) properties have the same value, then the order of preference in which their associated record destinations are chosen is device-dependent.

If the [recordDestination@preference](#) property is not supported by an implementation, then the order of preference of all specified record destinations is device-dependent.

Default Value: Vendor-defined.

Sort Order: Numeric.

Input: The desired setting.

Output: The current setting.

B.3.2 [desiredRecordQuality](#)

Namespace: srs **Property Data Type:** CSV (xsd:string) **Multi-Valued:** NO

Description: The [desiredRecordQuality](#) property is used to express the desired or preferred recording quality level(s) for a particular [recordSchedule](#). Multiple recording quality levels can be specified in the comma-separated value list of the [desiredRecordQuality](#) property. If there is more than one value specified, then the values indicate the desired recording quality, in order of preference, highest preference first. The value "[AUTO](#)" shall be supported by all implementations. When "[AUTO](#)" is included in the list, it shall appear as the last value in the list and indicates that if none of the preceding values are available, then the ScheduledRecording service is free to use any recording quality level to maximize the probability that the recording actually takes place. When the "[AUTO](#)" value is the only value in the list, then the ScheduledRecording service is free to use any recording quality level.

There are many ways to express recording quality. Some implementations use bitrates, some use user-friendly labels etc. Some implementations might even support multiple ways to express recording quality simultaneously. The [desiredRecordQuality](#) property is used in conjunction with the [desiredRecordQuality@type](#) to allow implementations to express these variations. However, since the [desiredRecordQuality](#) property can appear only once, the acceptable recording quality levels for a particular [recordSchedule](#) are restricted to a single type variation.

If an implementation is capable of encoding or transcoding, then it may do so in order to achieve the desired recording quality.

Example: Assume a (hypothetical) implementation that supports the type variations “[DEFAULT](#)”, “[ATSC](#)” and “[QLEVEL](#)” for the [desiredRecordQuality@type](#) property. The following table expresses the supported [desiredRecordQuality](#) property values for those variations and also indicates how the different type variations interrelate for this particular implementation:

Table B.9 — [desiredRecordQuality](#) Example

<u>“DEFAULT”</u>	<u>“ATSC”</u>	<u>“QLEVEL”</u>
<u>“HD”</u>	<u>“1080p30”</u>	<u>“Q1”</u>
	<u>“1080p24”</u>	
	<u>“1080i60”</u>	
	<u>“720p60”</u>	<u>“Q2”</u>
	<u>“720p30”</u>	
	<u>“720p24”</u>	
<u>“ED”</u>	<u>“480p60”</u>	<u>“Q3”</u>
<u>“SD”</u>	<u>“480p30”</u>	
	<u>“480p24”</u>	
	<u>“480i60”</u>	
<u>“AUTO”</u>	<u>“AUTO”</u>	<u>“AUTO”</u>

- a) Specifying “[HD,ED](#)” in the [desiredRecordQuality](#) property and “[DEFAULT](#)” in the [desiredRecordQuality@type](#) property will result in the following:
- If possible, the recording will be made using “[HD](#)” quality. In this case, it is up to the implementation to determine exactly which recording quality level within the “[HD](#)” range will be used for the recording.
 - If recording using “[HD](#)” quality is not possible, the recording will be made using “[ED](#)” quality, if possible. Again, it is up to the implementation to determine exactly which recording quality level within the “[ED](#)” range will be used for the recording.
 - If the recording cannot be made in either “[HD](#)” or “[ED](#)” quality, then no recording will be made.
- b) Specifying “[ED,SD,AUTO](#)” in the [desiredRecordQuality](#) property and “[DEFAULT](#)” in the [desiredRecordQuality@type](#) property will result in the following:
- If possible, the recording will be made using “[ED](#)” quality. It is up to the implementation to determine exactly which recording quality level within the “[ED](#)” range will be used for the recording.

- If that is not possible, the recording will be made using “*SD*” quality, if possible. It is up to the implementation to determine exactly which recording quality level within the “*SD*” range will be used for the recording.
 - If the recording cannot be made in either “*ED*” or “*SD*” quality, then the recording will be made using any other available recording quality.
- c) Specifying “*720p60*” in the *desiredRecordQuality* property and “*ATSC*” in the *desiredRecordQuality@type* property will result in the following:
- If possible, the recording will be made using “*720p60*” quality.
 - If that is not possible, no recording will be made.

When the ScheduledRecording service responds to a *GetAllowedValues()* action with *desiredRecordQuality* information, then the allowed values shall be listed in order of quality from highest quality to lowest. The value “*AUTO*” shall always be present and appear as the last item in the list.

Default Value: Vendor-defined.

Sort Order: Property Specific, based on the allowed values for the *desiredRecordQuality* property. Ascending: lowest quality first.

Input: The desired setting.

Output: The current setting.

Allowed Values:

Table B.10 — Allowed values for the *desiredRecordQuality* Property

Value	R/A	Description
“ <i>AUTO</i> ”	<i>R</i>	If none of the quality levels preceding the “ <i>AUTO</i> ” value are available, then any recording quality level may be used. The “ <i>AUTO</i> ” value shall always appear last in the list when present.
<i>Vendor-defined</i>	<i>X</i>	

B.3.2.1 *desiredRecordQuality@type*

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: *NO*

Description: There are many ways to express recording quality. Some implementations use bitrates, some use user-friendly labels etc. Some implementations might even support multiple ways to express recording quality simultaneously. The *desiredRecordQuality@type* property is used to express which type variation is used in its associated independent *desiredRecordQuality* property. The “*DEFAULT*” value shall be supported and indicates which of the supported type variations is preferred by the device when expressing recording quality levels.

Default Value: Vendor-defined.

Sort Order: Lexical.

Input: The desired setting.

Output: The current setting.

Allowed Values:**Table B.11 — Allowed values for the desiredRecordQuality@type Property**

Value	R/A	Description
<u>“DEFAULT”</u>	<u>R</u>	Indicates the type variation that is preferred by the device when expressing recording quality levels.
<i>Vendor-defined</i>	<u>X</u>	

B.4 Content Identification Related Properties**Table B.12 — Content Identification Related Properties**

Property Name	NS	Data Type	M-Val	Reference
<u>scheduledCDSObjectID</u>	srs	xsd:string	<u>NO</u>	Annex B.4.1
<u>scheduledCDSObjectID@link</u>	srs	xsd:string	<u>NO</u>	Annex B.4.1.1
<u>scheduledChannelID</u>	srs	xsd:string	<u>NO</u>	Annex B.4.2
<u>scheduledChannelID@type</u>	srs	xsd:string	<u>NO</u>	Annex B.4.2.1
<u>scheduledChannelID@distriNetworkName</u>	srs	xsd:string	<u>NO</u>	Annex B.4.2.2
<u>scheduledChannelID@distriNetworkID</u>	srs	xsd:string	<u>NO</u>	Annex B.4.2.3
<u>scheduledStartDateTime</u>	srs	xsd:string	<u>YES</u>	Annex B.4.3
<u>scheduledDuration</u>	srs	xsd:string	<u>NO</u>	Annex B.4.4
<u>scheduledProgramCode</u>	srs	xsd:string	<u>NO</u>	Annex B.4.5
<u>scheduledProgramCode@type</u>	srs	xsd:string	<u>NO</u>	Annex B.4.5.1

B.4.1 scheduledCDSObjectID**Namespace:** srs**Property Data Type:** xsd:string**Multi-Valued:** NO

Description: The scheduledCDSObjectID property contains the didl-lite:@id property value of the ContentDirectory service object from which relevant metadata information is extracted to create the recordSchedule.

Default Value: N/A – Required on input.

Sort Order: Lexical or Lexical Numeric.

Each implementation should use the sort method most appropriate for its method of generating didl-lite:@id values. If didl-lite:@id values contain a numeric (sub)string that contains values that increment with each new object creation, then use Lexical Numeric; otherwise, use Lexical.

Input: The desired setting.

Output: The current setting.

B.4.1.1 scheduledCDSObjectID@link**Namespace:** srs**Property Data Type:** xsd:string**Multi-Valued:** NO

Description: The scheduledCDSObjectID@link contains a unique, vendor-defined link identifier that unambiguously links its scheduledCDSObjectID property to a particular

[cdsReference](#) property instance within the same [recordSchedule](#) object. See Annex B.17 for details.

Default Value: N/A – Output only.

Sort Order: Same as [cdsReference@link](#).

Input: N/A.

Output: The current setting.

B.4.2 [scheduledChannelID](#)

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: [No](#)

Description: The [scheduledChannelID](#) property provides channel information for the [recordSchedule](#). Its format depends on the [scheduledChannelID@type](#) property as follows:

If [scheduledChannelID@type](#) = “[ANALOG](#)” then the [scheduledChannelID](#) property contains the channel number.

Note that the label “[ANALOG](#)” actually is a misnomer. The format of the [scheduledChannelID](#) property does not indicate the nature of the channel (analog versus digital). Rather, it merely indicates the format of the label (for example, a single channel number versus a channel number pair). Therefore, the label “[ANALOG](#)” should be interpreted as meaning: the [scheduledChannelID](#) property’s format is a single channel number.

Examples: “5”, “7”, etc.

If [scheduledChannelID@type](#) = “[DIGITAL](#)” then the [scheduledChannelID](#) property contains the channel number pair “<Major Channel Number>,<Minor Channel Number>”.

Note that the label “[DIGITAL](#)” actually is a misnomer. The format of the [scheduledChannelID](#) property does not indicate the nature of the channel (analog versus digital). Rather, it merely indicates the format of the label (for example, a single channel number versus a channel number pair). Therefore, the label “[DIGITAL](#)” should be interpreted as meaning: the [scheduledChannelID](#) property’s format is a channel number pair.

Examples: “5,1”, “5,2”, etc.

If [scheduledChannelID@type](#) = “[FREQUENCY](#)” then the [scheduledChannelID](#) property contains the channel center frequency, expressed in Hz.

Examples: “150125000” (VHF band), “615000000” (UHF band), “965000000” (FM band), etc.

If [scheduledChannelID@type](#) = “[SI](#)” then the [scheduledChannelID](#) property contains the Service Information Triplet “<Network ID>,<Transport Stream ID>, <Service ID>”, embedded in the content stream.

Examples: “0x1234,0xFEDC,0x0102”, “12345,23456,32109”, etc.

If [scheduledChannelID@type](#) = “[LINE](#)” then the [scheduledChannelID](#) property contains a vendor-defined label identifying the line input.

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Examples: “Line 1”, “AUX”, “Front”, “Rear”, etc.

If [scheduledChannelID@type](#) = “[NETWORK](#)” then the [scheduledChannelID](#) property contains the URI that uniquely identifies the content to be recorded.

Examples:

“http://upnp-server/stream1.mp2/”, “http://internet/stream2.mp2/”

Default Value: N/A – Required on input.

Sort Order: [type](#) Relationship.

- “[ANALOG](#)”: Numeric.
- “[DIGITAL](#)”: Sequenced numeric.
- “[FREQUENCY](#)”: Numeric.
- “[SI](#)”: Sequenced lexical.
- “[LINE](#)”: Lexical.
- “[NETWORK](#)”: Lexical.
- [Vendor-defined](#): Vendor-defined sorting.

Input: The desired setting.

Output: The current setting.

B.4.2.1 [scheduledChannelID@type](#)

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: [NO](#)

Description: The [scheduledChannelID@type](#) property determines the format that is used for the [scheduledChannelID](#) property as defined above.

Default Value: N/A – Required on input.

Sort Order: Property Specific, based on the order in Table B.13. Ascending: first table entry first. If there is a single vendor-defined value, it sorts in table position. If there are multiple vendor-defined values, they sort lexically among themselves, all after the Table B.13 entries in ascending order and all before the Table B.13 entries in descending order.

Input: The desired setting.

Output: The current setting.

Allowed Values:

Table B.13 — Allowed values for the [scheduledChannelID@type](#) Property

Value	R/A	Description
“ <u>ANALOG</u> ”	<u>A</u>	At least one value in these rows shall be supported by a compliant ScheduledRecording service implementation. Control points should support <i>all</i> values in these rows.
“ <u>DIGITAL</u> ”	<u>A</u>	
“ <u>FREQUENCY</u> ”	<u>A</u>	
“ <u>SI</u> ”	<u>A</u>	
“ <u>LINE</u> ”	<u>A</u>	

<u>"NETWORK"</u>	<u>A</u>	
<u>Vendor-defined</u>	<u>X</u>	

B.4.2.2 scheduledChannelID@distriNetworkName**Namespace:** srs**Property Data Type:** xsd:string**Multi-Valued:** NO

Description: The scheduledChannelID@distriNetworkName property contains the name of the Distribution Network that provides the channel, identified by the scheduledChannelID property.

Default Value: Vendor-defined.**Sort Order:** Lexical.**Input:** The desired setting.**Output:** The current setting.**B.4.2.3 scheduledChannelID@distriNetworkID****Namespace:** srs**Property Data Type:** xsd:string**Multi-Valued:** NO

Description: The scheduledChannelID@distriNetworkID property contains an ID that uniquely identifies the Distribution Network that provides the channel, identified by the scheduledChannelID property.

Default Value: Vendor-defined.**Sort Order:** Lexical.**Input:** The desired setting.**Output:** The current setting.**B.4.3 scheduledStartTimeTime****Namespace:** srs**Property Data Type:** xsd:string**Multi-Valued:** YES

Description: The scheduledStartTimeTime property indicates what date or day(s) and time the recording will take place. This property does not account for any recording time adjustments such as scheduledStartTimeTimeAdjust, and device latencies.

The `sched-start` format syntax of the scheduledStartTimeTime property is defined in Annex D.

Examples: "02-07T15:30:00" (February 7th, 3:30pm), "2005-02-07T15:30:00" (February 7th, 2005, 3:30pm), "MONT15:30:00" (Mondays at 3:30pm), "T15:30:00" (Every day at 3:30pm)

Recording(s) will occur on the next occurrence(s) of the specified date or day(s) and time until the total number of desired recordings (as indicated by the totalDesiredRecordTasks property) has been made.

Note that the scheduledStartTimeTime property is a multi-valued property. Therefore, multiple date× can be specified for the same recordSchedule. Recording will occur on every next occurrence of any of the specified start date× until the total number of desired recordings (as indicated by the totalDesiredRecordTasks property) has been made.

See Annex B.7.1 for further details on the use of the [totalDesiredRecordTasks](#) property.

The value “[NOW](#)” is defined by this specification to indicate that the recording shall start immediately (as soon as possible).

Default Value: N/A – Required on input.

Sort Order: Property Specific, in chronological order.

Input: The desired setting.

Output: The current setting.

B.4.4 [scheduledDuration](#)

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** [NO](#)

Description: The [scheduledDuration](#) property indicates the scheduled duration of the recording. The `duration` format syntax of the [scheduledDuration](#) property is defined in Annex D.

Examples: “P01:30:00” (one hour and thirty minutes), “P2D01:15:00” (two-day and seventy five minutes recording).

This property does not necessarily represent the exact recording duration but represents the scheduled recording duration. This property does not account for any recording time adjustments such as [scheduledDurationAdjust](#), and device latencies.

Default Value: N/A – Required on input.

Sort Order: Property Specific, based on elapsed time. Ascending: shortest elapsed time first.

Input: The desired setting.

Output: The current setting.

B.4.5 [scheduledProgramCode](#)

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** [NO](#)

Description: The [scheduledProgramCode](#) property indicates the program code provided by a program guide service of a particular program item. The format of the program code is defined by the program guide service. A [scheduledProgramCode@type](#) property shall be specified with this property to identify the program guide service used.

Default Value: N/A – Required on input.

Sort Order: Sorting on this property is meaningless and will be ignored.

Input: The desired setting.

Output: The current setting.

B.4.5.1 [scheduledProgramCode@type](#)

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** [NO](#)

Description: The [scheduledProgramCode@type](#) property indicates the type of the program guide service that defines the program code specified in the [scheduledProgramCode](#) property. The format of this property is "<ICANN registered domain>" " " "<program code name>".

Example: "epg.com_GuideCode".

Default Value: N/A – Required on input.

Sort Order: Sorting on this property is meaningless and will be ignored.

Input: The desired setting.

Output: The current setting.

B.5 Matching Content Criteria Properties

Table B.14 — Matching Content Criteria Properties

Property Name	NS	Data Type	M-Val	Reference
<u>matchingName</u>	srs	xsd:string	<u>NO</u>	Annex B.5.1
<u>matchingName@type</u>	srs	xsd:string	<u>NO</u>	Annex B.5.1.1
<u>matchingName@subStringMatch</u>	srs	xsd:boolean	<u>NO</u>	Annex B.5.1.2
<u>matchingID</u>	srs	xsd:string	<u>NO</u>	Annex B.5.2
<u>matchingID@type</u>	srs	xsd:string	<u>NO</u>	Annex B.5.2.1

B.5.1 [matchingName](#)

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: [NO](#)

Description: The [matchingName](#) property contains (part of) the name of a program or series. To match the criteria of this [recordSchedule](#), an external item's name information shall (partially) match the specified [matchingName](#) value. Matching should be done using lexical matching (see subclause 3.2.30). It may be done using simple non-case-sensitive matching (see subclause 3.2.32).

Example: "NFL Worldcup 2005", "Friends".

Default Value: N/A – Required on input.

Sort Order: Lexical.

Note that this is an exception to the normal rule of [type](#) Relationship sorting. The equivalent of [type](#) Relationship sorting may be achieved by including "+srs:matchingName@type" in the sort property list immediately in front of "+srs:matchingName".

Input: The desired setting.

Output: The current setting.

B.5.1.1 [matchingName@type](#)

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: [NO](#)

Description: IF set to “PROGRAM”, then the matchingName property contains a program name. If set to “SERIES”, then the matchingName property contains a series name.

Default Value: N/A – Required on input.

Sort Order: Property Specific, based on the order in Table B.15. Ascending: first table entry first.

Input: The desired setting.

Output: The current setting.

Allowed Values:

Table B.15 — Allowed values for the matchingName@type Property

Value	R/A	Description
“ <u>PROGRAM</u> ”	<u>R</u>	
“ <u>SERIES</u> ”	<u>R</u>	

B.5.1.2 matchingName@subStringMatch

Namespace: srs

Property Data Type: xsd:boolean

Multi-Valued: NO

Description: If set to “1”, the value specified in the matchingName property is used for a substring match search within the program or series name (title). If set to “0”, the value specified in the matchingName property shall match the program or series name exactly.

Default Value: “1”.

Sort Order: Boolean.

Input: The desired setting.

Output: The current setting.

B.5.2 matchingID

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The matchingID property contains the unique ID of a program or series. To match the criteria of this recordSchedule, an external item’s ID information shall match the specified matchingID value.

If the matchingID@type property is set to “SI_PROGRAMID”, then the matchingID property is formatted as follows:

“<Network ID>,<Transport Stream ID>,<Service ID>,<Program ID>”.

If the matchingID@type property is set to “SI_SERIESID”, then the matchingID property is formatted as follows:

“<Network ID>,<Transport Stream ID>,<Service ID>,<Series ID>”.

If the matchingID@type property is set to <ICANN Name>, then the matchingID property is formatted as follows:

“<Unique content ID, defined by the data provider>”.

Default Value: N/A – Required on input.

Sort Order: Sorting on this property is meaningless and will be ignored.

Input: The desired setting.

Output: The current setting.

B.5.2.1 matchingID@type

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The matchingID@type property indicates the type of the ID that is contained in the matchingID property.

Default Value: N/A – Required on input.

Sort Order: Sorting on this property is meaningless and will be ignored.

Input: The desired setting.

Output: The current setting.

Allowed Values:

Table B.16 — Allowed values for the matchingID@type Property

Value	R/A	Description
<u>"SI_PROGRAMID"</u>	<u>R</u>	
<u>"SI_SERIESID"</u>	<u>R</u>	
<u><ICANN Name>_<Identifier></u>	<u>R</u>	<ICANN Name>: The ICANN name of the organization that defines the format and values of the <u>matchingID</u> property. <Identifier>: A unique identifier for the particular ID type, defined by that organization. Examples: "mycompany.com_ID1", "upnp.org_SpecialID".

