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INTERNATIONAL STANDARD



**Information technology – UPnP device architecture –
Part 4-14: Audio Video Device Control Protocol – Level 2 – Scheduled Recording
Service**

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CONTENTS

1	Overview and Scope.....	8
1.1	Introduction	8
1.2	Notation	9
1.2.1	Data Types	9
1.2.2	Strings Embedded in Other Strings	9
1.2.3	Extended Backus-Naur Form	10
1.3	Derived Data Types.....	10
1.3.1	Comma Separated Value (CSV) Lists.....	11
1.4	Management of XML Namespaces in Standardized DCPs	12
1.4.1	Namespace Prefix Requirements	14
1.4.2	Namespace Names, Namespace Versioning and Schema Versioning	15
1.4.3	Namespace Usage Examples.....	17
1.5	Vendor-defined Extensions	18
1.5.1	Vendor-defined Action Names.....	18
1.5.2	Vendor-defined State Variable Names.....	18
1.5.3	Vendor-defined XML Elements and attributes	18
1.5.4	Vendor-defined Property Names	18
1.6	References.....	18
2	Service Modeling Definitions.....	22
2.1	ServiceType	22
2.2	Terms and Abbreviations	22
2.2.1	Abbreviations.....	22
2.2.2	Terms.....	22
2.3	ScheduledRecording Service Architecture.....	29
2.3.1	<i>recordSchedule</i>	29
2.3.2	<i>recordTask</i>	30
2.4	State Variables.....	31
2.4.1	State Variable Overview.....	32
2.4.2	<i>SortCapabilities</i>	32
2.4.3	<i>SortLevelCapability</i>	32
2.4.4	<i>StateUpdateID</i>	33
2.4.5	<i>LastChange</i>	33
2.4.6	<i>A_ARG_TYPE_PropertyList</i>	36
2.4.7	<i>A_ARG_TYPE_DataTypeID</i>	36
2.4.8	<i>A_ARG_TYPE_ObjectID</i>	36
2.4.9	<i>A_ARG_TYPE_ObjectIDList</i>	36
2.4.10	<i>A_ARG_TYPE_PropertyInfo</i>	36
2.4.11	<i>A_ARG_TYPE_Index</i>	37
2.4.12	<i>A_ARG_TYPE_Count</i>	37
2.4.13	<i>A_ARG_TYPE_SortCriteria</i>	37
2.4.14	<i>A_ARG_TYPE_RecordSchedule</i>	37
2.4.15	<i>A_ARG_TYPE_RecordTask</i>	37
2.4.16	<i>A_ARG_TYPE_RecordScheduleParts</i>	38
2.5	Eventing and Moderation	39
2.6	Actions.....	40

2.6.1	<u>GetSortCapabilities()</u>	40
2.6.2	<u>GetPropertyList()</u>	41
2.6.3	<u>GetAllowedValues()</u>	42
2.6.4	<u>GetStateUpdateID()</u>	44
2.6.5	<u>BrowseRecordSchedules()</u>	44
2.6.6	<u>BrowseRecordTasks()</u>	49
2.6.7	<u>CreateRecordSchedule()</u>	50
2.6.8	<u>DeleteRecordSchedule()</u>	53
2.6.9	<u>GetRecordSchedule()</u>	54
2.6.10	<u>EnableRecordSchedule()</u>	55
2.6.11	<u>DisableRecordSchedule()</u>	56
2.6.12	<u>DeleteRecordTask()</u>	57
2.6.13	<u>GetRecordTask()</u>	58
2.6.14	<u>EnableRecordTask()</u>	59
2.6.15	<u>DisableRecordTask()</u>	60
2.6.16	<u>ResetRecordTask()</u>	61
2.6.17	<u>GetRecordScheduleConflicts()</u>	62
2.6.18	<u>GetRecordTaskConflicts()</u>	63
2.6.19	Common Error Codes	64
2.7	State Diagram of <u>recordTask</u>	66
2.7.1	A Full-Featured State Diagram	66
2.7.2	A Minimal-Implementation State Diagram	71
2.7.3	<u>recordTask</u> State Example	74
2.8	ScheduledRecording Service Priority Model	75
2.8.1	Introduction of the ScheduledRecording Service Priority Model	75
2.8.2	Ordered Priority within Each Priority Level	76
2.8.3	Setting the Initial Priority Level of a <u>recordSchedule</u>	77
2.8.4	Sorting <u>recordSchedule</u> Instances Based on their Current Priority Settings	79
2.9	Theory of Operation	79
2.9.1	Introduction	79
2.9.2	Checking the Capabilities of a ScheduledRecording Service	79
2.9.3	Adding a Scheduled Recording Entry to the List	90
2.9.4	Deleting a <u>recordSchedule</u>	102
2.9.5	Browsing <u>recordSchedule</u> and <u>recordTask</u> instances	103
2.9.6	Rating System	108
2.9.7	Conflict Detection and Resolution	109
3	XML Service Description	110
4	Test	118
Annex A	(normative) srs XML Document	119
A.1	<u>A_ARG_TYPE_RecordSchedule</u> AVDT XML Document	119
A.2	<u>A_ARG_TYPE_RecordTask</u> AVDT XML Document	120
A.3	<u>A_ARG_TYPE_RecordScheduleParts</u> AVDT XML Document	120
Annex B	(normative) AV Working Committee Extended Properties	122
B.1	Base Properties	122
B.1.1	<u>@id</u>	122
B.1.2	<u>title</u>	122
B.1.3	<u>class</u>	123
B.1.4	<u>additionalStatusInfo</u>	123