B.6 Matching Qualifying Criteria Properties

Table B.17 — Matching Qualifying Criteria Properties

Property Name	NS	Data Type	M-Val	Reference
<u>matchingChannelID</u>	srs	xsd:string	<u>YES</u>	Annex B.6.1
<u>matchingChannelID@type</u>	srs	xsd:string	<u>NO</u>	Annex B.6.1.1
<u>matchingChannelID@distriNetworkName</u>	srs	xsd:string	<u>NO</u>	Annex B.6.1.2
<u>matchingChannelID@distriNetworkID</u>	srs	xsd:string	<u>NO</u>	Annex B.6.1.3
<u>matchingStartDateTimeRange</u>	srs	xsd:string	<u>YES</u>	Annex B.6.2
<u>matchingDurationRange</u>	srs	xsd:string	<u>YES</u>	Annex B.6.3
<u>matchingRatingLimit</u>	srs	xsd:string	<u>YES</u>	Annex B.6.4
<u>matchingRatingLimit@type</u>	srs	xsd:string	<u>NO</u>	Annex B.6.4.1
<u>matchingRatingLimit@equivalentAge</u>	srs	xsd:string	<u>NO</u>	Annex B.6.4.2
<u>matchingEpisodeType</u>	srs	xsd:string	<u>NO</u>	Annex B.6.5

B.6.1 matchingChannelID

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** YES

Description: The matchingChannelID property contains a scheduledChannelID value. Its format depends on the matchingChannelID@type property. To match the criteria of this recordSchedule, an external item's channel information (after translation into the format of a scheduledChannelID property) shall match one of the specified matchingChannelID values. If this property is omitted from the recordSchedule, the external item's channel information is not taken into consideration to determine a match.

Default Value: N/A – Not used if omitted on input.

Sort Order: Same as scheduledChannelID.

Input: The desired setting.

Output: The current setting if specified on input. Otherwise not present.

B.6.1.1 matchingChannelID@type

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** NO

Description: The matchingChannelID@type property determines the format that is used for the matchingChannelID property as defined in Annexes B.4.2 and B.4.2.1.

Default Value: N/A – Not used if omitted on input.

Sort Order: Same as scheduledChannelID@type.

Input: The desired setting.

Output: The current setting if specified on input. Otherwise not present.

B.6.1.2 matchingChannelID@distriNetworkName

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** NO

Description: The matchingChannelID@distriNetworkName property definition is identical to the scheduledChannelID@distriNetworkName property definition. See Annex B.4.2.2 for details.

Default Value: N/A – Not used if omitted on input.

Sort Order: Same as scheduledChannelID@distriNetworkName property.

Input: The desired setting.

Output: The current setting if specified on input. Otherwise not present.

B.6.1.3 matchingChannelID@distriNetworkID

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** NO

Description: The matchingChannelID@distriNetworkID property definition is identical to the scheduledChannelID@distriNetworkID property definition. See Annex B.4.2.3 for details.

Default Value: N/A – Not used if omitted on input.

Sort Order: Same as [scheduledChannelID@distriNetworkID](#) property.

Input: The desired setting.

Output: The current setting if specified on input. Otherwise not present.

B.6.2 [matchingStartDateTimeRange](#)

Namespace: srs **Property Data Type:** xsd:string

Multi-Valued: [YES](#)

Description: The [matchingStartDateTimeRange](#) property contains a date range. The start-range format syntax of the [matchingStartDateTimeRange](#) property is defined in Annex D.

The value specified after the "/" shall be equal or greater than the value specified before the "/".

To match the criteria of this [recordSchedule](#), an external item's start date and time information shall fall within one of the specified [matchingStartDateTimeRange](#) ranges. If this property is omitted from the [recordSchedule](#), the external item's start date and time information is not taken into consideration to determine a match.

Note: The [matchingStartDateTimeRange](#) property is different from the [activePeriod](#) property in that the first identifies the actual matching criteria whereas the second identifies the period of time when potential matches are to be examined.

Default Value: N/A – Not used if omitted on input.

Sort Order: Sequenced Sort of two date&time subvalues separated by "/".

Both subvalues are sorted in chronological order.

Input: The desired setting.

Output: The current setting if specified on input. Otherwise not present.

B.6.3 [matchingDurationRange](#)

Namespace: srs **Property Data Type:** xsd:string

Multi-Valued: [YES](#)

The [matchingDurationRange](#) property contains a duration range. The duration-range format syntax of the [matchingDurationRange](#) property is defined in Annex D.

The value specified after the "/" shall be equal or greater than the value specified before the "/".

To match the criteria of this [recordSchedule](#), an external item's duration information (after translation into the format of a [scheduledDuration](#) property) shall fall within the specified [matchingDurationRange](#) range. If this property is omitted from the [recordSchedule](#), the external item's duration information is not taken into consideration to determine a match.

Default Value: N/A – Not used if omitted on input.

Sort Order: Sequenced Sort of two duration subvalues separated by "/".

Input: The desired setting.

Output: The current setting if specified on input. Otherwise not present.

B.6.4 matchingRatingLimit**Namespace:** srs**Property Data Type:** xsd:string**Multi-Valued:** YES

Description: The matchingRatingLimit property indicates a maximum allowed rating. Several different rating systems are available. The rating system is indicated in the matchingRatingLimit@type property. The allowed values for the matchingRatingLimit property depend on the rating system used.

Common rating systems as well as their allowed rating values (in order of ascending restriction level beginning with the most lenient) for each rating system are defined below.

Other values may be specified using other rating systems identified by their ICANN domain names.

To match the criteria of this recordSchedule, an external item's rating information shall be less than or equal to all of the specified matchingRatingLimit values. If this property is omitted from the recordSchedule, the external item's rating information is not taken into consideration to determine a match. If the external item does not contain rating information and this property is specified, the external item will not be recorded.

Default Value: N/A – Not used if omitted on input.

Sort Order: type Relationship.

For each value of matchingRatingLimit@type, based on the order in the table associated with the matchingRatingLimit@type property below. Ascending: first table entry first.

Input: The desired setting.

Output: The current setting if specified on input. Otherwise not present.

Allowed Values: The allowed values for the matchingRatingLimit property depends on the matchingRatingLimit@type property. The following tables list the allowed values for each defined rating system.

Table B.18 — Allowed values for the matchingRatingLimit Property Using the MPAA Rating System (matchingRatingLimit@type = "MPAA.ORG")

Value	R/A	Description
" <u>G</u> "	<u>R</u>	General Audiences.
" <u>PG</u> "	<u>R</u>	Parental Guidance Suggested.
" <u>PG-13</u> "	<u>R</u>	Parents Strongly Cautioned.
" <u>R</u> "	<u>R</u>	Restricted.
" <u>NC-17</u> "	<u>R</u>	No One 17 and Under Admitted.
" <u>NR</u> "	<u>R</u>	Not Rated Yet.

Table B.19 — Allowed values for the matchingRatingLimit Property Using the RIAA Rating System (matchingRatingLimit@type = "RIAA.ORG")

Value	R/A	Description
" <u>—</u> "	<u>R</u>	Non-explicit Content
" <u>PA-EC</u> "	<u>R</u>	Parental Advisory – Explicit Content

Table B.20 — Allowed values for the matchingRatingLimit Property Using the ESRB Rating System (matchingRatingLimit@type = “ESRB.ORG”)

Value	R/A	Description
<u>“EC”</u>	<u>R</u>	Early Childhood.
<u>“E”</u>	<u>R</u>	Everyone.
<u>“E10+”</u>	<u>R</u>	Everyone 10 and Older.
<u>“T”</u>	<u>R</u>	Teen.
<u>“M”</u>	<u>R</u>	Mature.
<u>“AO”</u>	<u>R</u>	Adults Only.
<u>“RP”</u>	<u>R</u>	Rating Pending.

Table B.21 — Allowed values for the matchingRatingLimit Property Using the TVGUIDELINES Rating System (matchingRatingLimit@type = “TVGUIDELINES.ORG”)

Value	R/A	Description
<u>“TV-Y”</u>	<u>R</u>	All Children.
<u>“TV-Y7”</u>	<u>R</u>	Directed to Older Children.
<u>“TV-Y7FV”</u>	<u>R</u>	Directed to Older Children – Fantasy Violence.
<u>“TV-G”</u>	<u>R</u>	General Audience.
<u>“TV-PG”</u>	<u>R</u>	Parental Guidance Suggested.
<u>“TV-14”</u>	<u>R</u>	Parents Strongly Cautioned.
<u>“TV-MA”</u>	<u>R</u>	Mature Audience Only.

B.6.4.1 matchingRatingLimit@type

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The matchingRatingLimit@type property indicates the rating system used in the matchingRatingLimit property. Several different rating systems are available. The allowed values for the matchingRatingLimit property depend on the rating system used.

Other rating systems may be specified using their ICANN domain names.

This is not a matching property. It is used in conjunction with the matchingRatingLimit property and identifies the used rating system.

Default Value: N/A – Required in input.

Sort Order: Lexical.

Input: The desired setting.

Output: The current setting.

Allowed Values:**Table B.22 — Allowed values for the matchingRatingLimit@type Property**

Value	R/A	Description	Remarks
" <u>MPAA.ORG</u> "	<u>A</u>	The Motion Picture Association of America.	At least one value in these rows shall be supported by a compliant ScheduledRecording service implementation. Control points should support all values in these rows.
" <u>RIAA.ORG</u> "	<u>A</u>	The Recording Industry Association of America.	
" <u>ESRB.ORG</u> "	<u>A</u>	The Entertainment Software Rating Board.	
" <u>TVGUIDELINES.ORG</u> "	<u>A</u>	TV Parental Guidelines.	
<ICANN Name>_<Identifier>	<u>X</u>	<ICANN Name>: The ICANN name of the organization that defines the rating. <Identifier>: A unique identifier for a particular rating system, defined by that organization. Examples: "mycompany.com_RS1", "upnp.org_ratingx".	

B.6.4.2 matchingRatingLimit@equivalentAge**Namespace:** srs**Property Data Type:** xsd:string**Multi-Valued:** NO

Description: The matchingRatingLimit@equivalentAge property indicates the equivalent age of the rating system used in the matchingRatingLimit property. The equivalent age is the minimum age of the underlying rating system which allows the user to view the content.

The matchingRatingLimit@equivalentAge property is highly recommended if the matchingRatingLimit property is specified and the rating of referenced rating system can be translated to a minimum age. If the rating system does not specify equivalent age values, or the specific rating value does not specify an equivalent age, then this property is not allowed.

Default Value: N/A – Required in input.**Sort Order:** Lexical.**Input:** The desired setting.**Output:** The current setting.**B.6.5 matchingEpisodeType****Namespace:** srs**Property Data Type:** xsd:string**Multi-Valued:** NO

Description: The matchingEpisodeType property indicates the type of content to be recorded in terms of its broadcast novelty. To match the criteria of this recordSchedule, an external item's episode type information shall match the specified matchingEpisodeType value. If this property is omitted from the recordSchedule, the external item's episode type information is not taken into consideration to determine a

match. If the external item does not contain episode type information and this property is specified, the external item will not be recorded.

Default Value: N/A – Not used if omitted on input.

Sort Order: Property Specific, based on the order in Table B.23. Ascending: first table entry first.

Input: The desired setting.

Output: The current setting if specified on input. Otherwise not present.

Allowed values:

Table B.23 — Allowed values for the matchingEpisodeType Property

Value	R/A	Description
" <u>ALL</u> "	<u>R</u>	All programs are recorded.
" <u>FIRST-RUN</u> "	<u>R</u>	Only programs that have an original air date equal to the current date are recorded.
" <u>REPEAT</u> "	<u>R</u>	Only programs that have an original air date earlier than the current date are recorded.

B.7 Content Control Properties

Table B.24 — Content Control Properties

Property Name	NS	Data Type	M-Val	Reference
<u>totalDesiredRecordTasks</u>	srs	xsd:unsignedInt	<u>NO</u>	Annex B.7.1
<u>scheduledStartDateTimeAdjust</u>	srs	xsd:string	<u>NO</u>	Annex B.7.2
<u>scheduledDurationAdjust</u>	srs	xsd:string	<u>NO</u>	Annex B.7.3
<u>activePeriod</u>	srs	xsd:string	<u>NO</u>	Annex B.7.4
<u>durationLimit</u>	srs	xsd:string	<u>NO</u>	Annex B.7.5
<u>durationLimit@effect</u>	srs	xsd:string	<u>NO</u>	Annex B.7.5.1
<u>channelMigration</u>	srs	xsd:boolean	<u>NO</u>	Annex B.7.6
<u>timeMigration</u>	srs	xsd:boolean	<u>NO</u>	Annex B.7.7
<u>allowDuplicates</u>	srs	xsd:boolean	<u>NO</u>	Annex B.7.8

B.7.1 totalDesiredRecordTasks

Namespace: srs

Property Data Type: xsd:unsignedInt

Multi-Valued: NO

Description: The totalDesiredRecordTasks property indicates the maximum number of recordTask instances, associated with a given recordSchedule that will ever be generated over the lifetime of the recordSchedule. A value of 0 means that an unlimited number of recordTask instances can be spawned from the recordSchedule.

This property is used to enable or disable recurrence. If a value different from 1 is specified in the totalDesiredRecordTasks property, then the recordSchedule shall remain active after the first recordTask has been spawned and shall monitor its internal state to determine if the conditions that caused the first recordTask to be spawned are met again in the future. Whenever this happens, a new recordTask shall be spawned until the total number of spawned recordTask instances reaches the value, specified in the

totalDesiredRecordTasks property. The activePeriod property can be used to terminate this process prematurely.

Default Value: 1 (recurrence is disabled by default).

Sort Order: Numeric.

Input: The desired setting.

Output: The current setting.

B.7.2 scheduledStartDateTimeAdjust

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: No

Description: The scheduledStartDateTimeAdjust property indicates a time period to be applied as an adjustment to the scheduled start time. The `duration-adj` format syntax of the scheduledStartDateTimeAdjust property is defined in Annex D.

Note that the scheduledStartDateTimeAdjust property can take on both positive and negative values. Negative values provide pre-roll functionality (notice the + sign in the formula below) whereas positive values allow for starting the recording a certain period of time into the recording. The actual scheduled start time is calculated as:

$$\text{actualScheduledStartDateTime} = \text{scheduledStartDateTime} + \text{scheduledStartDateTimeAdjust}$$

Default Value: Vendor-defined.

Sort Order: Property Specific, based on elapsed time. Ascending: from longest negative elapsed time to longest positive elapsed time.

Input: The desired setting.

Output: The current setting.

B.7.3 scheduledDurationAdjust

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The scheduledDurationAdjust property indicates a period of time to be applied as an adjustment to the scheduled duration time. The `duration-adj` format syntax of the scheduledDurationAdjust property is defined in Annex D.

Note that the scheduledDurationAdjust property can take on both positive and negative values. Positive values provide post-roll functionality whereas negative values allow for ending the recording a certain time period before the end of the recording. The actual scheduled end time and actual scheduled duration are calculated as:

$$\text{actualScheduledEndTime} = \text{scheduledStartDateTime} + \text{scheduledDuration} + \text{scheduledDurationAdjust}$$

$$\text{actualScheduledDuration} = \text{actualScheduledEndTime} - \text{actualScheduledStartDateTime}$$

$$= \text{scheduledDuration} + \text{scheduledDurationAdjust} - \text{scheduledStartDateTimeAdjust}$$

Default Value: Vendor-defined.

Sort Order: Property Specific, based on elapsed time. Ascending: from longest negative elapsed time to longest positive elapsed time.

Input: The desired setting.

Output: The current setting.

B.7.4 activePeriod

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The activePeriod property indicates the date&time range within which the recordSchedule is active; that is: the recordSchedule shall not spawn any recordTask instances whose actualStartDateTime fall outside the period specified in the activePeriod property. The start-range format syntax of the activePeriod property is defined in Annex D.

The value specified after the "/" shall be equal or greater than the value specified before the "/".

A recordSchedule shall not generate new recordTask instances for programs broadcast after the expiration date.

A value of "NOW/INFINITY" means that recordTasks corresponding to content that is available from the current time of day into the future are spawned. A value of "PAST/INFINITY" means that there are no time-based restrictions on recordTask instances that are created. Implementations that are able to temporarily preserve transitory content that was broadcast in the past are allowed to record content that was broadcast in the past. For implementations that are not able to temporarily preserve content, "PAST/INFINITY" is equivalent to "NOW/INFINITY".

Note: The activePeriod property is different from the matchingStartDateTimeRange property in that the first identifies the period of time when potential matches are to be examined whereas the second identifies the actual matching criteria.

Default Value: "PAST/INFINITY".

Sort Order: Sequenced Sort of two date&time subvalues separated by "/".

Both subvalues are sorted in chronological order.

Input: The desired setting.

Output: The current setting.

B.7.5 durationLimit

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The durationLimit property indicates the maximum allowed duration of the recording. The duration-long format syntax of the durationLimit property is defined in Annex D.

If the actual duration of the recording exceeds the value specified in the durationLimit property, then the ScheduledRecording service shall stop recording and either delete the

partially recorded content so far or preserve part of the recorded content depending on the current setting of the [durationLimit@effect](#) property.

If the [durationLimit](#) property is set to “[INFINITY](#)”, then no limit is in effect.

Example: the value “P02:30:00” indicates that the recording shall be stopped after two and a half hours.

Default Value: Vendor-defined.

Sort Order: Property Specific, based on elapsed time. Ascending: shortest elapsed time first.

Input: The desired setting.

Output: The current setting.

B.7.5.1 [durationLimit@effect](#)

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** [NO](#)

Description: The [durationLimit@effect](#) property determines the behavior of the [recordSchedule](#) when the duration of the content exceeds the value specified in the [durationLimit](#) property.

If set to “[SKIP](#)”, then the partially recorded content is deleted once the *actualDuration* of the recording exceeds the value specified in the [durationLimit](#) property.

If set to “[LAST](#)”, then only the latest part (in length equal to the value specified in the [durationLimit](#) property) of the content is preserved, effectively deleting the first part of the recording.

If set to “[FIRST](#)”, then only the initial part (in length equal to the value specified in the [durationLimit](#) property) of the content is preserved, effectively deleting the last part of the recording.

Default Value: Vendor-defined.

Sort Order: Property Specific, based on the order in Table B.25. Ascending: first table entry first.

Input: The desired setting.

Output: The current setting.

Allowed Values:

Table B.25 — Allowed values for the [durationLimit@effect](#) Property

Value	R/A	Description
“ <u>SKIP</u> ”	<u>A</u>	At least one value in these rows shall be supported. Control points should support all values in these rows.
“ <u>LAST</u> ”	<u>A</u>	
“ <u>FIRST</u> ”	<u>A</u>	

B.7.6 [channelMigration](#)

Namespace: srs **Property Data Type:** xsd:boolean **Multi-Valued:** [NO](#)

Description: A program's scheduled channel might change between the time the recordSchedule was created and the actual broadcast time. If this property is set to "1", then the ScheduledRecording service shall automatically follow the program if it moves to another channel (The reservation will be tracking broadcast channel change). If this value is set to "0", then the ScheduledRecording service does not follow the program, and the recording will take place on the channel that was specified at the time the recordSchedule created the associated recordTask.

Default Value: Vendor-defined.

Sort Order: Boolean.

Input: The desired setting.

Output: The current setting.

B.7.7 timeMigration

Namespace: srs

Property Data Type: xsd:boolean

Multi-Valued: NO

Description: A program's scheduled date&time might change between the time the recordSchedule was created and the actual broadcast time. If this property is set to "1", then the ScheduledRecording service shall automatically follow the program if it moves to another date&time (The reservation will be tracking broadcast date&time change). If this value is set to "0", then the ScheduledRecording service does not follow the program, and the recording will take place at the date&time that was specified at the time the recordSchedule created the associated recordTask.

Default Value: Vendor-defined.

Sort Order: Boolean.

Input: The desired setting.

Output: The current setting.

B.7.8 allowDuplicates

Namespace: srs

Property Data Type: xsd:boolean

Multi-Valued: NO

Description: If set to "1", then programs are recorded, even if a duplicate program has already been recorded as a result of the recordSchedule. If set to "0", no duplicates are recorded. Detection of duplicate programs is device- and EPG-dependent.

Default Value: Vendor-defined.

Sort Order: Boolean.

Input: The desired setting.

Output: The current setting.

B.8 Storage Related Properties

Table B.26 — Storage Related Properties

Property Name	NS	Data Type	M-Val	Reference
<u>persistedRecordings</u>	srs	xsd:unsignedInt	<u>NO</u>	Annex B.8.1

<u><i>persistedRecordings@latest</i></u>	srs	xsd:boolean	<u><i>NO</i></u>	Annex B.8.1.1
<u><i>persistedRecordings@preAllocation</i></u>	srs	xsd:boolean	<u><i>NO</i></u>	Annex B.8.1.2
<u><i>persistedRecordings@storedLifetime</i></u>	srs	xsd:string	<u><i>NO</i></u>	Annex B.8.1.3

B.8.1 [*persistedRecordings*](#)

Namespace: srs **Property Data Type:** xsd:unsignedInt **Multi-Valued:** [*NO*](#)

Description: The [*persistedRecordings*](#) property indicates the minimum number of recordings for a given [*recordSchedule*](#) that will be preserved at all times, once available. Even when the ScheduledRecording service needs to make space for other recordings, this minimum number of recordings (that is: the actual content) generated by the [*recordSchedule*](#) will not be deleted. However, if more recordings, associated with the [*recordSchedule*](#) exist, then these excess recordings may be deleted by the ScheduledRecording service. Whether the oldest or the newest excess recordings will be deleted depends on the value of the [*persistedRecordings@latest*](#) property.

Default Value: Vendor-defined.

Sort Order: Numeric.

Input: The desired setting.

Output: The current setting.

B.8.1.1 [*persistedRecordings@latest*](#)

Namespace: srs **Property Data Type:** xsd:boolean **Multi-Valued:** [*NO*](#)

Description: The [*persistedRecordings@latest*](#) property indicates whether newest or oldest recordings are preserved. If set to "[*1*](#)", then the newest recordings are preserved. The recordings prior to these may be deleted when more recent content is recorded.

If set to "[*0*](#)", then the oldest recordings are preserved. Older content will never be deleted to make room for newer content.

Default Value: Vendor-defined.

Sort Order: Boolean.

Input: The desired setting.

Output: The current setting.

B.8.1.2 [*persistedRecordings@preAllocation*](#)

Namespace: srs **Property Data Type:** xsd:boolean **Multi-Valued:** [*NO*](#)

Description: The [*persistedRecordings@preAllocation*](#) property indicates whether to reserve storage space on beforehand to accommodate for the number of recordings as indicated by the [*persistedRecordings*](#) property. If set to "[*1*](#)", *adequate* storage space is reserved. To reserve storage space, the ScheduledRecording service calculates a *best estimate* based on parameters such as record quality, start time and duration adjustment etc. However, the ScheduledRecording service can never *guarantee* that sufficient storage space is reserved to accommodate the total number of recordings, specified in the [*persistedRecordings*](#) property. If set to "[*0*](#)", no storage space is reserved.

Default Value: Vendor-defined.

Sort Order: Boolean.

Input: The desired setting.

Output: The current setting.

B.8.1.3 ***persistedRecordings@storedLifetime***

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The ***persistedRecordings@storedLifetime*** property indicates the minimum time recorded content associated with a ***recordSchedule*** will be preserved after the recording completes. This will prohibit a recording from being deleted by the auto-delete operation within the specified time period. The *duration-any* format syntax of the ***persistedRecordings@storedLifetime*** property is defined in Annex D.

If the value is set to "***INFINITY***", then the content shall never be automatically deleted.

A value of "***ANY***" indicates that the content can be deleted at any time by the auto-delete operation. However, it is recommended that a ScheduledRecording service implementation only deletes content when space is needed.

Default Value: Vendor-defined.

Sort Order: Property Specific, based on elapsed time. Ascending: shortest elapsed time first. "***ANY***" is considered the shortest elapsed time possible; "***INFINITY***" is considered the longest elapsed time possible.

Input: The desired setting.

Output: The current setting.

B.9 Schedule State Properties

Table B.27 — Schedule State Properties

Property Name	NS	Data Type	M-Val	Reference
<u><i>scheduleState</i></u>	srs	xsd:string	<u>NO</u>	Annex B.9.1
<u><i>scheduleState@currentErrors</i></u>	srs	CSV (xsd:int)	<u>NO</u>	Annex B.9.1.1
<u><i>abnormalTasksExist</i></u>	srs	xsd:boolean	<u>NO</u>	Annex B.9.2

B.9.1 ***scheduleState***

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The ***scheduleState*** property indicates the overall state of the ***recordSchedule*** itself.

Default Value: N/A – Output only.

Sort Order: Property Specific, based on the order in Table B.28. Ascending: first table entry first.

Input: N/A.

Output: The current setting.

Allowed Values:

Table B.28 — Allowed values for the scheduleState Property

Value	R/A	Description
" <u>OPERATIONAL</u> "	<u>R</u>	<u>recordSchedule</u> is operating and spawning <u>recordTask</u> instances as scheduled.
" <u>COMPLETED</u> "	<u>R</u>	<u>recordSchedule</u> is completed and reached final disposition. No properties will change.
" <u>ERROR</u> "	<u>R</u>	<u>recordSchedule</u> ceases spawning <u>recordTask</u> instances due to error.

B.9.1.1 scheduleState@currentErrors

Namespace: srs

Property Data Type: CSV (xsd:int)

Multi-Valued: NO

Description: The scheduleState@currentErrors property indicates the current error(s) that cause the schedule to be in the "ERROR" state. This error list pertains specifically to the behavior of a recordSchedule and describes a recordSchedule's inability to create new tasks. When the scheduleState property has the value "OPERATIONAL", the scheduleState@currentErrors property shall be empty. The list of error codes are listed in Table B.29.

Default Value: N/A – Output only.

Sort Order: Sequenced Numeric.

Input: N/A.

Output: The current setting.

Allowed Values:

Table B.29 — Allowed values for the scheduleState@currentErrors Property

Value	R/A	Description
0-99	N/A	Reserved
100	<u>R</u>	General error – an error is detected but the cause can not be identified.
101	<u>A</u>	The number of spawned <u>recordTask</u> instances has reached some device dependent limit.
102	<u>A</u>	EPG information not available.
103	<u>A</u>	<u>recordSchedule</u> is disabled by the user.
104	<u>A</u>	Insufficient memory – The system does not have enough system memory to create any additional <u>recordTask</u> instances.
105	<u>A</u>	General resource error – some system related resource is causing the <u>recordSchedule</u> to malfunction.
106-149	<u>A</u>	Reserved for future <u>recordSchedule</u> error codes.
150-199	<u>X</u>	Vendor extended <u>recordSchedule</u> error codes.
200 and above	N/A	Reserved for future extensions.

B.9.2 abnormalTasksExist**Namespace:** srs **Property Data Type:** xsd:boolean **Multi-Valued:** NO

Description: If this property is set to “1”, then that indicates that at least one abnormal recordTask exists for the recordSchedule. If this property is set to “0”, then no abnormal recordTask exists for the recordSchedule. A recordTask is considered abnormal if it reaches any state other than “IDLE.READY”, “ACTIVE.RECORDING.FROMSTART.OK” or “DONE.FULL”.

Default Value: N/A – Output only.**Sort Order:** Boolean.**Input:** N/A.**Output:** The current setting.**B.10 Statistics Properties****Table B.30 — Statistics Properties**

Property Name	NS	Data Type	M-Val	Reference
<u>currentRecordTaskCount</u>	srs	xsd:unsignedInt	<u>NO</u>	Annex B.10.1
<u>totalCreatedRecordTasks</u>	srs	xsd:unsignedInt	<u>NO</u>	Annex B.10.2
<u>totalCompletedRecordTasks</u>	srs	xsd:unsignedInt	<u>NO</u>	Annex B.10.3

B.10.1 currentRecordTaskCount**Namespace:** srs **Property Data Type:** xsd:unsignedInt **Multi-Valued:** NO

Description: The currentRecordTaskCount property indicates the number of existing recordTask instances that are currently associated with a given recordSchedule. Previously generated recordTask instances that have finished recording and that have been (auto-)deleted by the ScheduledRecording service are not taken into account.

Default Value: N/A – Output only.**Sort Order:** Numeric.**Input:** N/A.**Output:** The current setting.**B.10.2 totalCreatedRecordTasks****Namespace:** srs **Property Data Type:** xsd:unsignedInt **Multi-Valued:** NO

Description: The totalCreatedRecordTasks property indicates how many recordTask instances have been created during the lifetime of the associated recordSchedule. This includes previously generated recordTask instances that have finished recording and that have been (auto-)deleted by the ScheduledRecording service.

Default Value: N/A – Output only.**Sort Order:** Numeric.

Input: N/A.

Output: The current setting.

B.10.3 totalCompletedRecordTasks

Namespace: srs **Property Data Type:** xsd:unsignedInt **Multi-Valued:** NO

Description: The totalCompletedRecordTasks property indicates how many recordTask instances have been completed (that is: reached any of the “DONE.xxx” states, during the lifetime of the associated recordSchedule. This includes previously generated recordTask instances that have finished recording and that have been (auto-)deleted by the ScheduledRecording service.

Default Value: N/A – Output only.

Sort Order: Numeric.

Input: N/A.

Output: The current setting.

B.11 Task General Properties

Table B.31 — Task General Properties

Property Name	NS	Data Type	M-Val	Reference
<u>recordScheduleID</u>	srs	xsd:string	<u>NO</u>	Annex B.11.1
<u>recordedCDSObjectID</u>	srs	xsd:string	<u>NO</u>	Annex B.11.2
<u>recordedCDSObjectID@link</u>	srs	xsd:string	<u>NO</u>	Annex B.11.2.1

B.11.1 recordScheduleID

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** NO

Description: The recordScheduleID property contains the value of the @id property of the recordSchedule that generated the recordTask.

Default Value: N/A – Output only.

Sort Order: Lexical or Lexical Numeric.

Each implementation should use the sort method most appropriate for its method of generating @id values. If @id values contain a numeric (sub)string that contains values that increment with each new object creation, then use Lexical Numeric; otherwise, use Lexical.

Input: N/A.

Output: The current setting.

B.11.2 recordedCDSObjectID

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** NO

Description: The [recordedCDSObjectID](#) property contains the [didi-lite:@id](#) property value of the ContentDirectory service object that represents the content recorded by the [recordTask](#).

Default Value: N/A – Output only.

Sort Order Lexical or Lexical Numeric.

Each implementation should use the sort method most appropriate for its method of generating [didi-lite:@id](#) values. If [didi-lite:@id](#) values contain a numeric (sub)string that contains values that increment with each new object creation, then use Lexical Numeric; otherwise, use Lexical.

Input: N/A.

Output: The current setting.

B.11.2.1 [recordedCDSObjectID@link](#)

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: [NO](#)

Description: The [recordedCDSObjectID@link](#) contains a unique, vendor-defined link identifier that unambiguously links its [recordedCDSObjectID](#) property to a particular [cdsReference](#) property instance within the same [recordTask](#) object. See Annex B.17 for details.

Default Value: N/A – Output only.

Sort Order: Same as [cdsReference@link](#) property.

Input: N/A.

Output: The current setting.

B.12 Task Content Identification Properties

Table B.32 — Task Content Identification Properties

Property Name	NS	Data Type	M-Val	Reference
<u>taskCDSObjectID</u>	srs	xsd:string	<u>NO</u>	Annex B.12.1
<u>taskCDSObjectID@link</u>	srs	xsd:string	<u>NO</u>	Annex B.12.1.1
<u>taskChannelID</u>	srs	xsd:string	<u>NO</u>	Annex B.12.2
<u>taskChannelID@type</u>	srs	xsd:string	<u>NO</u>	Annex B.12.2.1
<u>taskChannelID@distriNetworkName</u>	srs	xsd:string	<u>NO</u>	Annex B.12.2.2
<u>taskChannelID@distriNetworkID</u>	srs	xsd:string	<u>NO</u>	Annex B.12.2.3
<u>taskStartDateTime</u>	srs	xsd:string	<u>NO</u>	Annex B.12.3
<u>taskDuration</u>	srs	xsd:string	<u>NO</u>	Annex B.12.4
<u>taskProgramCode</u>	srs	xsd:string	<u>NO</u>	Annex B.12.5
<u>taskProgramCode@type</u>	srs	xsd:string	<u>NO</u>	Annex B.12.5.1
<u>recordQuality</u>	srs	xsd:string	<u>YES</u>	Annex B.12.6
<u>recordQuality@type</u>	srs	xsd:string	<u>NO</u>	Annex B.12.6.1

B.12.1 [taskCDSObjectID](#)

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** [NO](#)

Description: The [taskCDSObjectID](#) property contains the [didl-lite:id](#) property value of the ContentDirectory service object from which relevant metadata information was extracted to create the [recordSchedule](#) that generated this [recordTask](#).

Default Value: N/A – Output only.

Sort Order: Lexical or Lexical Numeric.

Each implementation should use the sort method most appropriate for its method of generating [didl-lite:@id](#) values. If [didl-lite:@id](#) values contain a numeric (sub)string that contains values that increment with each new object creation, then use Lexical Numeric; otherwise, use Lexical.

Input: N/A.

Output: The current setting.

B.12.1.1 [taskCDSObjectID@link](#)

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** [NO](#)

Description: The [taskCDSObjectID@link](#) contains a unique, vendor-defined link identifier that unambiguously links its [taskCDSObjectID](#) property to a particular [cdsReference](#) property instance within the same [recordTask](#) object. See Annex B.17 for details.

Default Value: N/A – Output only.

Sort Order: Same as [cdsReference@link](#) property.

Input: N/A.

Output: The current setting.

B.12.2 [taskChannelID](#)

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** [NO](#)

Description: The [taskChannelID](#) property indicates the actual channel that is used for the recording. Its format depends on the [taskChannelID@type](#) property. The possible formats and the dependency on the [taskChannelID@type](#) property are identical to the possible formats of the [scheduledChannelID](#) and its dependency on the [scheduledChannelID@type](#) property as described in Annexes B.4.2, and B.4.2.1.

Default Value: N/A – Output only.

Sort Order: Same as [scheduledChannelID](#) property.

Input: N/A.

Output: The current setting.

B.12.2.1 [taskChannelID@type](#)

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** [NO](#)

Description: The [taskChannelID@type](#) property determines the format that is used for the [taskChannelID](#) property as defined above. See Annex B.4.2.1 for details and allowed values.

Default Value: N/A – Output only.

Sort Order: Same as [scheduledChannelID@type](#) property.

Input: N/A.

Output: The current setting.

B.12.2.2 [taskChannelID@distriNetworkName](#)

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** [NO](#)

Description: The [taskChannelID@distriNetworkname](#) property definition is identical to the [scheduledChannelID@distriNetworkName](#) property definition. See Annex B.4.2.2 for details.

Default Value: N/A – Output only.

Sort Order: Same as [scheduledChannelID@distriNetworkName](#) property.

Input: N/A.

Output: The current setting.

B.12.2.3 [taskChannelID@distriNetworkID](#)

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** [NO](#)

Description: The [taskChannelID@distriNetworkID](#) property definition is identical to the [scheduledChannelID@distriNetwork](#) property definition. See Annex B.4.2.3 for details.

Default Value: N/A – Output only.

Sort Order: Same as [scheduledChannelID@distriNetworkID](#) property.

Input: N/A.

Output: The current setting.

B.12.3 [taskStartTime](#)

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** [NO](#)

Description: The [taskStartTime](#) property indicates the actual start date&time (based on the current information) of the recording. This date&time does not include any adjustments. These are reflected in the [taskStartTimeAdjust](#) property. The date-time format syntax of the [taskStartTime](#) property is defined in Annex D.

Default Value: N/A – Output only.

Sort Order: Property Specific, in chronological order.

Input: N/A.

Output: The current setting.

B.12.4 taskDuration

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The taskDuration property indicates the actual duration (based on the current information) of the recording. This duration does not include any adjustments. These are reflected in the taskDurationAdjust property. The duration format syntax of the taskDuration property is defined in Annex D.

Default Value: N/A – Output only.

Sort Order: Property Specific, based on elapsed time. Ascending: shortest elapsed time first.

Input: N/A.

Output: The current setting.

B.12.5 taskProgramCode

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The taskProgramCode property indicates the actual program code that is used for the recording. The format is identical to the format of the scheduledProgramCode property. See Annex B.4.5 for details.

Default Value: N/A – Output only.

Sort Order: Sorting on this property is meaningless and will be ignored.

Input: N/A.

Output: The current setting.

B.12.5.1 taskProgramCode@type

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The taskProgramCode@type property indicates the type of the program guide service that defines the program code specified in the taskProgramCode property. The format is identical to the format of the scheduledProgramCode@type property. See Annex B.4.5.1 for details.

Default Value: N/A – Output only.

Sort Order: Sorting on this property is meaningless and will be ignored.

Input: N/A.

Output: The current setting.

B.12.6 recordQuality

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: YES

Description: The recordQuality property expresses the recording quality level that is used for a particular recordTask.

When the recordTask is in the “IDLE” phase (the actual recording has not started yet), this property contains a best-known estimate of the recording quality for the recording. Therefore, the recordQuality property shall contain one of the vendor-defined values supported by the ScheduledRecording service. The value “AUTO” is not allowed. If the implementation does not have enough information to generate a value with some accuracy, then the value “UNKNOWN” shall be used.

When the recordTask is in the “ACTIVE” or “DONE” phase, the recordQuality property shall contain one of the values supported by the implementation, that describes the actual recording quality. The values “AUTO” and “UNKNOWN” are not allowed.

There are many ways to express recording quality. Some implementations use bitrates, some use user-friendly labels etc. Some implementations might even support multiple ways to express recording quality simultaneously. The recordQuality property is used in conjunction with the recordQuality@type to allow implementations to express these type variations.

For each type variation, the allowed values for the recordQuality property shall be the same as the allowed values supported for the corresponding type variation of the desiredRecordQuality property, except that “UNKNOWN” replaces “AUTO”.

Note that the recordQuality property is a multi-valued property. Therefore, the actual recording quality level can be expressed using different type variations simultaneously. As a baseline, all implementations shall support type variation “DEFAULT”. All record quality levels expressed in a certain type variation shall have equivalent quality levels expressed in all other type variations, supported by the implementation. If an implementation supports multiple type variations to express recording quality, then it shall provide the recording quality level expressed in all supported type variations.

Example: Assume a (hypothetical) implementation that supports the type variations “DEFAULT”, “ATSC” and “QLEVEL” for the recordQuality@type property. The following table expresses the supported recordQuality property values for those variations and also indicates how the different type variations interrelate for this particular implementation:

Table B.33 — recordQuality Example

“ <u>DEFAULT</u> ”	“ <u>ATSC</u> ”	“ <u>QLEVEL</u> ”
“ <u>HD</u> ”	“ <u>1080p30</u> ”	“ <u>Q1</u> ”
	“ <u>1080p24</u> ”	
	“ <u>1080i60</u> ”	
	“ <u>720p60</u> ”	“ <u>Q2</u> ”
	“ <u>720p30</u> ”	
	“ <u>720p24</u> ”	
“ <u>ED</u> ”	“ <u>480p60</u> ”	“ <u>Q3</u> ”
“ <u>SD</u> ”	“ <u>480p30</u> ”	
	“ <u>480p24</u> ”	
	“ <u>480i60</u> ”	
“ <u>UNKNOWN</u> ”	“ <u>UNKNOWN</u> ”	“ <u>UNKNOWN</u> ”

- Assuming the actual recording quality of a recordTask is “720p60” (as an example), then the recordTask object shall include three instances of the recordQuality property as illustrated by the following XML fragment:

```
<recordQuality type="DEFAULT">HD</recordQuality>
<recordQuality type="ATSC">720p60</recordQuality>
<recordQuality type="QLEVEL">Q2</recordQuality>
```

- Assuming the actual recording quality of a recordTask is "480p60", then the recordTask object shall include three instances of the recordQuality property as illustrated by the following XML fragment:

```
<recordQuality type="DEFAULT">ED</recordQuality>
<recordQuality type="ATSC">480p60</recordQuality>
<recordQuality type="QLEVEL">Q3</recordQuality>
```

When the ScheduledRecording service responds to a GetAllowedValues() action with recordQuality information, then the allowed values shall be listed in order of quality from highest quality to lowest.

Default Value: N/A – Output only.

Sort Order: type Relationship.

Input: N/A.

Output: The current setting.