B.1.5	<u>cdsReference</u>	124
B.2	Priority Properties	125
B.2.1	<u>priority</u>	125
B.2.2	<u>desiredPriority</u>	126
B.2.3	<u>desiredPriority@type</u>	128
B.3	Output Control Properties	128
B.3.1	<u>recordDestination</u>	128
B.3.2	<u>desiredRecordQuality</u>	130
B.4	Content Identification Related Properties	133
B.4.1	<u>scheduledCDSObjectID</u>	133
B.4.2	<u>scheduledChannelID</u>	134
B.4.3	<u>scheduledStartDateTime</u>	136
B.4.4	<u>scheduledDuration</u>	137
B.4.5	<u>scheduledProgramCode</u>	137
B.5	Matching Content Criteria Properties	138
B.5.1	<u>matchingName</u>	138
B.5.2	<u>matchingID</u>	139
B.6	Matching Qualifying Criteria Properties	140
B.6.1	<u>matchingChannelID</u>	140
B.6.2	<u>matchingStartDateTimeRange</u>	142
B.6.3	<u>matchingDurationRange</u>	142
B.6.4	<u>matchingRatingLimit</u>	143
B.6.5	<u>matchingEpisodeType</u>	145
B.7	Content Control Properties	146
B.7.1	<u>totalDesiredRecordTasks</u>	146
B.7.2	<u>scheduledStartDateTimeAdjust</u>	146
B.7.3	<u>scheduledDurationAdjust</u>	147
B.7.4	<u>activePeriod</u>	147
B.7.5	<u>durationLimit</u>	148
B.7.6	<u>channelMigration</u>	149
B.7.7	<u>timeMigration</u>	149
B.7.8	<u>allowDuplicates</u>	150
B.8	Storage Related Properties	150
B.8.1	<u>persistedRecordings</u>	150
B.9	Schedule State Properties	152
B.9.1	<u>scheduleState</u>	152
B.9.2	<u>abnormalTasksExist</u>	153
B.10	Statistics Properties	153
B.10.1	<u>currentRecordTaskCount</u>	154
B.10.2	<u>totalCreatedRecordTasks</u>	154
B.10.3	<u>totalCompletedRecordTasks</u>	154
B.11	Task General Properties	155
B.11.1	<u>recordScheduleID</u>	155
B.11.2	<u>recordedCDSObjectID</u>	155
B.12	Task Content Identification Properties	156
B.12.1	<u>taskCDSObjectID</u>	156
B.12.2	<u>taskChannelID</u>	157
B.12.3	<u>taskStartDateTime</u>	158
B.12.4	<u>taskDuration</u>	158