Allowed Values:

Table B.34 — Allowed values for the recordQuality Property

Value	R/A	Description
" <u>UNKNOWN</u> "	<u>R</u>	The recording quality is unknown by the ScheduledRecording service. Only applicable when the <u>recordTask</u> is in the " <u>IDLE</u> " phase.
<u>Vendor-defined</u>	<u>X</u>	

B.12.6.1 recordQuality@type

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: There are many ways to express recording quality. Some implementations use bitrates, some use user-friendly labels etc. Some implementations might even support multiple ways to express recording quality simultaneously. The recordQuality@type property is used to express which type variation is used in its associated independent recordQuality property. The "DEFAULT" value shall be supported.

Default Value: N/A – Output only.

Sort Order: Sorting on this property is meaningless and will be ignored.

Input: N/A.

Output: The current setting.

B.13 Task Matched Content Criteria Properties

Table B.35 — Task Matched Content Criteria Properties

Property Name	NS	Data Type	M-Val	Reference
<u>matchedName</u>	srs	xsd:string	<u>NO</u>	Annex B.13.1
<u>matchedName@type</u>	srs	xsd:string	<u>NO</u>	Annex B.13.1.1
<u>matchedID</u>	srs	xsd:string	<u>NO</u>	Annex B.13.2
<u>matchedID@type</u>	srs	xsd:string	<u>NO</u>	Annex B.13.2.1

B.13.1 [matchedName](#)

Namespace: srs Property Data Type: xsd:string Multi-Valued: [NO](#)

Description: The [matchedName](#) property contains the full matched name of a program or series. This is the full program or series name of the external item that (partially) matched the name specified in the [matchingName](#) property of the [recordSchedule](#).

Default Value: N/A – Output only.

Sort Order: Same as [matchingName](#) property.

Input: N/A.

Output: The current setting.

B.13.1.1 [matchedName@type](#)

Namespace: srs Property Data Type: xsd:string Multi-Valued: [NO](#)

Description: IF set to “[PROGRAM](#)”, then the [matchedName](#) property contains a program name. If set to “[SERIES](#)”, then the [matchedName](#) property contains a series name. The format is identical to the format of the [matchingName@type](#) property. See Annex B.5.1.1 for details.

Default Value: N/A – Output only.

Sort Order: Same as [matchingName@type](#) property.

Input: N/A.

Output: The current setting.

B.13.2 [matchedID](#)

Namespace: srs Property Data Type: xsd:string Multi-Valued: [NO](#)

Description: The [matchedID](#) property contains the matched ID of a program or series. This is the ID of the external item that matched the ID specified in the [matchingID](#) property of the [recordSchedule](#). The format is identical to the format of the [matchingID](#) property. See Annex B.5.2 for details.

Default Value: N/A – Output only.

Sort Order: Sorting on this property is meaningless and will be ignored.

Input: N/A.

Output: The current setting.

B.13.2.1 matchedID@type

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The matchedID@type property indicates the type of the ID that is contained in the matchedID property. The format of this property is identical to the format of the matchingID@type property. See Annex B.5.2.1 for details.

Default Value: N/A – Output only.

Sort Order: Sorting on this property is meaningless and will be ignored.

Input: N/A.

Output: The current setting.

B.14 Task Matched Qualifying Criteria Properties

Table B.36 — Task Matched Qualifying Criteria Properties

Property Name	NS	Data Type	M-Val	Reference
<u>matchedRating</u>	srs	xsd:string	<u>YES</u>	Annex B.14.1
<u>matchedRating@type</u>	srs	xsd:string	<u>NO</u>	Annex B.14.1.1
<u>matchedRating@equivalentAge</u>	srs	xsd:string	<u>NO</u>	Annex B.14.1.2
<u>matchedEpisodeType</u>	srs	xsd:string	<u>NO</u>	Annex B.14.2

B.14.1 matchedRating

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: YES

Description: The matchedRating property contains the actual rating of the recording. This is the rating of the external item that matched (was less or equal to) a rating limit specified in one of the matchingRatingLimit properties of the recordSchedule. The format is identical to the format of the matchingRatingLimit property. See Annex B.6.4 for details.

Default Value: N/A – Output only.

Sort Order: Same as matchingRatingLimit property.

Input: N/A.

Output: The current setting.

B.14.1.1 matchedRating@type

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The matchedRating@type property indicates the rating system used in the matchedRating property. The format is identical to the format of the matchingRatingLimit@type property. See Annex B.6.4.1 for details.

Default Value: N/A – Output only.

Sort Order: Same as matchingRatingLimit@type property.

Input: N/A.

Output: The current setting.

B.14.1.2 matchedRating@equivalentAge

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The matchedRating@equivalentAge property indicates the equivalent age rating used in the matchedRating property. The format is identical to the format of the matchingRatingLimit@equivalentAge property. See Annex B.6.4.2 for details.

Default Value: N/A – Output only.

Sort Order: Same as matchingRatingLimit@equivalentAge property.

Input: N/A.

Output: The current setting.

B.14.2 matchedEpisodeType

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The matchedEpisodeType property contains the actual episode type of the recording. This is the episode type of the external item that matched episode type specified in the matchingEpisodeType property of the recordSchedule. The format is identical to the format of the matchingEpisodeType property. See Annex B.6.5 for details.

Default Value: N/A – Output only.

Sort Order: Same as matchingEpisodeType property.

Input: N/A.

Output: The current setting.

B.15 Task Matched Content Control Properties

Table B.37 — Task Matched Content Control Properties

Property Name	NS	Data Type	M-Val	Reference
<u>taskStartDateTimeAdjust</u>	srs	xsd:string	<u>NO</u>	Annex B.15.1
<u>taskDurationAdjust</u>	srs	xsd:string	<u>NO</u>	Annex B.15.2
<u>taskDurationLimit</u>	srs	xsd:string	<u>NO</u>	Annex B.15.3
<u>taskDurationLimit@effect</u>	srs	xsd:string	<u>NO</u>	Annex B.15.3.1
<u>taskChannelMigration</u>	srs	xsd:boolean	<u>NO</u>	Annex B.15.4
<u>taskTimeMigration</u>	srs	xsd:boolean	<u>NO</u>	Annex B.15.5

B.15.1 taskStartDateTimeAdjust

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The taskStartDateTimeAdjust property is set to the value of the scheduledStartDateTimeAdjust property of the parent recordSchedule. The format is

identical to the format of the [scheduledStartDateTimeAdjust](#) property. See Annex B.7.2 for details.

Default Value: N/A – Output only.

Sort Order: Same as [scheduledStartDateTimeAdjust](#) property.

Input: N/A.

Output: The current setting.

B.15.2 [taskDurationAdjust](#)

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** [No](#)

Description: The [taskDurationAdjust](#) property is set to the value of the [scheduledDurationAdjust](#) property of the parent [recordSchedule](#). The format is identical to the format of the [scheduledDurationAdjust](#) property. See Annex B.7.3 for details.

Default Value: N/A – Output only.

Sort Order: Same as [scheduledDurationAdjust](#) property.

Input: N/A.

Output: The current setting.

B.15.3 [taskDurationLimit](#)

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** [NO](#)

The [taskDurationLimit](#) property is set to the value of the [durationLimit](#) property of the parent [recordSchedule](#). The format is identical to the format of the [durationLimit](#) property. See Annex B.7.5 for details.

Default Value: N/A – Output only.

Sort Order: Same as [durationLimit](#) property.

Input: N/A.

Output: The current setting.

B.15.3.1 [taskDurationLimit@effect](#)

Namespace: srs **Property Data Type:** xsd:string **Multi-Valued:** [NO](#)

The [taskDurationLimit@effect](#) property is set to the value of the [durationLimit@effect](#) property of the parent [recordSchedule](#). The format is identical to the format of the [durationLimit@effect](#) property. See Annex B.7.5.1 for details.

Default Value: N/A – Output only.

Sort Order: Same as [durationLimit@effect](#) property.

Input: N/A.

Output: The current setting.

B.15.4 taskChannelMigration

Namespace: srs **Property Data Type:** xsd:boolean **Multi-Valued:** NO

Description: The taskChannelMigration property is set to the value of the channelMigration property of the parent recordSchedule. The format is identical to the format of the channelMigration property. See Annex B.7.6 for details.

Default Value: N/A – Output only.

Sort Order: Same as channelMigration property.

Input: N/A.

Output: The current setting.

B.15.5 taskTimeMigration

Namespace: srs **Property Data Type:** xsd:boolean **Multi-Valued:** NO

Description: The taskTimeMigration property is set to the value of the timeMigration property of the parent recordSchedule. The format is identical to the format of the timeMigration property. See Annex B.7.7 for details.

Default Value: N/A – Output only.

Sort Order: Same as timeMigration property.

Input: N/A.

Output: The current setting.

B.16 Task State Properties**Table B.38 — State Related Properties**

Property Name	NS	Data Type	M-Val	Reference
<u>taskState</u>	srs	xsd:string	<u>NO</u>	Annex B.16.1
<u>taskState@phase</u>	srs	xsd:string	<u>NO</u>	Annex B.16.1.1
<u>taskState@startDateTimeMet</u>	srs	xsd:boolean	<u>NO</u>	Annex B.16.1.2
<u>taskState@endDateTimeMet</u>	srs	xsd:boolean	<u>NO</u>	Annex B.16.1.3
<u>taskState@recording</u>	srs	xsd:boolean	<u>NO</u>	Annex B.16.1.4
<u>taskState@someBitsRecorded</u>	srs	xsd:boolean	<u>NO</u>	Annex B.16.1.5
<u>taskState@someBitsMissing</u>	srs	xsd:boolean	<u>NO</u>	Annex B.16.1.6
<u>taskState@firstBitsRecorded</u>	srs	xsd:boolean	<u>NO</u>	Annex B.16.1.7
<u>taskState@lastBitsRecorded</u>	srs	xsd:boolean	<u>NO</u>	Annex B.16.1.8
<u>taskState@fatalError</u>	srs	xsd:boolean	<u>NO</u>	Annex B.16.1.9
<u>taskState@currentErrors</u>	srs	CSV (xsd:int)	<u>NO</u>	Annex B.16.1.10
<u>taskState@errorHistory</u>	srs	CSV (xsd:int)	<u>NO</u>	Annex B.16.1.11
<u>taskState@pendingErrors</u>	srs	CSV (xsd:int)	<u>NO</u>	Annex B.16.1.12
<u>taskState@infoList</u>	srs	CSV (xsd:int)	<u>NO</u>	Annex B.16.1.13

B.16.1 taskState**Namespace:** srs**Property Data Type:** xsd:string**Multi-Valued:** NO**Description:** The taskState property indicates the overall state of the recordTask.**Default Value:** N/A – Output only.**Sort Order:** Property Specific, based on the order in Table B.39. Ascending: first table entry first.**Input:** N/A.**Output:** The current setting.

Allowed Values: This subclause defines the normative allowed values for the taskState property. Each of these values represents a semantically meaningful combination of values for some of the “low-level” state properties (that is: taskState@xxx). Although it is possible to derive the value of the taskState property from some of the “low-level” taskState@xxx properties, the taskState property provides a more convenient mechanism to determine the current state of the recordTask.

The definition of each state is shown in the Table B.39 below. The table represents the normative definitions of the various states. Although some of the low-level state properties have been declared as allowed, their underlying semantics and their significance towards the definition of each valid taskState value is not diminished. Regardless of whether or not a given device is able to expose all of the low-level state properties, every device has a conceptual notion of property semantics. For example, some devices might not be able to support the taskState@lastBitsRecorded property, however, even these devices have an internal concept that the last bits of the content have or have not been recorded.

In some cases, a specific low-level state property does not contribute to the definition of a given state. In other words, the low-level property can have any value without affecting the semantics of the state. This situation is indicated by a “-” in the table entry.

The “Ø” symbol is used to indicate an empty attribute. The “{ }” symbol is used when the attribute is not empty.

Following Table B.39, a more intuitive informational description of each state value and their support level is described.

Table B.39 — Allowed values for the attributes of the taskState Property

Value	<u>@phase</u>	<u>@recording</u>	<u>@someBitsRecorded</u>	<u>@someBitsMissing</u>	<u>@fatalError</u>	<u>@currentErrors</u>	<u>@pendingErrors</u>	<u>@errorHistory</u>	<u>@startDateTimeMet</u> ^a	<u>@endDateTimeMet</u> ^a	<u>@firstBitsRecorded</u> ^a	<u>@lastBitsRecorded</u> ^a
<u>“IDLE.READY”</u>	<u>“IDLE”</u>	0	0	0	0	Ø	Ø	Ø	0	0	0	0
<u>“IDLE.ATRISK”</u>	<u>“IDLE”</u>	0	0	0	0	Ø	{ }	Ø	0	0	0	0
<u>“ACTIVE.TRANSITION.FROMSTART”</u>	<u>“ACTIVE”</u>	0	0	0	0	Ø	-	Ø	1	0	0	0

" <u>ACTIVE.TRANSITION.RESTART</u> "	" <u>ACTIVE</u> "	0	-	1	0	Ø	-	{ }	1	0	-	0
" <u>ACTIVE.RECORDING.FROMSTART.OK</u> "	" <u>ACTIVE</u> "	1	1	0	0	Ø	Ø	Ø	1	0	1	0
" <u>ACTIVE.RECORDING.FROMSTART.ATRISK</u> "	" <u>ACTIVE</u> "	1	1	0	0	Ø	{ }	Ø	1	0	1	0
" <u>ACTIVE.RECORDING.RESTART.OK</u> "	" <u>ACTIVE</u> "	1	1	1	0	Ø	Ø	{ }	1	0	-	0
" <u>ACTIVE.RECORDING.RESTART.ATRISK</u> "	" <u>ACTIVE</u> "	1	1	1	0	Ø	{ }	{ }	1	0	-	0
" <u>ACTIVE.NOTRECORDING</u> "	" <u>ACTIVE</u> "	0	-	1	0	{ }	-	{ }	1	0	-	0
" <u>DONE.FULL</u> "	" <u>DONE</u> "	0	1	0	0	Ø	-	Ø	1	1	1	1
" <u>DONE.PARTIAL</u> "	" <u>DONE</u> "	0	1	1	0	Ø	-	{ }	1	1	-	-
" <u>DONE.EMPTY</u> "	" <u>DONE</u> "	0	0	1	0	Ø	-	{ }	1	0	0	0
	" <u>DONE</u> "	0	0	1	1	Ø	-	{ }	-	0	0	0

^a Some implementations might not expose these individual properties to the control point. However, in this case, all visible external behavior of the device shall be as if it implemented all of the properties as specified in the table above.

In the following table, a more intuitive informational description of each state value and its support level is described.

Table B.40 — Allowed values for the taskState Property

Value	R/A	Description
" <u>IDLE.READY</u> "	<u>R</u>	The <u>recordTask</u> is waiting for the start time to be reached. No errors have been detected.
" <u>IDLE.ATRISK</u> "	<u>A</u>	The <u>recordTask</u> is waiting for the start time to be reached while some pending errors exist.
" <u>ACTIVE.TRANSITION.FROMSTART</u> "	<u>A</u>	The device's record mechanism has been initiated to record the content from its beginning but no actual recording has occurred.
" <u>ACTIVE.TRANSITION.RESTART</u> "	<u>A</u>	The device's record mechanism has been re-initiated following some content loss from previous error conditions.
" <u>ACTIVE.RECORDING.FROMSTART.OK</u> "	<u>R</u>	The device's record mechanism is currently continuously recording from the beginning. No current or pending errors exist.
" <u>ACTIVE.RECORDING.FROMSTART.ATRISK</u> "	<u>A</u>	The device's record mechanism is currently continuously recording from the beginning. Some pending errors are detected.
" <u>ACTIVE.RECORDING.RESTART.OK</u> "	<u>A</u>	The device's record mechanism is currently recording content, following some content loss from previous error conditions. No current or pending errors exist.
" <u>ACTIVE.RECORDING.RESTART.ATRISK</u> "	<u>A</u>	The device's record mechanism is currently recording content following some content loss from previous error conditions. One or more pending errors are detected, which will block the recording in the future.
" <u>ACTIVE.NOTRECORDING</u> "	<u>A</u>	The device's record mechanism is currently not recording content due to one or more

		error conditions.
" <u>DONE.FULL</u> "	<u>R</u>	The <u>recordTask</u> has reached its final disposition and no other property or attribute changes will occur. All of the content has been recorded.
" <u>DONE.PARTIAL</u> "	<u>R</u>	The <u>recordTask</u> has reached its final disposition and no other property or attribute changes will occur. The content is only partially recorded due to error(s).
" <u>DONE.EMPTY</u> "	<u>R</u>	The <u>recordTask</u> has reached its final disposition and no other property or attribute changes will occur. No content has been recorded at all due to error conditions.

B.16.1.1 taskState@phase

Namespace: srs

Property Data Type: xsd:string

Multi-Valued: NO

Description: The taskState@phase property indicates the current phase of a recordTask within its normal lifetime. The following allowed values for this property are sequentially assigned at the appropriate points in time within the recordTask's normal lifetime: "IDLE" → "ACTIVE" → "DONE". In certain cases, some of the phase values may be skipped, for example, when a fatal error is detected.

Default Value: N/A – Output only.

Sort Order: Property Specific, based on the order in

. Ascending: first table entry first.

Input: N/A.

Output: The current setting.

Allowed Values:

Table B.41 — Allowed values for the taskState@phase Property

Value	R/A	Description
" <u>IDLE</u> "	<u>R</u>	Indicates that the <u>recordTask</u> 's start time has not yet been reached.
" <u>ACTIVE</u> "	<u>R</u>	Indicates that the <u>recordTask</u> is in between the " <u>IDLE</u> " and " <u>DONE</u> " phases. Typically, the <u>recordTask</u> 's content is (partially) available and an attempt is made to record the remaining content.
" <u>DONE</u> "	<u>R</u>	Indicates that the <u>recordTask</u> 's final disposition has been reached. For example, the <u>recordTask</u> 's end time has been reached or a fatal error has occurred. Once the device reaches this phase, no additional state changes occur.

B.16.1.2 taskState@startDateTimeMet

Namespace: srs

Property Data Type: xsd:boolean

Multi-Valued: NO

Description: The taskState@startDateTimeMet property indicates whether the recordTask's actualStartDateTime has been reached. See subclause 3.2 for the definition of actualStartDateTime.

If a recordTask has reached the “DONE” phase, this property indicates the last status before the recordTask has reached the “DONE” phase. Note: if the recordTask terminates prematurely (that is: reaches the “DONE” phase before the start time is reached, for example, due to a fatal error), this property is not updated.

Default Value: N/A – Output only.

Sort Order: Boolean.

Input: N/A.

Output: The current setting.

B.16.1.3 taskState@endDateTimeMet

Namespace: srs **Property Data Type:** xsd:boolean **Multi-Valued:** NO

Description: The taskState@endDateTimeMet property indicates whether the recordTask's *actualEndTime* has been reached. See subclause 8.2 for the definition of *actualEndTime*.

If a recordTask has reached the “DONE” phase, this property indicates the last status before the recordTask has reached the “DONE” phase. Note: if the recordTask terminates prematurely (that is: reaches the “DONE” phase before the end time is reached, for example, due to a fatal error), this property is not updated.

Default Value: N/A – Output only.

Sort Order: Boolean.

Input: N/A.

Output: The current setting.

B.16.1.4 taskState@recording

Namespace: srs **Property Data Type:** xsd:boolean **Multi-Valued:** NO

Description: The taskState@recording property indicates whether one of the device's record destinations is currently recording the content identified by the recordTask.

Default Value: N/A – Output only.

Sort Order: Boolean.

Input: N/A.

Output: The current setting.

B.16.1.5 taskState@someBitsRecorded

Namespace: srs **Property Data Type:** xsd:boolean **Multi-Valued:** NO

Description: The taskState@someBitsRecorded property indicates whether some portion of the content identified by the recordTask has been recorded.

Default Value: N/A – Output only.

Sort Order: Boolean.

Input: N/A.

Output: The current setting.

B.16.1.6 taskState@someBitsMissing

Namespace: srs **Property Data Type:** xsd:boolean **Multi-Valued:** NO

Description: The taskState@someBitsMissing property indicates whether some portion of the content identified by the recordTask has not been recorded. This property will be “0” as long as all the bits that have been available so far have also been recorded.

Default Value: N/A – Output only.

Sort Order: Boolean.

Input: N/A.

Output: The current setting.

B.16.1.7 taskState@firstBitsRecorded

Namespace: srs **Property Data Type:** xsd:boolean **Multi-Valued:** NO

Description: The taskState@firstBitsRecorded property indicates whether the first portion of the content identified by the recordTask has been recorded.

Default Value: N/A – Output only.

Sort Order: Boolean.

Input: N/A.

Output: The current setting.

B.16.1.8 taskState@lastBitsRecorded

Namespace: srs **Property Data Type:** xsd:boolean **Multi-Valued:** NO

Description: The taskState@lastBitsRecorded property indicates whether the ending portion of the content identified by the recordTask has been recorded.

Default Value: N/A – Output only.

Sort Order: Boolean.

Input: N/A.

Output: The current setting.

B.16.1.9 taskState@fatalError

Namespace: srs **Property Data Type:** xsd:boolean **Multi-Valued:** NO

Description: The taskState@fatalError property indicates whether a fatal error has occurred. A fatal error is defined to be an error condition that causes the recordTask to terminate before its *actualEndDateTime* has been reached.

Default Value: N/A – Output only.

Sort Order: Boolean.

Input: N/A.

Output: The current setting.

B.16.1.10 taskState@currentErrors

Namespace: srs

Property Data Type: CSV (xsd:int) **Multi-Valued:** NO

Description: The taskState@currentErrors property identifies the CSV list of errors that are currently preventing the recordTask from recording. An empty CSV list indicates that there are no errors currently blocking the recording. Multiple errors are listed in order of occurrence starting with the oldest error and ending with the most recent.

When the errors are not resolved before reaching the “DONE” phase, they may be persisted in the “DONE” phase. If a device persists current errors, the value of this property shall be set to the value that this property had immediately prior to entering the “DONE” phase. If a device does not persist current errors, the taskState@currentErrors shall be empty in the “DONE” phase.

By definition, this property shall be empty while in the “IDLE” phase. The current errors are also copied to the taskState@errorHistory property.

Default Value: N/A – Output only.

Sort Order: Sequenced Numeric.

Input: N/A.

Output: The current setting.

Allowed values for the taskState@currentErrors Property and Other Error Properties:

The following table defines error codes for all error properties of a recordTask, such as taskState@currentErrors, taskState@errorHistory, etc. to expose error conditions. This error list can be extended in the future or by vendors. The errors are grouped into separate categories and labeled 1xx, 2xx, 3xx, and 4xx groups, each group representing the nature of errors; that is: general errors, media errors, system errors and content errors, respectively. The grouping of error codes allows a control point to be able to understand the nature of errors when an unknown error code (that is: extended specification or vendor extended) is encountered. For example, if an unknown error is labeled 3xx, it can be interpreted by the control point as 300.

Table B.42 — Allowed values for the taskState@xxx Properties

Value	R/A	Description
Non-positive	N/A	These error codes are reserved for future use. Control points shall gracefully ignore any non-positive error codes.
001-099	N/A	Reserved.
100-199	N/A	General Error Code Group - arbitrary errors, which do not belong to other groups.
100	<u>R</u>	General Problem – a problem is confirmed, but no specific reason can be identified.
101	<u>A</u>	Disabled - the <u>recordTask</u> is disabled by the user.

102	<u>A</u>	The <u>recordTask</u> 's enable/disable behavior is overriding the default behavior specified by the associated <u>recordSchedule</u> .
103-149	N/A	Reserved for future General Error Codes.
150-199	N/A	Reserved for vendor-defined General Error Codes.
200-299	N/A	Media Error Code Group - arbitrary media related errors.
200	<u>A</u>	General Media Problem – some trouble related to media is detected. Replacing the media might likely resolve it.
201	<u>A</u>	No Media – necessary media is missing from the recording device.
202	<u>A</u>	Media Write Protect - write access to the recording media is prohibited.
203	<u>A</u>	Insufficient Media Space - recording media does not have enough available space to complete the <u>recordTask</u> .
204	<u>A</u>	Media Low Space - the recording media has low available space and the <u>recordTask</u> might fail. The criteria to determine "low space" is vendor dependent and might be independent from the size of the scheduled content to record.
205-249	N/A	Reserved for future Media ErrorCodes.
250-299	N/A	Reserved for vendor-defined Media Error Codes.
300-399	N/A	System Error Code Group - arbitrary system related error.
300	<u>A</u>	General System Problem – a problem related to the system is detected. It might affect all <u>recordTask</u> instances in the ScheduledRecording service.
301	<u>A</u>	Insufficient Memory- the system does not have enough system memory to complete the <u>recordTask</u> .
302	<u>A</u>	Insufficient Processing - the system does not have enough CPU power to execute the <u>recordTask</u> .
303	<u>A</u>	Low Memory - the system has low available memory and the <u>recordTask</u> might fail. The criteria to determine "low memory" is vendor dependent and might be independent from the size of the scheduled content to record.
304	<u>A</u>	Low Processing - the system has low available CPU power and the <u>recordTask</u> might fail. The criteria to determine "low processing" is vendor dependent and might be independent from the size of the scheduled content to record.
305	<u>A</u>	Signal Lost - the system has lost the input signal.
306	<u>A</u>	Low Signal - The system has low input signal and the <u>recordTask</u> might fail. The criteria to determine "low processing" is vendor dependent.
307	<u>A</u>	No EPG - the system lost access to the EPG.
308-349	N/A	Reserved for future System Error Codes.
350-399	N/A	Reserved for vendor-defined System Error Codes.
400-499	N/A	Content Error Code Group - arbitrary errors related to the content program to be recorded.
400	<u>A</u>	General Content Problem – a problem related to the content is detected. It might be associated with the content that is being recorded.
401	<u>A</u>	Conflicting Program Loser – there are other conflicting programs with overlapping time period, and the current <u>recordTask</u> is superseded by the conflicting program.
402	<u>A</u>	Conflicting Program Winner - there are other conflicting programs with overlapping time period, and the current <u>recordTask</u> superseded the conflicting program.
403	<u>A</u>	PPV (Pay per View) - the content is PPV and some procedures are needed for the <u>recordTask</u> to begin.
404	<u>A</u>	Content Rescheduled - the originally scheduled content has been preempted.
405-449	N/A	Reserved for future Content Error Codes.

450-499	N/A	Reserved for vendor-defined Content Error Codes.
500 and above	N/A	Reserved for future new category information extensions.

B.16.1.11 taskState@errorHistory**Namespace:** srs**Property Data Type:** CSV (xsd:int) **Multi-Valued:** NO

Description: The taskState@errorHistory property identifies the CSV list of errors that have (at any time) prevented the recordTask from completing successfully. This includes both past and current recording errors. Multiple errors are listed in order of occurrence starting with the oldest error and ending with the most recent. An empty list indicates that none of the recordTask's content has yet been prevented from being recorded. By definition, this list will always be empty while in the "IDLE" phase. Note that any errors listed in taskState@currentErrors shall also be copied to and persisted in this property.

Default Value: N/A – Output only.**Sort Order:** Sequenced Numeric.**Input:** N/A.**Output:** The current setting.**Allowed Values:**See allowed values for the taskState@currentErrors in subclause B.16.1.10 for details.**B.16.1.12 taskState@pendingErrors****Namespace:** srs**Property Data Type:** CSV (xsd:int) **Multi-Valued:** NO

Description: The taskState@pendingErrors property identifies the CSV list of errors that might prevent the recordTask from completing successfully at some time in the future unless resolved. An empty CSV list means that no pending errors have been detected. The list of errors that the device is able to detect before they actually occur may be obtained via the GetAllowedValues() action.

Those devices that are not able to detect any pending errors before they actually occur may always return an empty list for the value of this property. In this case, the value returned by GetAllowedValues() for this property shall also be an empty list.

If any of these pending errors actually occur, they shall be added to the taskState@currentErrors list and taskState@errorHistory and removed from this list. When the pending errors did not occur, these errors may be persisted to the "DONE" phase. If a device does not persist any pending errors that have not occurred yet, then the taskState@pendingErrors shall be empty in the "DONE" phase. Otherwise the value of this property shall be set to the value that this property had immediately prior to entering the "DONE" phase.

Default Value: N/A – Output only.**Sort Order:** Sequenced Numeric.**Input:** N/A.**Output:** The current setting.**Allowed Values:**

See allowed values for the [taskState@currentErrors](#) in subclause B.16.1.10 for details.

B.16.1.13 [taskState@infoList](#)

Namespace: srs **Property Data Type:** CSV (xsd:int) **Multi-Valued:** [NO](#)

Description: The [taskState@infoList](#) property identifies the CSV list of additional conditions that have been detected but will not block the current [recordTask](#), for example, conflict winner.

The list of possible information that the device is able to detect may be obtained via the [GetAllowedValues\(\)](#) action.

Devices that are not able to detect any additional information shall always return an empty list. In this case, the value returned by [GetAllowedValues\(\)](#) for this property shall also be an empty list.

Note: a device can also use [additionalStatusInfo](#) to expose information in text format.

Default Value: N/A – Output only.

Sort Order: Sequenced Numeric.

Input: N/A.

Output: The current setting.

Allowed Values:

See allowed values for the [taskState@currentErrors](#) in subclause B.16.1.10 for details.

B.17 ContentDirectory Service Imported Properties

ContentDirectory service properties are imported through the [cdsReference](#) multi-valued property. The main reason to import properties (metadata) from ContentDirectory service objects into a [recordSchedule](#) or [recordTask](#) object is to make that object self-contained; that is: a control point can retrieve relevant metadata from the ScheduledRecording service object without having to first extract the object IDs of external ContentDirectory service objects and then retrieve the metadata from these objects via additional actions. In addition, even when the referenced object in the ContentDirectory service is deleted, its metadata is still preserved within the ScheduledRecording service. It is the responsibility of the device to maintain consistency between the actual ContentDirectory service object's metadata and the metadata contained in the corresponding [cdsReference](#) property.

The [cdsReference](#) property shall contain a *valid* (it shall contain all the required properties as dictated by the DIDL-Lite Schema; also, if dependent properties are imported, their independent properties shall be imported as well.) and properly escaped *DIDL-Lite XML Document* as defined in the ContentDirectory service specification. (Care needs to be taken to correctly define namespaces.)

The *DIDL-Lite XML Document* describes a device-dependent (sub)set of imported properties (metadata) of the ContentDirectory service object that is referenced by the linked [xxxCDSObjectID](#) property. The information contained in the *DIDL-Lite XML Document* shall exactly match the *DIDL-Lite XML Document* that would be returned in the [Result](#) argument of the [ContentDirectory::Browse\(\)](#) action with its input arguments set as follows:

- **ObjectID**: The linked [xxxCDSObjectID](#) property value.
- **BrowseFlag**: Set to "[BrowseMetaData](#)".
- **Filter**: Set to the list of property names that are imported from the ContentDirectory service by the ScheduledRecording service.
- **StartingIndex**: 0.
- **RequestedCount**: 0.
- **SortCriteria**: "", the empty string.

The following example illustrates the possible content of a [cdsReference](#) property in the context of a [recordSchedule](#) object (expressed in XML).

```
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="sched001">
    <class>OBJECT.RECORDSCHEDULE.DIRECT.CDSEPG</class>
    <title>My Schedule</title>
    ...
    <scheduledCDSObjectID link="schedObj001">
      epg001
    </scheduledCDSObjectID>
    ...
    <cdsReference link="schedObj001">
      <!--
      The following DIDL-Lite XML Document needs to be interpreted as a
      simple string and therefore needs to be properly escaped
      -->

      &lt;?xml version="1.0" encoding="UTF-8"?&gt;
      &lt;DIDL-Lite
        xmlns:dc="http://purl.org/dc/elements/1.1/"
        xmlns:upnp="urn:schemas-upnp-org:metadata-1-0/upnp/"
        xmlns="urn:schemas-upnp-org:metadata-1-0/DIDL-Lite/"&gt;
        &lt;item id="epg001" parentID="container007"
          restricted="0"&gt;
          &lt;dc:title&gt;Friends&lt;/dc:title&gt;
          &lt;upnp:class&gt;
            object.item.epgItem.videoProgram
          &lt;/upnp:class&gt;
          ...
          &lt;/item&gt;
        &lt;/DIDL-Lite&gt;

      <!-- End of DIDL-Lite XML Document -->

    </cdsReference>
    ...
  </item>
</srs>
```

The next example illustrates the possible content of two [cdsReference](#) property instances relating to the [taskCDSObjectID](#) and [recordedCDSObjectID](#) property in the context of a [recordTask](#) object (expressed in XML).

```
<?xml version="1.0" encoding="UTF-8"?>
<srs
  xmlns="urn:schemas-upnp-org:av:srs"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="
    urn:schemas-upnp-org:av:srs
    http://www.upnp.org/schemas/av/srs.xsd">
  <item id="Task001">
    <class>OBJECT.RECORDTASK</class>
    <title>My Task</title>
    ...
    <taskCDSObjectID link="tskObj001">
      epg001
    </taskCDSObjectID>
    ...
    <recordedCDSObjectID link="recObj001">
      rec001
    </recordedCDSObjectID>
    ...
    <cdsReference link="tskObj001">
<!--
The following DIDL-Lite XML Document needs to be interpreted as a
simple string and therefore needs to be properly escaped
-->

    <?xml version="1.0" encoding="UTF-8"?>
    <?DIDL-Lite
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:upnp="urn:schemas-upnp-org:metadata-1-0/upnp/"
    xmlns="urn:schemas-upnp-org:metadata-1-0/DIDL-Lite/">
      <?item id="epg001" parentID="container007"
        restricted="0">
        <?dc:title>Friends<?/dc:title>
        <?upnp:class>
          object.item.epgItem.videoProgram
        <?/upnp:class>
        ...
      <?/item>
    <?/DIDL-Lite>
<!-- End of DIDL-Lite XML Document -->
    </cdsReference>
    ...
    <cdsReference link="recObj001">
<!--
The following DIDL-Lite XML Document needs to be interpreted as a
simple string and therefore needs to be properly escaped
-->

    <?xml version="1.0" encoding="UTF-8"?>
```

```

    <?DIDL-Lite
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:upnp="urn:schemas-upnp-org:metadata-1-0/upnp/"
    xmlns="urn:schemas-upnp-org:metadata-1-0/DIDL-Lite/">
    <?item id="rec001" parentID="cnt009"
restricted="0">
    <?dc:title>My Show<?/dc:title>
    <?upnp:class>
    object.item.videoItem
    <?/upnp:class>
    ...
    <?/item>
    <?/DIDL-Lite>

<!-- End of DIDL-Lite XML Document -->

    </cdsReference>
    ...
  </item>
</srs>

```

Annex C (normative)

AV Working Committee Class Definitions

C.1 Class Hierarchy

The ScheduledRecording service exposes a class hierarchy which is used to type all objects that can be retrieved from it. Each class is named using a string of the form described in Annex D.3 below.

For a particular class, some properties are required, others are allowed and some are not allowed.

A class that is derived from another class shall include all of the member properties of the parent class. The definition of a derived class may make some allowed properties of the base class required.

Each class definition includes a list of properties. Each property is expressed in XML as either an XML Element or an XML Attribute. Some independent properties are multi-valued for a class, meaning that, in an XML instance of the class, the property may occur more than once.

This Annex C defines the base class object from which all other classes are derived. No object of this abstract class can be instantiated. From the object class, two classes are derived; the object.recordSchedule class and the object.recordTask class.

The abstract object.recordSchedule class and its two derived abstract classes object.recordSchedule.direct and object.recordSchedule.query make up the basic hierarchy from which all other recordSchedule classes are derived. These three classes can not be instantiated (no object can exist within the ScheduledRecording service that has its class property set to "OBJECT.RECORDSCHEDULE", "OBJECT.RECORDSCHEDULE.DIRECT" or "OBJECT.RECORDSCHEDULE.QUERY").

The object.recordTask class is used to type all recordTask objects in the ScheduledRecording service. The object.recordTask class has no derived classes defined yet.

In addition to these classes, a number of classes are derived from the object.recordSchedule.direct and object.recordSchedule.query classes. Figur below shows the hierarchy of these classes.

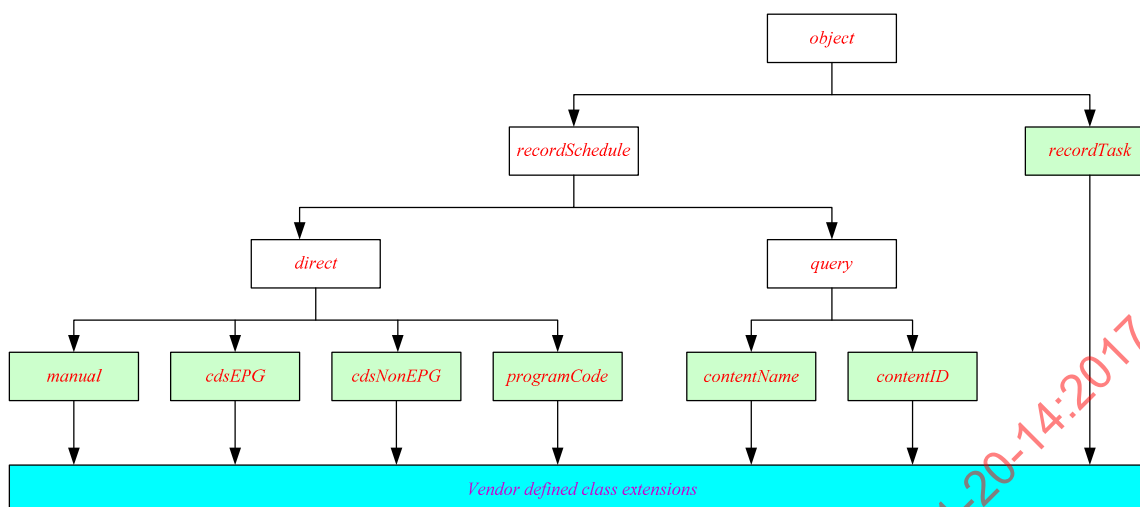


Figure C.1 — Class hierarchy for the ScheduledRecording service.

Vendors may extend the functionality, provided by the standard record classes, by adding vendor-defined properties. Any device that adds a property whose description matches one of the AV Working Committee-defined property descriptions shall use the AV Working Committee-defined property name. In addition, any device that uses a property name from the ScheduledRecording service specification shall use it with the same semantics as the AV Working Committee-defined description of that property. In order to accommodate vendor-defined properties, control points shall gracefully ignore any properties whose names and semantics they do not understand.

When adding properties, it is recommended that vendors create a vendor-defined derived class with a vendor-defined class name, rather than adding the properties to the existing standard class without creating a vendor-defined class. This provides a simple mechanism for control points to determine if a class has been extended by simply examining the *class* property value. In all cases, vendor-defined classes shall remain fully compatible with the standard class from which they were derived. In other words, control points that do not understand the specifics of the vendor-defined additions should still be able to interact with an instance of the vendor-defined derived class object as if it were an instance of that standard class.

Vendor-defined classes shall always be derived from standard classes that can be instantiated (the green-colored boxes in Figure C.1). It is therefore not allowed to derive vendor-defined classes directly from classes, such as "OBJECT.RECORDSCHEDULE", "OBJECT.RECORDSCHEDULE.DIRECT", and "OBJECT.RECORDSCHEDULE.QUERY". It is allowed to derive vendor-defined classes from class "OBJECT.RECORDTASK".

All standard classes and vendor-defined derived classes supported by a particular ScheduledRecording service implementation shall be individually listed in the allowed values of the *class* property. (This list can be retrieved via the *GetAllowedValues()* action.) Implementations are required to support all intermediate classes in a chain of derived classes. For example, if an implementation supports a vendor-defined class "OBJECT.RECORDSCHEDULE.DIRECT.CDSEPG.HDTV.LOCAL", then it shall also support the "OBJECT.RECORDSCHEDULE.DIRECT.CDSEPG.HDTV" and "OBJECT.RECORDSCHEDULE.DIRECT.CDSEPG" classes.

As indicated in Annex D.3, strict naming conventions shall be followed when naming derived vendor-defined classes. Vendor-defined class names shall be based on one of

the instantiatable class names in this specification. Therefore, *all* vendor-defined class names shall start with one of the string values, defined in Table B.2.

Control points that need to examine class property values, should be prepared to handle vendor-defined class names. Therefore, control points should *never* use simple string matching to determine the actual class of an object. Rather, they should parse the class name from left to right and determine if there is at least a left substring match with one of the string values defined in Table B.2. If such a match is found, the remaining characters in the class name can be examined for potential matches with vendor-defined class names of which the control point is aware. If no such match is found, the control point can treat the object as if it were an instance of the most specialized class for which a match was found.