B.12.5	<u>taskProgramCode</u>	159
B.12.6	<u>recordQuality</u>	159
B.13	Task Matched Content Criteria Properties	161
B.13.1	<u>matchedName</u>	161
B.13.2	<u>matchedID</u>	162
B.14	Task Matched Qualifying Criteria Properties	163
B.14.1	<u>matchedRating</u>	163
B.14.2	<u>matchedRating@type</u>	163
B.14.3	<u>matchedEpisodeType</u>	163
B.15	Task Matched Content Control Properties	164
B.15.1	<u>taskStartDateTimeAdjust</u>	164
B.15.2	<u>taskDurationAdjust</u>	164
B.15.3	<u>taskDurationLimit</u>	164
B.15.4	<u>taskDurationLimit@effect</u>	165
B.15.5	<u>taskChannelMigration</u>	165
B.15.6	<u>taskTimeMigration</u>	165
B.16	Task State Properties	166
B.16.1	<u>taskState</u>	166
B.17	ContentDirectory Service Imported Properties	175
Annex C	(normative) AV Working Committee Class Definitions	180
C.1	Class Hierarchy	180
C.1.1	Relationships between Classes and Properties	181
C.1.2	<u>recordScheduleParts</u> Properties	182
C.1.3	<u>recordSchedule</u> Properties	186
C.1.4	<u>recordTask</u> Properties	190
C.2	Class Definitions	192
C.3	<u>object</u> Base Class	193
C.3.1	<u>object.recordSchedule</u> Class	194
C.3.2	<u>object.recordTask</u> Class	207
Annex D	(normative) EBNF Syntax Definitions	209
D.1	Priority Syntax	209
D.2	Date&time Syntax	209
D.3	Class Name Syntax	209
Annex E	(informative) ScheduledRecording Service Relationship to ContentDirectory Service	211
Annex F	(informative) ScheduledRecording Service Relationship to EPG	212
Annex G	(informative) AVDT Examples	213
G.1	<u>A_ARG_TYPE_RecordSchedule</u> AVDT Example	213
G.2	<u>A_ARG_TYPE_RecordTask</u> AVDT Example	228
G.3	<u>A_ARG_TYPE_RecordScheduleParts</u> AVDT Example	244
Figure 1	— Creating a new <u>recordSchedule</u>	29
Figure 2	— Capability check.	30
Figure 3	— Browse <u>recordSchedule</u>	30
Figure 4	— Delete a <u>recordSchedule</u>	30
Figure 5	— A Full-Featured State Diagram	67
Figure 6	— A Minimal-Implementation State Diagram	72

Figure 7 — Class hierarchy for the ScheduledRecording service	181
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Table 1-1 — EBNF Operators	10
Table 1-2 — CSV Examples.....	11
Table 1-3 — Namespace Definitions	13
Table 1-4 — Schema-related Information	14
Table 1-5 — Default Namespaces for the AV Specifications	15
Table 2-1 — Abbreviations.....	22
Table 2-1 — Properties in XML	25
Table 2-2 — State Variables	32
Table 2-3 — allowedValueList for the <u>DataTypeID</u> argument	32
Table 2-4 — Allowed Elements in <StateEvent> Element.....	34
Table 2-5 — Eventing and Moderation	39
Table 2-6 — Actions	40
Table 2-7 — Arguments for <u>GetSortCapabilities()</u>	40
Table 2-8 — Error Codes for <u>GetSortCapabilities()</u>	41
Table 2-9 — Arguments for <u>GetPropertyList()</u>	41
Table 2-10 — Error Codes for <u>GetPropertyList()</u>	42
Table 2-11 — Arguments for <u>GetAllowedValues()</u>	42
Table 2-12 — Error Codes for <u>GetAllowedValues()</u>	43
Table 2-13 — Arguments for <u>GetStateUpdateID()</u>	44
Table 2-14 — Error Codes for <u>GetStateUpdateID()</u>	44
Table 2-15 — Arguments for <u>BrowseRecordSchedules()</u>	44
Table 2-16 — Error Codes for <u>BrowseRecordSchedules()</u>	48
Table 2-17 — Arguments for <u>BrowseRecordTasks()</u>	49
Table 2-18 — Error Codes for <u>BrowseRecordTasks()</u>	50
Table 2-19 — Arguments for <u>CreateRecordSchedule()</u>	51
Table 2-20 — Error Codes for <u>CreateRecordSchedule()</u>	53
Table 2-21 — Arguments for <u>DeleteRecordSchedule()</u>	54
Table 2-22 — Error Codes for <u>DeleteRecordSchedule()</u>	54
Table 2-23 — Arguments for <u>GetRecordSchedule()</u>	54
Table 2-24 — Error Codes for <u>GetRecordSchedule()</u>	55
Table 2-25 — Arguments for <u>EnableRecordSchedule()</u>	56
Table 2-26 — Error Codes for <u>EnableRecordSchedule()</u>	56
Table 2-27 — Arguments for <u>DisableRecordSchedule()</u>	57
Table 2-28 — Error Codes for <u>DisableRecordSchedule()</u>	57
Table 2-29 — Arguments for <u>DeleteRecordTask()</u>	57
Table 2-30 — Error Codes for <u>DeleteRecordTask()</u>	58
Table 2-31 — Arguments for <u>GetRecordTask()</u>	58
Table 2-32 — Error Codes for <u>GetRecordTask()</u>	59
Table 2-33 — Arguments for <u>EnableRecordTask()</u>	59
Table 2-34 — Error Codes for <u>EnableRecordTask()</u>	60
Table 2-35 — Arguments for <u>DisableRecordTask()</u>	60