C.1.1 Relationships between Classes and Properties

The following tables present a complete overview of all the defined properties and in which classes these properties are actually used (member properties).

For a particular class, some properties are required, others are allowed and some are not allowed. Every instance of a class shall have a value for each supported required or allowed member property of that class (see subclause 3.2).

The support level of a member property defines how the member property shall be used in the arguments of an action when that action is invoked. The support level of a member property can be different for recordSchedule, recordScheduleParts, and recordTask usage.

The recordScheduleParts support level for the specified class indicates the use of a member property when a control point requests to create a recordSchedule. If a member property is defined as required for recordScheduleParts usage, an argument of type A_ARG_TYPE_RecordScheduleParts shall contain that member property and the ScheduledRecording service shall support it. If it is defined as allowed, the ScheduledRecording service may support the member property and a control point may specify or omit the member property in a request message even if the member property is supported by the ScheduledRecording service. Not allowed or unsupported allowed member properties specified in an argument of type A_ARG_TYPE_RecordScheduleParts shall be gracefully ignored by the ScheduledRecording service. The set of properties that are supported for an argument of type A_ARG_TYPE_RecordScheduleParts can be retrieved by specifying "A_ARG_TYPE_RecordScheduleParts" in the DataTypeID argument when invoking the GetPropertyList() action. The support level for each of those supported member properties of each class can be retrieved by invoking the GetAllowedValues() action.

The recordSchedule support level for the specified class indicates the use of a member property when a control point retrieves a recordSchedule object. If a member property is defined as required for recordSchedule usage, an argument of type A_ARG_TYPE_RecordSchedule shall contain that member property and the ScheduledRecording service shall support it. allowed supported member properties that are enumerated in the Filter argument shall also be specified in the argument. If the resulting XML is not a valid document, other allowed properties shall be added to create the smallest valid XML document. If the action does not have a Filter argument (like the CreateRecordSchedule() action), the action shall return *all* allowed supported member properties (as if the Filter argument were set to "*.*"). If a control point does not specify a supported allowed member property in a request, the ScheduledRecording service shall add it into the response and provide its default setting. The set of properties that are supported for an argument of type A_ARG_TYPE_RecordSchedule can be retrieved by specifying "A_ARG_TYPE_RecordSchedule" in the DataTypeID argument when invoking

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[illegible]

Matched Qualifying Criteria	
<u>matchedRating</u>	U
<u>matchedRating@type</u>	U
<u>matchedRating@equivalentAge</u>	U
<u>matchedEpisodeType</u>	U
Content Control Properties	
<u>taskStartDateTimeAdjust</u>	U
<u>taskDurationAdjust</u>	U
<u>taskDurationLimit</u>	U
<u>taskDurationLimit@effect</u>	U
<u>taskChannelMigration</u>	U

C.1.3 recordSchedule Properties

The next table indicates the support level (Required, Allowed, Not Allowed or Undefined) of a property when used in an argument of type A_ARG_TYPE_RecordSchedule for each class. The ✓ mark indicates that the property's support level is inherited from the parent class. The coloring still indicates the support level.

C.1.3 *recordSchedule* Properties

The next table indicates the support level (Required, Allowed, Not Allowed or Undefined) of a property when used in an argument of type A ARG TYPE RecordSchedule for each class. The ✓ mark indicates that the property's support level is inherited from the parent class. The coloring still indicates the support level.

Table C.2 — Class Properties Overview for `recordSchedule` usage

[illegible]

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Matched Content Criteria		
<u>matchedName</u>	<u>U</u>	<u>P</u>
<u>matchedName@type</u>	<u>U</u>	<u>P</u>
<u>matchedID</u>	<u>U</u>	<u>P</u>
<u>matchedID@type</u>	<u>U</u>	<u>P</u>
Matched Qualifying Criteria		
<u>matchedRating</u>	<u>U</u>	<u>P</u>
<u>matchedRating@type</u>	<u>U</u>	<u>P</u>
<u>matchedRating@equivalentAge</u>	<u>U</u>	<u>P</u>
<u>matchedEpisodeType</u>	<u>U</u>	<u>P</u>
Content Control Properties		
<u>taskStartDateTimeAdjust</u>	<u>U</u>	<u>P</u>

C.1.4 recordTask Properties

The next table indicates the support level (R of a property when used in an argument of t indicates that the property's support level is still indicates the support level.

Click

R	Required	object .recordTask	
A	Allowed		
N	Not Allowed		
U	Undefined		
y	Inherited		
Property Name			
Common Properties			
Base Properties			
<u>@id</u>		R	y
<u>title</u>		R	y
<u>class</u>		R	y
<u>additionalStatusInfo</u>		U	O

R	Required	object -recordTask	
A	Allowed		
N	Not Allowed		
U	Undefined		
✓	Inherited		
Property Name			
<u><i>cdsReference</i></u>		U	Q
<u><i>cdsReference@link</i></u>		U	B
Priority Properties			
<u><i>priority</i></u>		U	R
<u><i>priority@orderedValue</i></u>		U	Q
<u><i>desiredPriority</i></u>		Q	U

R	Required		
A	Allowed		
N	Not Allowed		
U	Undefined		
✓	Inherited		
Property Name		object	.recordTask
<u>desiredPriority@type</u>		R	✓
Output Control Properties			
<u>recordDestination</u>		U	B
<u>recordDestination@mediaType</u>		U	R
<u>recordDestination@targetURL</u>		U	O
<u>recordDestination@preference</u>		U	B
<u>desiredrecordQuality</u>		O	✓
<u>desiredrecordQuality@type</u>		R	✓
Schedule Only Properties			
Content ID Related Properties			
<u>scheduledCDSObjectID</u>		U	P
<u>scheduledCDSObjectID@link</u>		U	P
<u>scheduledChannelID</u>		U	P
<u>scheduledChannelID@type</u>		U	P
<u>scheduledChannelID@distriNetworkName</u>		U	P
<u>scheduledChannelID@distriNetworkID</u>		U	P
<u>scheduledStartDateTime</u>		U	P
<u>scheduledDuration</u>		U	P
<u>scheduledProgramCode</u>		U	P
<u>scheduledProgramCode@type</u>		U	P
Matching Content Criteria			
<u>matchingName</u>		U	P
<u>matchingName@type</u>		U	P
<u>matchingName@subStringMatch</u>		U	P
<u>matchingID</u>		U	P
<u>matchingID@type</u>		U	P
Matching Qualifying Criteria			
<u>matchingChannelID</u>		U	P
<u>matchingChannelID@type</u>		U	P
<u>matchingChannelID@distriNetworkName</u>		U	P
<u>matchingChannelID@distriNetworkID</u>		U	P
<u>matchingStartDateTimeRange</u>		U	P
<u>matchingDurationRange</u>		U	P
<u>matchingRatingLimit</u>		U	P

R	Required		
A	Allowed		
N	Not Allowed		
U	Undefined		
✓	Inherited		
Property Name		object	.recordTask
<u>matchingRatingLimit@type</u>		U	P
<u>matchingRatingLimit@equivalentAge</u>		U	P
<u>matchingEpisodeType</u>		U	P
Content Control Properties			
<u>totalDesiredRecordTasks</u>		U	P
<u>scheduledStartDateTimeAdjust</u>		U	P
<u>scheduledDurationAdjust</u>		U	P
<u>activePeriod</u>		U	P
<u>durationLimit</u>		U	P
<u>durationLimit@effect</u>		U	P
<u>channelMigration</u>		U	P
<u>timeMigration</u>		U	P
<u>allowDuplicates</u>		U	P
Storage Related Properties			
<u>persistedRecordings</u>		U	P
<u>persistedRecordings@latest</u>		U	P
<u>persistedRecordings@preAllocation</u>		U	P
<u>persistedRecordings@storedLifetime</u>		U	P
Schedule State Properties			
<u>scheduleState</u>		U	P
<u>scheduleState@currentErrors</u>		U	P
<u>abnormalTasksExist</u>		U	P
Statistics Properties			
<u>currentRecordTaskCount</u>		U	P
<u>totalCreatedRecordTasks</u>		U	P
<u>totalCompletedRecordTasks</u>		U	P
Task Only Properties			
General Properties			
<u>recordScheduleID</u>		U	B
<u>recordedCDSObjectID</u>		U	O
<u>recordedCDSObjectID@link</u>		U	O
Content ID Related Properties			
<u>taskCDSObjectID</u>		U	O
<u>taskCDSObjectID@link</u>		U	O

R	Required		
A	Allowed		
N	Not Allowed		
U	Undefined		
✓	Inherited		
Property Name		object	.recordTask
<u>taskChannelID</u>	U	R	
<u>taskChannelID@type</u>	U	R	
<u>taskChannelID@distriNetworkName</u>	U	O	
<u>taskChannelID@distriNetworkID</u>	U	O	
<u>taskStartDateTime</u>	U	R	
<u>taskDuration</u>	U	B	
<u>taskProgramCode</u>	U	O	
<u>taskProgramCode@type</u>	U	R	
<u>recordQuality</u>	U	B	
<u>recordQuality@type</u>	U	R	
Matched Content Criteria			
<u>matchedName</u>	U	O	
<u>matchedName@type</u>	U	R	
<u>matchedID</u>	U	O	
<u>matchedID@type</u>	U	R	
Matched Qualifying Criteria			
<u>matchedRating</u>	U	O	
<u>matchedRating@type</u>	U	R	
<u>matchedRating@equivalentAge</u>	U	O	
<u>matchedEpisodeType</u>	U	O	
Content Control Properties			
<u>taskStartDateTimeAdjust</u>	U	O	

R	Required		
A	Allowed		
N	Not Allowed		
U	Undefined		
✓	Inherited		
Property Name		object	.recordTask
<u>taskDurationAdjust</u>	U	O	
<u>taskDurationLimit</u>	U	O	
<u>taskDurationLimit@effect</u>	U	B	
<u>taskChannelMigration</u>	U	O	
<u>taskTimeMigration</u>	U	O	
Task State Properties			
<u>taskState</u>	U	R	
<u>taskState@phase</u>	U	R	
<u>taskState@startDateTimeMet</u>	U	O	
<u>taskState@endDateTimeMet</u>	U	O	
<u>taskState@recording</u>	U	R	
<u>taskState@someBitsRecorded</u>	U	B	
<u>taskState@someBitsMissing</u>	U	R	
<u>taskState@firstBitsRecorded</u>	U	O	
<u>taskState@lastBitsRecorded</u>	U	O	
<u>taskState@fatalError</u>	U	R	
<u>taskState@currentErrors</u>	U	B	
<u>taskState@errorHistory</u>	U	B	
<u>taskState@pendingErrors</u>	U	R	
<u>taskState@infoList</u>	U	B	

C.2 Class Definitions

The following subclauses define the standard record classes. The support level of the available properties for each class is also indicated. Vendors may add vendor-dependent properties to any of the defined classes. An instance of a normative class shall not add properties, other than the properties already listed for each class definition below. In other words, a given instance of a record class can only have:

- The properties listed for that class (as per each definition below).
- The properties that are defined members of the parent class.
- Vendor-defined properties that are using other XML namespace(s).
- ContentDirectory service properties imported with a normative namespace prefix (see Annex B.17).

C.3 object Base Class

This is the abstract base class for the entire ScheduledRecording service class hierarchy. No object of this abstract class can be instantiated. The object class defines properties that are common to all ScheduledRecording service objects. The table below lists all standard defined properties (see Annex B for the definition of each property) and indicates the support level (**Required**, **Allowed**, **Not Allowed** or **Undefined**) in this class for each property.

Table C.4 — object Base Class Properties

Property Name		Property Name	
Base Properties		Content Control Properties	
<u>@id</u>	R	<u>totalDesiredRecordTasks</u>	U
<u>title</u>	R	<u>scheduledStartDateTimeAdjust</u>	U
<u>class</u>	R	<u>scheduledDurationAdjust</u>	U
<u>additionalStatusInfo</u>	U	<u>activePeriod</u>	U
<u>cdsReference</u>	U	<u>durationLimit</u>	U
<u>cdsReference@link</u>	U	<u>durationLimit@effect</u>	U
Priority Properties		<u>channelMigration</u>	U
<u>priority</u>	U	<u>timeMigration</u>	U
<u>priority@orderedValue</u>	U	<u>allowDuplicates</u>	U
<u>desiredPriority</u>	Q	Storage Related Properties	
<u>desiredPriority@type</u>	R	<u>persistedRecordings</u>	U
Output Control Properties		<u>persistedRecordings@latest</u>	U
<u>recordDestination</u>	U	<u>persistedRecordings@preAllocation</u>	U
<u>recordDestination@mediaType</u>	U	<u>persistedRecordings@storedLifetime</u>	U
<u>recordDestination@targetURL</u>	U	Schedule State Properties	
<u>recordDestination@preference</u>	U	<u>scheduleState</u>	U
<u>desiredRecordQuality</u>	Q	<u>scheduleState@currentErrors</u>	U
<u>desiredRecordQuality@type</u>	R	<u>abnormalTasksExist</u>	U
Content ID Related Properties		Statistics Properties	
<u>scheduledCDSObjectID</u>	U	<u>currentRecordTaskCount</u>	U
<u>scheduledCDSObjectID@link</u>	U	<u>totalCreatedRecordTasks</u>	U
<u>scheduledChannelID</u>	U	<u>totalCompletedRecordTasks</u>	U
<u>scheduledChannelID@type</u>	U	Task General Properties	
<u>scheduledChannelID@distriNetworkName</u>	U	<u>recordScheduleID</u>	U
<u>scheduledChannelID@distriNetworkID</u>	U	<u>recordedCDSObjectID</u>	U
<u>scheduledStartDateTime</u>	U	<u>recordedCDSObjectID@link</u>	U
<u>scheduledDuration</u>	U	Task Content ID Properties	
<u>scheduledProgramCode</u>	U	<u>taskCDSObjectID</u>	U
<u>scheduledProgramCode@type</u>	U	<u>taskCDSObjectID@link</u>	U
Matching Content Criteria		<u>taskChannelID</u>	U
<u>matchingName</u>	U	<u>taskChannelID@type</u>	U
<u>matchingName@type</u>	U	<u>taskChannelID@distriNetworkName</u>	U
<u>matchingName@subStringMatch</u>	U	<u>taskChannelID@distriNetworkID</u>	U
<u>matchingID</u>	U	<u>taskStartTime</u>	U
<u>matchingID@type</u>	U	<u>taskDuration</u>	U
Matching Qualifying Criteria		<u>taskProgramCode</u>	U
<u>matchingChannelID</u>	U	<u>taskProgramCode@type</u>	U
<u>matchingChannelID@type</u>	U	<u>recordQuality</u>	U
<u>matchingChannelID@distriNetworkName</u>	U	<u>recordQuality@type</u>	U
<u>matchingChannelID@distriNetworkID</u>	U	Matched Content Criteria	
<u>matchingStartDateTimeRange</u>	U	<u>matchedName</u>	U
<u>matchingDurationRange</u>	U	<u>matchedName@type</u>	U
<u>matchingRatingLimit</u>	U	<u>matchedID</u>	U
<u>matchingRatingLimit@type</u>	U	<u>matchedID@type</u>	U
<u>matchingRatingLimit@equivalentAge</u>	U	Matched Qualifying Criteria	
<u>matchingEpisodeType</u>	U		

Property Name	
matchedRating	U
matchedRating@type	U
matchedRating@equivalentAge	U
matchedEpisodeType	U
Content Control Properties	
taskStartDateTimeAdjust	U
taskDurationAdjust	U
taskDurationLimit	U
taskDurationLimit@effect	U
taskChannelMigration	U
taskTimeMigration	U
Task State Properties	
taskState	U

Property Name	
taskState@phase	U
taskState@startDateTimeMet	U
taskState@endDateTimeMet	U
taskState@recording	U
taskState@someBitsRecorded	U
taskState@someBitsMissing	U
taskState@firstBitsRecorded	U
taskState@lastBitsRecorded	U
taskState@fatalError	U
taskState@currentErrors	U
taskState@errorHistory	U
taskState@pendingErrors	U
taskState@infoList	U

C.3.1 [object.recordSchedule](#) Class

This is the abstract base class for the ScheduledRecording service record schedules class hierarchy. No object of this abstract class can be instantiated. The [object.recordSchedule](#) class defines properties that are common to all [object.recordSchedule](#) list entries. The table below lists all [recordSchedule](#)-related standard defined properties ([recordTask](#)-only properties are omitted from the table – see Annex B for the definition of each property) and indicates the support level (Required, Allowed, Not Allowed or Undefined) in this class for [recordScheduleParts](#) (RSP) and [recordSchedule](#) (RS) usage for each property.

Table C.5 — [object.recordSchedule](#) Base Class Properties

Property Name	RSP	RS
Base Properties		
@id	Y	Y
title	Y	Y
class	Y	Y
additionalStatusInfo	N	O
cdsReference	N	Y
cdsReference@link	N	Y
Priority Properties		
priority	N	R
priority@orderedValue	N	O
desiredPriority	Y	Y
desiredPriority@type	Y	Y
Output Control Properties		
recordDestination	O	R
recordDestination@mediaType	O	R
recordDestination@targetURL	O	O
recordDestination@preference	O	R
desiredRecordQuality	Y	Y
desiredRecordQuality@type	Y	Y
Content ID Related Properties		
scheduledCDSObjectID	Y	Y
scheduledCDSObjectID@link	N	Y
scheduledChannelID	Y	Y
scheduledChannelID@type	Y	Y
scheduledChannelID@distriNetworkName	Y	Y
scheduledChannelID@distriNetworkID	Y	Y
Property Name	RSP	RS
Matching Content Criteria		
matchingName	Y	Y
matchingName@type	Y	Y
matchingName@subStringMatch	Y	Y
matchingID	Y	Y
matchingID@type	Y	Y
Property Name	RSP	RS
Matching Qualifying Criteria		
matchingChannelID	Y	Y
matchingChannelID@type	Y	Y
matchingChannelID@distriNetworkName	Y	Y
matchingChannelID@distriNetworkID	Y	Y
matchingStartDateTimeRange	Y	Y
matchingDurationRange	Y	Y
matchingRatingLimit	Y	Y
matchingRatingLimit@type	Y	Y
matchingRatingLimit@equivalentAge	Y	Y
matchingEpisodeType	Y	Y
Content Control Properties		
totalDesiredRecordTasks	O	O

Property Name	RSP	RS
<u>scheduledStartDateTimeAdjust</u>	O	O
<u>scheduledDurationAdjust</u>	O	O
<u>activePeriod</u>	Y	Y
<u>durationLimit</u>	Y	Y
<u>durationLimit@effect</u>	Y	Y
<u>channelMigration</u>	Y	Y
<u>timeMigration</u>	Y	Y
<u>allowDuplicates</u>	Y	Y
Storage Related Properties		
<u>persistedRecordings</u>	O	O
<u>persistedRecordings@latest</u>	O	O

Property Name	RSP	RS
<u>persistedRecordings@preAllocation</u>	O	O
<u>persistedRecordings@storedLifetime</u>	O	O
Schedule State Properties		
<u>scheduleState</u>	N	R
<u>scheduleState@currentErrors</u>	N	R
<u>abnormalTasksExist</u>	N	R
Statistics Properties		
<u>currentRecordTaskCount</u>	N	R
<u>totalCreatedRecordTasks</u>	N	O
<u>totalCompletedRecordTasks</u>	N	O

C.3.1.1 object.recordSchedule.direct Class

The object.recordSchedule.direct abstract class is derived from the object.recordSchedule class. No object of this abstract class can be instantiated.

The main characteristic of the object.recordSchedule.direct class is that all the information that is needed to create associated recordTask instances is contained within the properties of the recordSchedule. The properties contain sufficient information to allow the ScheduledRecording service to translate this information into a deterministic set of recordTask properties. For example, if a ScheduledRecording service implementation supports the object.recordSchedule.direct.programCode class, the ScheduledRecording service is able to interpret the scheduledProgramCode property and derive the appropriate taskStartDate, taskStartTime, taskDuration, and taskChannelID recordTask properties from it. The table below lists all standard defined properties (see Annex B for the definition of each property) and indicates the support level (Required, Allowed, Not Allowed or Undefined) in this class for recordScheduleParts (RSP) and recordSchedule (RS) usage for each property.

Table C.6 — object.recordSchedule.direct Class Properties

Property Name	RSP	RS
Base Properties		
<u>@id</u>	Y	Y
<u>title</u>	Y	Y
<u>class</u>	Y	Y
<u>additionalStatusInfo</u>	Y	Y
<u>cdsReference</u>	Y	Y
<u>cdsReference@link</u>	Y	Y
Priority Properties		
<u>priority</u>	Y	Y
<u>priority@orderedValue</u>	Y	Y
<u>desiredPriority</u>	Y	Y
<u>desiredPriority@type</u>	Y	Y
Output Control Properties		
<u>recordDestination</u>	Y	Y
<u>recordDestination@mediaType</u>	Y	Y
<u>recordDestination@targetURL</u>	Y	Y
<u>recordDestination@preference</u>	Y	Y
<u>desiredRecordQuality</u>	Y	Y
<u>desiredRecordQuality@type</u>	Y	Y

Property Name	RSP	RS
Content ID Related Properties		
<u>scheduledCDSObjectID</u>	Y	Y
<u>scheduledCDSObjectID@link</u>	Y	Y
<u>scheduledChannelID</u>	Y	Y
<u>scheduledChannelID@type</u>	Y	Y
<u>scheduledChannelID@distriNetworkName</u>	Y	Y
<u>scheduledChannelID@distriNetworkID</u>	Y	Y
<u>scheduledStartDateTime</u>	Y	Y
<u>scheduledDuration</u>	Y	Y
<u>scheduledProgramCode</u>	Y	Y
<u>scheduledProgramCode@type</u>	Y	Y
Matching Content Criteria		
<u>matchingName</u>	N	N
<u>matchingName@type</u>	N	N
<u>matchingName@subStringMatch</u>	N	N
<u>matchingID</u>	N	N
<u>matchingID@type</u>	N	N

Property Name	RSP	RS
Matching Qualifying Criteria		
<u>matchingChannelID</u>	N	N
<u>matchingChannelID@type</u>	N	N
<u>matchingChannelID@distriNetworkName</u>	N	N
<u>matchingChannelID@distriNetworkID</u>	N	N
<u>matchingStartDateTimeRange</u>	N	N
<u>matchingDurationRange</u>	N	N
<u>matchingRatingLimit</u>	N	N
<u>matchingRatingLimit@type</u>	N	N
<u>matchingRatingLimit@equivalentAge</u>	N	N
<u>matchingEpisodeType</u>	N	N
Content Control Properties		
<u>totalDesiredRecordTasks</u>	Y	Y
<u>scheduledStartDateTimeAdjust</u>	Y	Y
<u>scheduledDurationAdjust</u>	Y	Y
<u>activePeriod</u>	Y	Y
<u>durationLimit</u>	Y	Y
<u>durationLimit@effect</u>	Y	Y

Property Name	RSP	RS
<u>channelMigration</u>	Y	Y
<u>timeMigration</u>	Y	Y
<u>allowDuplicates</u>	N	N
Storage Related Properties		
<u>persistedRecordings</u>	Y	Y
<u>persistedRecordings@latest</u>	Y	Y
<u>persistedRecordings@preAllocation</u>	Y	Y
<u>persistedRecordings@storedLifetime</u>	Y	Y
Schedule State Properties		
<u>scheduleState</u>	Y	Y
<u>scheduleState@currentErrors</u>	Y	Y
<u>abnormalTasksExist</u>	Y	Y
Statistics Properties		
<u>currentRecordTaskCount</u>	Y	Y
<u>totalCreatedRecordTasks</u>	Y	Y
<u>totalCompletedRecordTasks</u>	Y	Y

C.3.1.1.1 object.recordSchedule.direct.manual Class

The object.recordSchedule.direct.manual class is used to create recordSchedule instances for manual scheduling of recordings. The content to be recorded is uniquely identified by the scheduledChannelID, scheduledStartDateTime, and scheduledDuration properties.

The table below lists all standard defined properties (see Annex B for the definition of each property) and indicates the support level (Required, Allowed, Not Allowed or Undefined) in this class for recordScheduleParts (RSP) and recordSchedule (RS) usage for each property.

Table C.7 — object.recordSchedule.direct.manual Class Properties

Property Name	RSP	RS
Base Properties		
<u>@id</u>	Y	Y
<u>title</u>	Y	Y
<u>class</u>	Y	Y
<u>additionalStatusInfo</u>	Y	Y
<u>cdsReference</u>	Y	N
<u>cdsReference@link</u>	Y	N
Priority Properties		
<u>priority</u>	Y	Y
<u>priority@orderedValue</u>	Y	Y
<u>desiredPriority</u>	Y	Y
<u>desiredPriority@type</u>	Y	Y
Output Control Properties		
<u>recordDestination</u>	Y	Y
<u>recordDestination@mediaType</u>	Y	Y
<u>recordDestination@targetURL</u>	Y	Y
<u>recordDestination@preference</u>	Y	Y
<u>desiredRecordQuality</u>	Y	Y
<u>desiredRecordQuality@type</u>	Y	Y

Property Name	RSP	RS
Content ID Related Properties		
<u>scheduledCDSObjectID</u>	N	N
<u>scheduledCDSObjectID@link</u>	Y	N
<u>scheduledChannelID</u>	Y	Y
<u>scheduledChannelID@type</u>	Y	Y
<u>scheduledChannelID@distriNetworkName</u>	O	O
<u>scheduledChannelID@distriNetworkID</u>	O	O
<u>scheduledStartDateTime</u>	Y	Y
<u>scheduledDuration</u>	Y	Y
<u>scheduledProgramCode</u>	N	N
<u>scheduledProgramCode@type</u>	N	N
Matching Content Criteria		
<u>matchingName</u>	Y	Y
<u>matchingName@type</u>	Y	Y
<u>matchingName@subStringMatch</u>	Y	Y
<u>matchingID</u>	Y	Y
<u>matchingID@type</u>	Y	Y

Property Name	RSP	RS
Matching Qualifying Criteria		
<u>matchingChannelID</u>	Y	Y
<u>matchingChannelID@type</u>	Y	Y
<u>matchingChannelID@distriNetworkName</u>	Y	Y
<u>matchingChannelID@distriNetworkID</u>	Y	Y
<u>matchingStartDateTimeRange</u>	Y	Y
<u>matchingDurationRange</u>	Y	Y
<u>matchingRatingLimit</u>	Y	Y
<u>matchingRatingLimit@type</u>	Y	Y
<u>matchingRatingLimit@equivalentAge</u>	Y	Y
<u>matchingEpisodeType</u>	Y	Y
Content Control Properties		
<u>totalDesiredRecordTasks</u>	Y	Y
<u>scheduledStartDateTimeAdjust</u>	Y	Y
<u>scheduledDurationAdjust</u>	Y	Y
<u>activePeriod</u>	O	O
<u>durationLimit</u>	N	N
<u>durationLimit@effect</u>	N	N

Property Name	RSP	RS
<u>channelMigration</u>	N	N
<u>timeMigration</u>	N	N
<u>allowDuplicates</u>	Y	Y
Storage Related Properties		
<u>persistedRecordings</u>	Y	Y
<u>persistedRecordings@latest</u>	Y	Y
<u>persistedRecordings@preAllocation</u>	Y	Y
<u>persistedRecordings@storedLifetime</u>	Y	Y
Schedule State Properties		
<u>scheduleState</u>	Y	Y
<u>scheduleState@currentErrors</u>	Y	Y
<u>abnormalTasksExist</u>	Y	Y
Statistics Properties		
<u>currentRecordTaskCount</u>	Y	Y
<u>totalCreatedRecordTasks</u>	Y	Y
<u>totalCompletedRecordTasks</u>	Y	Y

C.3.1.1.2 object.recordSchedule.direct.cdsEPG Class

The object.recordSchedule.direct.cdsEPG class is used to create recordSchedule instances for scheduling of recordings, based on local EPG information. The content to be recorded is uniquely identified by the scheduledCDSObjectID property that shall reference an EPG item (object.item.epgItem class) in an associated ContentDirectory service. Most EPG item types currently defined identify only a single recording event. In the future, new EPG item types can be defined that identify multiple recording events.

The required association between a ContentDirectory service and a ScheduledRecording service is established by having both services reside within the same UPnP MediaServer device. See also Annex E and Annex F for further details.

The table below lists all standard defined properties (see Annex B for the definition of each property) and indicates the support level (Required, Allowed, Not Allowed or Undefined) in this class for recordScheduleParts (RSP) and recordSchedule (RS) usage for each property.

Table C.8 — object.recordSchedule.direct.cdsEPG Class Properties

Property Name	RSP	RS
Base Properties		
<u>@id</u>	Y	Y
<u>title</u>	Y	Y
<u>class</u>	Y	Y
<u>additionalStatusInfo</u>	Y	Y
<u>cdsReference</u>	Y	O
<u>cdsReference@link</u>	Y	Y
Priority Properties		
<u>priority</u>	Y	Y
<u>priority@orderedValue</u>	Y	Y
<u>desiredPriority</u>	Y	Y
<u>desiredPriority@type</u>	Y	Y

Property Name	RSP	RS
Output Control Properties		
<u>recordDestination</u>	Y	Y
<u>recordDestination@mediaType</u>	Y	Y
<u>recordDestination@targetURL</u>	Y	Y
<u>recordDestination@preference</u>	Y	Y
<u>desiredRecordQuality</u>	Y	Y
<u>desiredRecordQuality@type</u>	Y	Y
Content ID Related Properties		
<u>scheduledCDSObjectID</u>	Y	Y
<u>scheduledCDSObjectID@link</u>	Y	O
<u>scheduledChannelID</u>	N	N
<u>scheduledChannelID@type</u>	N	N

Property Name	RSP	RS
<u>scheduledChannelID@distriNetworkName</u>	N	N
<u>scheduledChannelID@distriNetworkID</u>	N	N
<u>scheduledStartTime</u>	N	N
<u>scheduledDuration</u>	N	N
<u>scheduledProgramCode</u>	N	N
<u>scheduledProgramCode@type</u>	N	N
Matching Content Criteria		
<u>matchingName</u>	Y	Y
<u>matchingName@type</u>	Y	Y
<u>matchingName@subStringMatch</u>	Y	Y
<u>matchingID</u>	Y	Y
<u>matchingID@type</u>	Y	Y
Matching Qualifying Criteria		
<u>matchingChannelID</u>	Y	Y
<u>matchingChannelID@type</u>	Y	Y
<u>matchingChannelID@distriNetworkName</u>	Y	Y
<u>matchingChannelID@distriNetworkID</u>	Y	Y
<u>matchingStartTimeRange</u>	Y	Y
<u>matchingDurationRange</u>	Y	Y
<u>matchingRatingLimit</u>	Y	Y
<u>matchingRatingLimit@type</u>	Y	Y
<u>matchingRatingLimit@equivalentAge</u>	Y	Y
<u>matchingEpisodeType</u>	Y	Y

Property Name	RSP	RS
Content Control Properties		
<u>totalDesiredRecordTasks</u>	Y	Y
<u>scheduledStartTimeAdjust</u>	Y	Y
<u>scheduledDurationAdjust</u>	Y	Y
<u>activePeriod</u>	O	O
<u>durationLimit</u>	O	O
<u>durationLimit@effect</u>	O	R
<u>channelMigration</u>	O	O
<u>timeMigration</u>	O	O
<u>allowDuplicates</u>	Y	Y
Storage Related Properties		
<u>persistedRecordings</u>	Y	Y
<u>persistedRecordings@latest</u>	Y	Y
<u>persistedRecordings@preAllocation</u>	Y	Y
<u>persistedRecordings@storedLifetime</u>	Y	Y
Schedule State Properties		
<u>scheduleState</u>	Y	Y
<u>scheduleState@currentErrors</u>	Y	Y
<u>abnormalTasksExist</u>	Y	Y
Statistics Properties		
<u>currentRecordTaskCount</u>	Y	Y
<u>totalCreatedRecordTasks</u>	Y	Y
<u>totalCompletedRecordTasks</u>	Y	Y

C.3.1.1.3 object.recordSchedule.direct.cdsNonEPG Class

The object.recordSchedule.direct.cdsNonEPG class is used to create recordSchedule instances for scheduling of recordings, for which (only) channel information is available in a local ContentDirectory database. The content to be recorded is uniquely identified by the scheduledStartTime, and scheduledDuration properties, supplemented with the scheduledCDSObjectID property that shall reference a ContentDirectory service object whose class is not "object.item.epgItem" or derived from that class. Additionally, the referenced ContentDirectory service object shall identify content that will be available for recording at the time the recording is scheduled to start.

Examples of applicable ContentDirectory service objects are:

- A User Channel object that contains specific channel information.
- An object that represents an analog A/V input connection to the device.
- An object that represents an IP network program feed.
- An object that represents an already existing file.
- Etc.

The required association between a ContentDirectory service and a ScheduledRecording service is established by having both services reside within the same UPnP MediaServer device. See also Annex E and Annex F for further details.

The table below lists all standard defined properties (see Annex B for the definition of each property) and indicates the support level (Required, Allowed, Not Allowed or Undefined) in this class for recordScheduleParts (RSP) and recordSchedule (RS) usage for each property.

Table C.9 — **object.recordSchedule.direct.cdsNonEPG** Class Properties

Property Name	RSP	RS
Base Properties		
<u>@id</u>	Y	Y
<u>title</u>	Y	Y
<u>class</u>	Y	Y
<u>additionalStatusInfo</u>	Y	Y
<u>cdsReference</u>	Y	O
<u>cdsReference@link</u>	Y	R
Priority Properties		
<u>priority</u>	Y	Y
<u>priority@orderedValue</u>	Y	Y
<u>desiredPriority</u>	Y	Y
<u>desiredPriority@type</u>	Y	Y
Output Control Properties		
<u>recordDestination</u>	Y	Y
<u>recordDestination@mediaType</u>	Y	Y
<u>recordDestination@targetURL</u>	Y	Y
<u>recordDestination@preference</u>	Y	Y
<u>desiredRecordQuality</u>	Y	Y
<u>desiredRecordQuality@type</u>	Y	Y
Content ID Related Properties		
<u>scheduledCDSObjectID</u>	R	R
<u>scheduledCDSObjectID@link</u>	Y	O
<u>scheduledChannelID</u>	N	N
<u>scheduledChannelID@type</u>	N	N
<u>scheduledChannelID@distriNetworkName</u>	N	N
<u>scheduledChannelID@distriNetworkID</u>	N	N
<u>scheduledStartTime</u>	R	R
<u>scheduledDuration</u>	R	R
<u>scheduledProgramCode</u>	N	N
<u>scheduledProgramCode@type</u>	N	N
Matching Content Criteria		
<u>matchingName</u>	Y	Y
<u>matchingName@type</u>	Y	Y
<u>matchingName@subStringMatch</u>	Y	Y
<u>matchingID</u>	Y	Y
<u>matchingID@type</u>	Y	Y
Matching Qualifying Criteria		
<u>matchingChannelID</u>	Y	Y
<u>matchingChannelID@type</u>	Y	Y
<u>matchingChannelID@distriNetworkName</u>	Y	Y
<u>matchingChannelID@distriNetworkID</u>	Y	Y
<u>matchingStartTimeRange</u>	Y	Y
<u>matchingDurationRange</u>	Y	Y
<u>matchingRatingLimit</u>	Y	Y
<u>matchingRatingLimit@type</u>	Y	Y
<u>matchingRatingLimit@equivalentAge</u>	Y	Y
<u>matchingEpisodeType</u>	Y	Y
Content Control Properties		
<u>totalDesiredRecordTasks</u>	Y	Y
<u>scheduledStartDateTimeAdjust</u>	Y	Y
<u>scheduledDurationAdjust</u>	Y	Y
<u>activePeriod</u>	O	O
<u>durationLimit</u>	N	N
<u>durationLimit@effect</u>	N	N
<u>channelMigration</u>	N	N
<u>timeMigration</u>	N	N
<u>allowDuplicates</u>	Y	Y
Storage Related Properties		
<u>persistedRecordings</u>	Y	Y
<u>persistedRecordings@latest</u>	Y	Y
<u>persistedRecordings@preAllocation</u>	Y	Y
<u>persistedRecordings@storedLifetime</u>	Y	Y
Schedule State Properties		
<u>scheduleState</u>	Y	Y
<u>scheduleState@currentErrors</u>	Y	Y
<u>abnormalTasksExist</u>	Y	Y
Statistics Properties		
<u>currentRecordTaskCount</u>	Y	Y
<u>totalCreatedRecordTasks</u>	Y	Y
<u>totalCompletedRecordTasks</u>	Y	Y

C.3.1.1.4 **object.recordSchedule.direct.programCode** Class

The **object.recordSchedule.direct.programCode** class is used to create **recordSchedule** instances for scheduling of recordings, based on program code information. The content to be recorded is uniquely identified by the **scheduledprogramCode** property that contains a unique code that can be translated by the ScheduledRecording service into a precise start date, start time, duration and channel for the recording event(s). However, most program code types currently defined identify only a single recording event. In the future, new program code types can be defined that identify multiple recording events.

The table below lists all standard defined properties (see Annex B for the definition of each property) and indicates the support level (**Required**, **Allowed**, **Not Allowed** or **Undefined**) in this class for **recordScheduleParts** (RSP) and **recordSchedule** (RS) usage for each property.

Table C.10 — **object.recordSchedule.direct.programCode** Class Properties

Property Name	RSP	RS
Base Properties		
<u>@id</u>	Y	Y
<u>title</u>	Y	Y
<u>class</u>	Y	Y
<u>additionalStatusInfo</u>	Y	Y
<u>cdsReference</u>	Y	N
<u>cdsReference@link</u>	Y	N
Priority Properties		
<u>priority</u>	Y	Y
<u>priority@orderedValue</u>	Y	Y
<u>desiredPriority</u>	Y	Y
<u>desiredPriority@type</u>	Y	Y
Output Control Properties		
<u>recordDestination</u>	Y	Y
<u>recordDestination@mediaType</u>	Y	Y
<u>recordDestination@targetURL</u>	Y	Y
<u>recordDestination@preference</u>	Y	Y
<u>desiredRecordQuality</u>	Y	Y
<u>desiredRecordQuality@type</u>	Y	Y
Content ID Related Properties		
<u>scheduledCDSObjectID</u>	N	N
<u>scheduledCDSObjectID@link</u>	Y	N
<u>scheduledChannelID</u>	N	N
<u>scheduledChannelID@type</u>	N	N
<u>scheduledChannelID@distriNetworkName</u>	N	N
<u>scheduledChannelID@distriNetworkID</u>	N	N
<u>scheduledStartTime</u>	N	N
<u>scheduledDuration</u>	N	N
<u>scheduledProgramCode</u>	Y	Y
<u>scheduledProgramCode@type</u>	Y	Y
Matching Content Criteria		
<u>matchingName</u>	Y	Y
<u>matchingName@type</u>	Y	Y
<u>matchingName@subStringMatch</u>	Y	Y
<u>matchingID</u>	Y	Y
<u>matchingID@type</u>	Y	Y
Matching Qualifying Criteria		
<u>matchingChannelID</u>	Y	Y
<u>matchingChannelID@type</u>	Y	Y
<u>matchingChannelID@distriNetworkName</u>	Y	Y
<u>matchingChannelID@distriNetworkID</u>	Y	Y
<u>matchingStartTimeRange</u>	Y	Y
<u>matchingDurationRange</u>	Y	Y
<u>matchingRatingLimit</u>	Y	Y
<u>matchingRatingLimit@type</u>	Y	Y
<u>matchingRatingLimit@equivalentAge</u>	Y	Y
<u>matchingEpisodeType</u>	Y	Y
Content Control Properties		
<u>totalDesiredRecordTasks</u>	Y	Y
<u>scheduledStartTimeAdjust</u>	Y	Y
<u>scheduledDurationAdjust</u>	Y	Y
<u>activePeriod</u>	N	N
<u>durationLimit</u>	N	N
<u>durationLimit@effect</u>	N	N
<u>channelMigration</u>	N	N
<u>timeMigration</u>	N	N
<u>allowDuplicates</u>	Y	Y
Storage Related Properties		
<u>persistedRecordings</u>	Y	Y
<u>persistedRecordings@latest</u>	Y	Y
<u>persistedRecordings@preAllocation</u>	Y	Y
<u>persistedRecordings@storedLifetime</u>	Y	Y
Schedule State Properties		
<u>scheduleState</u>	Y	Y
<u>scheduleState@currentErrors</u>	Y	Y
<u>abnormalTasksExist</u>	Y	Y
Statistics Properties		
<u>currentRecordTaskCount</u>	Y	Y
<u>totalCreatedRecordTasks</u>	Y	Y
<u>totalCompletedRecordTasks</u>	Y	Y

C.3.1.2 **object.recordSchedule.query** Class

The **object.recordSchedule.query** abstract class is derived from the **recordSchedule** base class. No object of this abstract class can be instantiated.