Table 2-36 — Error Codes for <u>DisableRecordTask()</u>	61
Table 2-37 — Arguments for <u>ResetRecordTask()</u>	61
Table 2-38 — Error Codes for <u>ResetRecordTask()</u>	62
Table 2-39 — Arguments for <u>GetRecordScheduleConflicts()</u>	62
Table 2-40 — Error Codes for <u>GetRecordScheduleConflicts()</u>	63
Table 2-41 — Arguments for <u>GetRecordTaskConflicts()</u>	63
Table 2-42 — Error Codes for <u>GetRecordTaskConflicts()</u>	64
Table 2-43 — Common Error Codes	65
Table 2-44 — <u>recordTask</u> State Timeline	75
Table 2-45 — Example 1: Fewer <u>recordSchedule</u> instances than the Number of Supported Priority Levels.....	76
Table 2-46 — Example 2: More <u>recordSchedule</u> instances than the Number of Supported Priority Levels.....	77
Table 2-47 — Existing <u>recordSchedule</u> Priorities	78
Table 2-48 — <u>desiredPriority</u> Property Set to “RS-C”	78
Table 2-49 — <u>desiredPriority</u> Property Set to “HIGHEST”, “L1_HI”, or “RS-A”	78
Table 2-50 — <u>desiredPriority</u> Property Set to “LOWEST”, “L3_LOW”, or “RS-B”	79
Table 2-51 — <u>desiredPriority</u> Property Set to “RS-C”	79
Table B.1 — Base Properties Overview.....	122
Table B.2 — allowedValueList for the <u>class</u> Property.....	123
Table B.3 — Priority Properties.....	125
Table B.4 — allowedValueList for the <u>priority</u> Property	125
Table B.5 — Primary allowedValueList for the <u>desiredPriority</u> Property	126
Table B.6 — Additional allowedValueList for the <u>desiredPriority</u> Property	127
Table B.7 — allowedValueList for the <u>desiredPriority@type</u> Property.....	128
Table B.8 — Output Control Properties	128
Table B.9 — <u>desiredRecordQuality</u> Example	131
Table B.10 — allowedValueList for the <u>desiredRecordQuality</u> Property	132
Table B.11 — allowedValueList for the <u>desiredRecordQuality@type</u> Property	132
Table B.12 — Content Identification Related Properties	133
Table B.13 — allowedValueList for the <u>scheduledChannelID@type</u> Property	135
Table B.14 — Matching Content Criteria Properties.....	138
Table B.15 — allowedValueList for the <u>matchingName@type</u> Property	139
Table B.16 — allowedValueList for the <u>matchingID@type</u> Property.....	140
Table B.17 — Matching Qualifying Criteria Properties	140
Table B.18 — allowedValueList for the <u>matchingRatingLimit</u> Property Using the MPAA Rating System (<u>matchingRatingLimit@type</u> = “MPAA.ORG”)	143
Table B.19 — allowedValueList for the <u>matchingRatingLimit</u> Property Using the RIAA Rating System (<u>matchingRatingLimit@type</u> = “RIAA.ORG”)	144
Table B.20 — allowedValueList for the <u>matchingRatingLimit</u> Property Using the ESRB Rating System (<u>matchingRatingLimit@type</u> = “ESRB.ORG”)	144
Table B.21 — allowedValueList for the <u>matchingRatingLimit</u> Property Using the TVGUIDELINES Rating System (<u>matchingRatingLimit@type</u> = “TVGUIDELINES.ORG”)	144
Table B.22 — allowedValueList for the <u>matchingRatingLimit@type</u> Property	145
Table B.23 — allowedValueList for the <u>matchingEpisodeType</u> Property	145