The main characteristic of the **object.recordSchedule.query** class is that the properties of the **recordSchedule** are used as *matching criteria* to select items from external sources (like EPG databases, side-band metadata streams in digital broadcasts, etc.). After appropriate searching and matching, the metadata from these external items is used to populate **recordTask** instances. This process ensures that the **recordTask** properties match the rules set forth in the **recordSchedule**'s properties (matching criteria).

The table below lists all standard defined properties (see Annex B for the definition of each property) and indicates the support level (**Required**, **Allowed**, **Not Allowed** or **Undefined**) in this class for **recordScheduleParts** (RSP) and **recordSchedule** (RS) usage for each property.

Table C.11 — **object.recordSchedule.query** Class Properties

Property Name	RSP	RS	Property Name	RSP	RS
Base Properties			Matching Qualifying Criteria		
<u>@id</u>	Y	Y	<u>matchingChannelID</u>	Y	Y
<u>title</u>	Y	Y	<u>matchingChannelID@type</u>	Y	Y
<u>class</u>	Y	Y	<u>matchingChannelID@distriNetworkName</u>	Y	Y
<u>additionalStatusInfo</u>	Y	Y	<u>matchingChannelID@distriNetworkID</u>	Y	Y
<u>cdsReference</u>	Y	N	<u>matchingStartTimeRange</u>	Y	Y
<u>cdsReference@link</u>	Y	N	<u>matchingDurationRange</u>	Y	Y
Priority Properties			<u>matchingRatingLimit</u>	Y	Y
<u>priority</u>	Y	Y	<u>matchingRatingLimit@type</u>	Y	Y
<u>priority@orderedValue</u>	Y	Y	<u>matchingRatingLimit@equivalentAge</u>	Y	Y
<u>desiredPriority</u>	Y	Y	<u>matchingEpisodeType</u>	Y	Y
<u>desiredPriority@type</u>	Y	Y	Content Control Properties		
Output Control Properties			<u>totalDesiredRecordTasks</u>	Y	Y
<u>recordDestination</u>	Y	Y	<u>scheduledStartTimeAdjust</u>	Y	Y
<u>recordDestination@mediaType</u>	Y	Y	<u>scheduledDurationAdjust</u>	Y	Y
<u>recordDestination@targetURL</u>	Y	Y	<u>activePeriod</u>	O	O
<u>recordDestination@preference</u>	Y	Y	<u>durationLimit</u>	O	O
<u>desiredRecordQuality</u>	Y	Y	<u>durationLimit@effect</u>	O	Y
<u>desiredRecordQuality@type</u>	Y	Y	<u>channelMigration</u>	O	O
Content ID Related Properties			<u>timeMigration</u>	O	O
<u>scheduledCDSObjectID</u>	N	N	<u>allowDuplicates</u>	O	O
<u>scheduledCDSObjectID@link</u>	Y	N	Storage Related Properties		
<u>scheduledChannelID</u>	N	N	<u>persistedRecordings</u>	Y	Y
<u>scheduledChannelID@type</u>	N	N	<u>persistedRecordings@latest</u>	Y	Y
<u>scheduledChannelID@distriNetworkName</u>	N	N	<u>persistedRecordings@preAllocation</u>	Y	Y
<u>scheduledChannelID@distriNetworkID</u>	N	N	<u>persistedRecordings@storedLifetime</u>	Y	Y
<u>scheduledStartTime</u>	N	N	Schedule State Properties		
<u>scheduledDuration</u>	N	N	<u>scheduleState</u>	Y	Y
<u>scheduledProgramCode</u>	N	N	<u>scheduleState@currentErrors</u>	Y	Y
<u>scheduledProgramCode@type</u>	N	N	<u>abnormalTasksExist</u>	Y	Y
Matching Content Criteria			Statistics Properties		
<u>matchingName</u>	Y	Y	<u>currentRecordTaskCount</u>	Y	Y
<u>matchingName@type</u>	Y	Y	<u>totalCreatedRecordTasks</u>	Y	Y
<u>matchingName@subStringMatch</u>	Y	Y	<u>totalCompletedRecordTasks</u>	Y	Y
<u>matchingID</u>	Y	Y			
<u>matchingID@type</u>	Y	Y			

C.3.1.2.1 **object.recordSchedule.query.contentName** Class

The object.recordSchedule.query.contentName class is used to create recordSchedule instances for scheduling of recordings, based on program or series name information. The content to be recorded is determined by matching the value, specified in the matchingName property to the names of content items made available to the ScheduledRecording service by required external resources like access to EPG databases, access to Service Information side-band data in digital broadcasts, etc. The matching process can be further restricted by providing a combination of Matching Qualifying Criteria properties. Any external content item shall match those additional criteria to be considered a potential candidate for recording.

The table below lists all standard defined properties (see Annex B for the definition of each property) and indicates the support level (Required, Allowed, Not Allowed or Undefined) in this class for recordScheduleParts (RSP) and recordSchedule (RS) usage for each property.

Table C.12 — **object.recordSchedule.query.contentName** Class Properties

Property Name	RSP	RS
Base Properties		
<u>@id</u>	Y	Y
<u>title</u>	Y	Y
<u>class</u>	Y	Y
<u>additionalStatusInfo</u>	Y	Y
<u>cdsReference</u>	Y	Y
<u>cdsReference@link</u>	Y	Y
Priority Properties		
<u>priority</u>	Y	Y
<u>priority@orderedValue</u>	Y	Y
<u>desiredPriority</u>	Y	Y
<u>desiredPriority@type</u>	Y	Y
Output Control Properties		
<u>recordDestination</u>	Y	Y
<u>recordDestination@mediaType</u>	Y	Y
<u>recordDestination@targetURL</u>	Y	Y
<u>recordDestination@preference</u>	Y	Y
<u>desiredRecordQuality</u>	Y	Y
<u>desiredRecordQuality@type</u>	Y	Y
Content ID Related Properties		
<u>scheduledCDSObjectID</u>	Y	Y
<u>scheduledCDSObjectID@link</u>	Y	Y
<u>scheduledChannelID</u>	Y	Y
<u>scheduledChannelID@type</u>	Y	Y
<u>scheduledChannelID@distriNetworkName</u>	Y	Y
<u>scheduledChannelID@distriNetworkID</u>	Y	Y
<u>scheduledStartDateTime</u>	Y	Y
<u>scheduledDuration</u>	Y	Y
<u>scheduledProgramCode</u>	Y	Y
<u>scheduledProgramCode@type</u>	Y	Y
Matching Content Criteria		
<u>matchingName</u>	R	R
<u>matchingName@type</u>	R	R
<u>matchingName@subStringMatch</u>	O	O
<u>matchingID</u>	N	N
<u>matchingID@type</u>	N	N

Property Name	RSP	RS
Matching Qualifying Criteria		
<u>matchingChannelID</u>	O	O
<u>matchingChannelID@type</u>	R	R
<u>matchingChannelID@distriNetworkName</u>	O	O
<u>matchingChannelID@distriNetworkID</u>	O	O
<u>matchingStartDateTimeRange</u>	O	O
<u>matchingDurationRange</u>	O	O
<u>matchingRatingLimit</u>	O	O
<u>matchingRatingLimit@type</u>	R	R
<u>matchingRatingLimit@equivalentAge</u>	O	O
<u>matchingEpisodeType</u>	O	O
Content Control Properties		
<u>totalDesiredRecordTasks</u>	Y	Y
<u>scheduledStartDateTimeAdjust</u>	Y	Y
<u>scheduledDurationAdjust</u>	Y	Y
<u>activePeriod</u>	Y	Y
<u>durationLimit</u>	Y	Y
<u>durationLimit@effect</u>	Y	Y
<u>channelMigration</u>	Y	Y
<u>timeMigration</u>	Y	Y
<u>allowDuplicates</u>	Y	Y
Storage Related Properties		
<u>persistedRecordings</u>	Y	Y
<u>persistedRecordings@latest</u>	Y	Y
<u>persistedRecordings@preAllocation</u>	Y	Y
<u>persistedRecordings@storedLifetime</u>	Y	Y
Schedule State Properties		
<u>scheduleState</u>	Y	Y
<u>scheduleState@currentErrors</u>	Y	Y
<u>abnormalTasksExist</u>	Y	Y
Statistics Properties		
<u>currentRecordTaskCount</u>	Y	Y
<u>totalCreatedRecordTasks</u>	Y	Y
<u>totalCompletedRecordTasks</u>	Y	Y

C.3.1.2.2 **object.recordSchedule.query.contentID** Class

The **object.recordSchedule.query.contentID** class is used to create **recordSchedule** instances for scheduling of recordings, based on program or series ID information. The content to be recorded is determined by matching the value, specified in the **matchingID** property to the IDs of content items made available to the ScheduledRecording service by required external resources like access to EPG databases, access Service Information side-band data in digital broadcasts, etc. The matching process can be further restricted by providing a combination of Matching Qualifying Criteria properties. Any external content item shall match those additional criteria to be considered a potential candidate for recording.

The table below lists all standard defined properties (see Annex B for the definition of each property) and indicates the support level (**Required**, **Allowed**, **Not Allowed** or **Undefined**) in this class for both *input* and *output* for each property.

Table C.13 — object.recordSchedule.query.contentID Class Properties

Property Name	RSP	RS
Base Properties		
<u>@id</u>	Y	Y
<u>title</u>	Y	Y
<u>class</u>	Y	Y
<u>additionalStatusInfo</u>	Y	Y
<u>cdsReference</u>	Y	Y
<u>cdsReference@link</u>	Y	Y
Priority Properties		
<u>priority</u>	Y	Y
<u>priority@orderedValue</u>	Y	Y
<u>desiredPriority</u>	Y	Y
<u>desiredPriority@type</u>	Y	Y
Output Control Properties		
<u>recordDestination</u>	Y	Y
<u>recordDestination@mediaType</u>	Y	Y
<u>recordDestination@targetURL</u>	Y	Y
<u>recordDestination@preference</u>	Y	Y
<u>desiredRecordQuality</u>	Y	Y
<u>desiredRecordQuality@type</u>	Y	Y
Content ID Related Properties		
<u>scheduledCDSObjectID</u>	Y	Y
<u>scheduledCDSObjectID@link</u>	Y	Y
<u>scheduledChannelID</u>	Y	Y
<u>scheduledChannelID@type</u>	Y	Y
<u>scheduledChannelID@distriNetworkName</u>	Y	Y
<u>scheduledChannelID@distriNetworkID</u>	Y	Y
<u>scheduledStartDateTime</u>	Y	Y
<u>scheduledDuration</u>	Y	Y
<u>scheduledProgramCode</u>	Y	Y
<u>scheduledProgramCode@type</u>	Y	Y
Matching Content Criteria		
<u>matchingName</u>	N	N
<u>matchingName@type</u>	N	N
<u>matchingName@subStringMatch</u>	N	N
<u>matchingID</u>	Y	Y
<u>matchingID@type</u>	Y	Y

Property Name	RSP	RS
Matching Qualifying Criteria		
<u>matchingChannelID</u>	N	N
<u>matchingChannelID@type</u>	N	N
<u>matchingChannelID@distriNetworkName</u>	N	N
<u>matchingChannelID@distriNetworkID</u>	N	N
<u>matchingStartDateTimeRange</u>	Y	Y
<u>matchingDurationRange</u>	Y	Y
<u>matchingRatingLimit</u>	Y	Y
<u>matchingRatingLimit@type</u>	Y	Y
<u>matchingRatingLimit@equivalentAge</u>	Y	Y
<u>matchingEpisodeType</u>	Y	Y
Content Control Properties		
<u>totalDesiredRecordTasks</u>	Y	Y
<u>scheduledStartDateTimeAdjust</u>	Y	Y
<u>scheduledDurationAdjust</u>	Y	Y
<u>activePeriod</u>	Y	Y
<u>durationLimit</u>	Y	Y
<u>durationLimit@effect</u>	Y	Y
<u>channelMigration</u>	Y	Y
<u>timeMigration</u>	Y	Y
<u>allowDuplicates</u>	Y	Y
Storage Related Properties		
<u>persistedRecordings</u>	Y	Y
<u>persistedRecordings@latest</u>	Y	Y
<u>persistedRecordings@preAllocation</u>	Y	Y
<u>persistedRecordings@storedLifetime</u>	Y	Y
Schedule State Properties		
<u>scheduleState</u>	Y	Y
<u>scheduleState@currentErrors</u>	Y	Y
<u>abnormalTasksExist</u>	Y	Y
Statistics Properties		
<u>currentRecordTaskCount</u>	Y	Y
<u>totalCreatedRecordTasks</u>	Y	Y
<u>totalCompletedRecordTasks</u>	Y	Y

C.3.2 object.recordTask Class

This is the base class for the ScheduledRecording service record task class hierarchy. Currently, this is the only class defined in this hierarchy. All recordTask objects in the ScheduledRecording service are members of this class. The object.recordTask class defines properties that are common to all recordTask list entries.

A recordTask object represents an actual recording occurrence. More sophisticated ScheduledRecording service implementations may implement allowed actions that allow a control point to manipulate individual recordTask instances. For example, the allowed DisableRecordTask() action can be used to selectively disable (that is: recording task suspended and any actual recording shall not occur) one or more recordTask instances, spawned from the same recordSchedule if not all recordings are desired.

A recordTask should be created by the ScheduledRecording service as soon as all necessary information (like EPG data) becomes available. It should be maintained at least until the recordTask has finished. It is recommended to maintain all completed recordTask instances for a reasonable time or until space is needed so that control points can retrieve recordTask state information after the recording has finished.

One or more recordTask instances can be created per recordSchedule. Some recordSchedule instances may not have a recordTask because they have not scheduled any recordings yet.

The list of the recordTask instances can be obtained using the BrowseRecordTasks() action. A recordTask can be disabled using the DisableRecordTask() action.

Note that a recordTask is not created by a control point directly; therefore, the *input* support level below indicates **Not Allowed** for all properties.

The table below lists all recordTask-related standard defined properties (recordSchedule-only properties are omitted from the table – see Annex B for the definition of each property) and indicates the support level (**Required**, **Allowed**, **Not Allowed** or **Undefined**) in this class for recordTask (RT) usage for each property.

Table C.14 — *object.recordTask* Base Class Properties

Property Name	RT	Property Name	RT
Base Properties		Matched Content Criteria	
<u>@id</u>	Y	<u>matchedName</u>	O
<u>title</u>	Y	<u>matchedName@type</u>	R
<u>class</u>	Y	<u>matchedID</u>	O
<u>additionalStatusInfo</u>	O	<u>matchedID@type</u>	R
<u>cdsReference</u>	O	Matched Qualifying Criteria	
<u>cdsReference@link</u>	R	<u>matchedRating</u>	O
Priority Properties		<u>matchedRating@type</u>	R
<u>priority</u>	R	<u>matchedRating@equivalentAge</u>	O
<u>priority@orderedValue</u>	O	<u>matchedEpisodeType</u>	O
<u>desiredPriority</u>	Y	Content Control Properties	
<u>desiredPriority@type</u>	Y	<u>taskStartDateTimeAdjust</u>	O
Output Control Properties		<u>taskDurationAdjust</u>	O
<u>recordDestination</u>	R	<u>taskDurationLimit</u>	O
<u>recordDestination@mediaType</u>	R	<u>taskDurationLimit@effect</u>	R
<u>recordDestination@targetURL</u>	O	<u>taskChannelMigration</u>	O
<u>recordDestination@preference</u>	R	<u>taskTimeMigration</u>	O
<u>desiredRecordQuality</u>	Y	Task State Properties	
<u>desiredRecordQuality@type</u>	Y	<u>taskState</u>	R
General Properties		<u>taskState@phase</u>	R
<u>recordScheduleID</u>	R	<u>taskState@startDateTimeMet</u>	O
<u>recordedCDSObjectID</u>	O	<u>taskState@endDateTimeMet</u>	O
<u>recordedCDSObjectID@link</u>	O	<u>taskState@recording</u>	R
Content ID Related Properties		<u>taskState@someBitsRecorded</u>	R
<u>taskCDSObjectID</u>	O	<u>taskState@someBitsMissing</u>	R
<u>taskCDSObjectID@link</u>	O	<u>taskState@firstBitsRecorded</u>	O
<u>taskChannelID</u>	R	<u>taskState@lastBitsRecorded</u>	O
<u>taskChannelID@type</u>	R	<u>taskState@fatalError</u>	R
<u>taskChannelID@distriNetworkName</u>	O	<u>taskState@currentErrors</u>	R
<u>taskChannelID@distriNetworkID</u>	O	<u>taskState@errorHistory</u>	R
<u>taskStartDateTime</u>	R	<u>taskState@pendingErrors</u>	R
<u>taskDuration</u>	R	<u>taskState@infoList</u>	R
<u>taskProgramCode</u>	O		
<u>taskProgramCode@type</u>	R		
<u>recordQuality</u>	R		
<u>recordQuality@type</u>	R		

Annex D (normative)

EBNF Syntax Definitions

Annex D defines the syntax used for some of the properties and classes described in this document. The syntax is formally defined using EBNF as described in subclause 4.1.3.

D.1 Priority Syntax

Note that due to possible future extensions, unknown value inputs shall be gracefully ignored. In this case, the semantics of the “DEFAULT” value shall be applied.

```

priority-value ::= standard-value |
                  extended-value (* extended-value is only
                  applicable if priority@orderedValue is
                  supported *)
standard-value ::= level | 'DEFAULT'
level          ::= ('L' number)
number         ::= (* integer (n>0) *)
extended-value ::= 'HIGHEST' | 'LOWEST' | level-hi | level-low | object-id
level-hi       ::= level '_HI'
level-low      ::= level '_LOW'
object-id      ::= (* @id value *)

```

D.2 Date&time Syntax

```

sched-start    ::= date-time |
                  day-of-yr-time |
                  named-day-time |
                  T-labeled-time |
                  'NOW'
start-range    ::= (date-time | 'PAST' | 'NOW') '/' (date-
time | 'INFINITY')
date-time-range ::= date-time '/' date-time

duration       ::= 'P' [n 'D'] time
duration-long  ::= duration | 'INFINITY'
duration-any   ::= duration | 'INFINITY' | 'ANY'
duration-adj   ::= ('+' | '-') duration
duration-range ::= duration '/' duration-long

date-time      ::= yyyy '-' mm '-' dd T-labeled-time
day-of-yr-time ::= mm '-' dd T-labeled-time
named-day-time ::= named-day T-labeled-time

T-labeled-time ::= 'T' time [zone]
time           ::= HH ':' MM ':' SS
zone           ::= 'Z' | (('+' | '-') HH ':' MM)
month-day      ::= mm '-' dd
named-day      ::= 'MON' | 'TUE' | 'WED' | 'THU' | 'FRI' | 'SAT' | 'SUN' |
                  'MON-FRI' | 'MON-SAT'
n              ::= 1 * DIGIT (* non-negative integer *)
yyyy           ::= 4 DIGIT (* 0001-9999 *)
mm             ::= 2 DIGIT (* 01-12 *)
dd             ::= 2 DIGIT (* 01-28, 01-29, 01-30, 01-31
                        based on month/year *)
HH             ::= 2 DIGIT (* 00-23 *)
MM             ::= 2 DIGIT (* 00-59 *)
SS             ::= 2 DIGIT (* 00-59 *)

```

D.3 Class Name Syntax

```

className      ::= 'OBJECT.' (sName|tName)
sName          ::= 'RECORDSCHEDULE.' (dName|qName)
tName          ::= 'RECORDTASK' ('.' shortName)*
dName          ::= 'DIRECT.' directName ('.' shortName)*
qName          ::= 'QUERY.' queryName ('.' shortName)*
directName     ::= 'MANUAL'|'CDSEPG'|'CDSNONEPG'|'PROGRAMCODE'
queryName      ::= 'CONTENTNAME'|'CONTENTID'
shortName      ::= (* valid XML 1.0 name, excluding the characters
                    '.' (UTF-8 code 0x2E)
                    and
                    ':' (UTF-8 code 0x3A) *)

```

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