Table B.24 — Content Control Properties.....	146
Table B.25 — allowedValueList for the <u>durationLimit@effect</u> Property	149
Table B.26 — Storage Related Properties	150
Table B.27 — Schedule State Properties	152
Table B.28 — allowedValueList for the <u>scheduleState</u> Property	152
Table B.29 — allowedValueList for the <u>scheduleState@currentErrors</u> Property.....	153
Table B.30 — Statistics Properties.....	153
Table B.31 — Task General Properties	155
Table B.32 — Task Content Identification Properties.....	156
Table B.33 — <u>recordQuality</u> Example.....	160
Table B.34 — allowedValueList for the <u>recordQuality</u> Property	161
Table B.35 — Task Matched Content Criteria Properties	161
Table B.36 — Task Matched Qualifying Criteria Properties.....	163
Table B.37 — Task Matched Content Control Properties	164
Table B.38 — State Related Properties	166
Table B.39 — allowedValueList for the <u>taskState</u> Property	167
Table B.40 — allowedValueList for the <u>taskState</u> Property	167
Table B.41 — allowedValueList for the <u>taskState@phase</u> Property.....	169
Table B.42 — allowedValueList for the <u>taskState@xxx</u> Properties	173
Table C.1 — Class Properties Overview for <u>recordScheduleParts</u> usage	183
Table C.2 — Class Properties Overview for <u>recordSchedule</u> usage	187
Table C.3 — Class Properties Overview for <u>recordTask</u> usage	191
Table C.4 — <u>object</u> Base Class Properties.....	193
Table C.5 — <u>object.recordSchedule</u> Base Class Properties	194
Table C.6 — <u>object.recordSchedule.direct</u> Class Properties	196
Table C.7 — <u>object.recordSchedule.direct.manual</u> Class Properties	197
Table C.8 — <u>object.recordSchedule.direct.cdsEPG</u> Class Properties.....	198
Table C.9 — <u>object.recordSchedule.direct.cdsNonEPG</u> Class Properties.....	201
Table C.10 — <u>object.recordSchedule.direct.programCode</u> Class Properties.....	202
Table C.11 — <u>object.recordSchedule.query</u> Class Properties	203
Table C.12 — <u>object.recordSchedule.query.contentName</u> Class Properties	205
Table C.13 — <u>object.recordSchedule.query.contentID</u> Class Properties.....	206
Table C.14 — <u>object.recordTask</u> Base Class Properties.....	208

INFORMATION TECHNOLOGY – UPNP DEVICE ARCHITECTURE –

Part 4-14: Audio Video Device Control Protocol – Level 2 – Scheduled Recording Service

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This International Standard has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

¹ UPnP Forum Steering committee, UPnP Forum, 3855 SW 153rd Drive, Beaverton, Oregon 97006 USA. See also "Introduction".

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1 Overview and Scope

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

1.1 Introduction

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 MUST 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.

1.2 Notation

- In this document, features are described as Required, Recommended, or Optional as follows:

The keywords “MUST,” “MUST NOT,” “REQUIRED,” “SHALL,” “SHALL NOT,” “SHOULD,” “SHOULD NOT,” “RECOMMENDED,” “MAY,” and “OPTIONAL” in this specification are to be interpreted as described in [RFC 2119].

In addition, the following keywords are used in this specification:

PROHIBITED – The definition or behavior is prohibited by this specification. Opposite of **REQUIRED**.

CONDITIONALLY REQUIRED – The definition or behavior depends on a condition. If the specified condition is met, then the definition or behavior is **REQUIRED**, otherwise it is **PROHIBITED**.

CONDITIONALLY OPTIONAL – The definition or behavior depends on a condition. If the specified condition is met, then the definition or behavior is **OPTIONAL**, otherwise it is **PROHIBITED**.

These keywords are thus capitalized when used to unambiguously specify requirements over protocol and application features and behavior that affect the interoperability and security of implementations. When these words are not capitalized, they are meant in their natural-language sense.

- Strings that are to be taken literally are enclosed in “double quotes”.
- Words that are emphasized are printed in *italic*.
- Keywords that are defined by the UPnP AV Working Committee are printed using the *forum* character style.
- Keywords that are defined by the UPnP Device Architecture specification are printed using the *arch* character style [DEVICE].
- A double colon delimiter, “::”, 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.

1.2.1 Data Types

This specification uses data type definitions from two different sources. The UPnP Device Architecture defined data types are used to define state variable and action argument data types [DEVICE]. The XML Schema namespace is used to define property data types [XML SCHEMA-2].

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

1.2.2 Strings Embedded in Other Strings

Some string variables and arguments described in this document contain substrings that **MUST** 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 Clause 1.3.1, “Comma Separated Value (CSV) Lists”) 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

1.2.3 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 [EBNF].

1.2.3.1 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 MUST 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:

Table 1-1 — EBNF Operators

Operator	Semantics
: =	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.
	alternative separator – separates sequences on the right that are independently allowed definitions for the non-terminal on the left.
*	null repetition – means the expression to its left MAY occur zero or more times.
+	non-null repetition – means the expression to its left MUST occur at least once and MAY occur more times.
[]	optional – the expression between the brackets is optional.
()	grouping – groups the expressions between the parentheses.
-	character range – represents all characters between the left and right character operands inclusively.

1.3 Derived Data Types

This clause 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 applies to both string data types.