

# 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  | <a href="#"><u>GetSortCapabilities()</u></a>   | 40  |
| 2.6.2  | <a href="#"><u>GetPropertyList()</u></a>   | 41  |
| 2.6.3  | <a href="#"><u>GetAllowedValues()</u></a>  | 42  |
| 2.6.4  | <a href="#"><u>GetStateUpdateID()</u></a>  | 44  |
| 2.6.5  | <a href="#"><u>BrowseRecordSchedules()</u></a>   | 44  |
| 2.6.6  | <a href="#"><u>BrowseRecordTasks()</u></a>   | 49  |
| 2.6.7  | <a href="#"><u>CreateRecordSchedule()</u></a>  | 50  |
| 2.6.8  | <a href="#"><u>DeleteRecordSchedule()</u></a>  | 53  |
| 2.6.9  | <a href="#"><u>GetRecordSchedule()</u></a>   | 54  |
| 2.6.10 | <a href="#"><u>EnableRecordSchedule()</u></a>  | 55  |
| 2.6.11 | <a href="#"><u>DisableRecordSchedule()</u></a>   | 56  |
| 2.6.12 | <a href="#"><u>DeleteRecordTask()</u></a>  | 57  |
| 2.6.13 | <a href="#"><u>GetRecordTask()</u></a>   | 58  |
| 2.6.14 | <a href="#"><u>EnableRecordTask()</u></a>  | 59  |
| 2.6.15 | <a href="#"><u>DisableRecordTask()</u></a>   | 60  |
| 2.6.16 | <a href="#"><u>ResetRecordTask()</u></a>   | 61  |
| 2.6.17 | <a href="#"><u>GetRecordScheduleConflicts()</u></a>  | 62  |
| 2.6.18 | <a href="#"><u>GetRecordTaskConflicts()</u></a>  | 63  |
| 2.6.19 | Common Error Codes   | 64  |
| 2.7    | State Diagram of <a href="#"><u>recordTask</u></a>   | 66  |
| 2.7.1  | A Full-Featured State Diagram  | 66  |
| 2.7.2  | A Minimal-Implementation State Diagram   | 71  |
| 2.7.3  | <a href="#"><u>recordTask</u></a> 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 <a href="#"><u>recordSchedule</u></a>                    | 77  |
| 2.8.4  | Sorting <a href="#"><u>recordSchedule</u></a> 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 <a href="#"><u>recordSchedule</u></a>   | 102 |
| 2.9.5  | Browsing <a href="#"><u>recordSchedule</u></a> and <a href="#"><u>recordTask</u></a> 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    | <a href="#"><u>A_ARG_TYPE_RecordSchedule</u></a> AVDT XML Document                               | 119 |
| A.2    | <a href="#"><u>A_ARG_TYPE_RecordTask</u></a> AVDT XML Document                                   | 120 |
| A.3    | <a href="#"><u>A_ARG_TYPE_RecordScheduleParts</u></a> AVDT XML Document                          | 120 |
|        | Annex B (normative) AV Working Committee Extended Properties                                     | 122 |
| B.1    | Base Properties  | 122 |
| B.1.1  | <a href="#"><u>@id</u></a>   | 122 |
| B.1.2  | <a href="#"><u>title</u></a>   | 122 |
| B.1.3  | <a href="#"><u>class</u></a>   | 123 |
| B.1.4  | <a href="#"><u>additionalStatusInfo</u></a>  | 123 |

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

|                       |  |     |
|-----------------------|--|-----|
| B.12.5                | <a href="#"><u>taskProgramCode</u></a> .....                             | 159 |
| B.12.6                | <a href="#"><u>recordQuality</u></a> .....                               | 159 |
| B.13                  | Task Matched Content Criteria Properties.....                            | 161 |
| B.13.1                | <a href="#"><u>matchedName</u></a> .....                                 | 161 |
| B.13.2                | <a href="#"><u>matchedID</u></a> .....                                   | 162 |
| B.14                  | Task Matched Qualifying Criteria Properties.....                         | 163 |
| B.14.1                | <a href="#"><u>matchedRating</u></a> .....                               | 163 |
| B.14.2                | <a href="#"><u>matchedRating@type</u></a> .....                          | 163 |
| B.14.3                | <a href="#"><u>matchedEpisodeType</u></a> .....                          | 163 |
| B.15                  | Task Matched Content Control Properties.....                             | 164 |
| B.15.1                | <a href="#"><u>taskStartDateTimeAdjust</u></a> .....                     | 164 |
| B.15.2                | <a href="#"><u>taskDurationAdjust</u></a> .....                          | 164 |
| B.15.3                | <a href="#"><u>taskDurationLimit</u></a> .....                           | 164 |
| B.15.4                | <a href="#"><u>taskDurationLimit@effect</u></a> .....                    | 165 |
| B.15.5                | <a href="#"><u>taskChannelMigration</u></a> .....                        | 165 |
| B.15.6                | <a href="#"><u>taskTimeMigration</u></a> .....                           | 165 |
| B.16                  | Task State Properties.....   | 166 |
| B.16.1                | <a href="#"><u>taskState</u></a> .....                                   | 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                 | <a href="#"><u>recordScheduleParts</u></a> Properties.....               | 182 |
| C.1.3                 | <a href="#"><u>recordSchedule</u></a> Properties.....                    | 186 |
| C.1.4                 | <a href="#"><u>recordTask</u></a> Properties.....                        | 190 |
| C.2                   | Class Definitions.....   | 192 |
| C.3                   | <a href="#"><u>object</u></a> Base Class.....                            | 193 |
| C.3.1                 | <a href="#"><u>object.recordSchedule</u></a> Class.....                  | 194 |
| C.3.2                 | <a href="#"><u>object.recordTask</u></a> 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                   | <a href="#"><u>A_ARG_TYPE_RecordSchedule</u></a> AVDT Example.....       | 213 |
| G.2                   | <a href="#"><u>A_ARG_TYPE_RecordTask</u></a> AVDT Example.....           | 228 |
| G.3                   | <a href="#"><u>A_ARG_TYPE_RecordScheduleParts</u></a> AVDT Example.....  | 244 |
| Figure 1              | — Creating a new <a href="#"><u>recordSchedule</u></a> .....             | 29  |
| Figure 2              | — Capability check.....  | 30  |
| Figure 3              | — Browse <a href="#"><u>recordSchedule</u></a> .....                     | 30  |
| Figure 4              | — Delete a <a href="#"><u>recordSchedule</u></a> .....                   | 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 |
| 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 <a href="#">DisableRecordTask()</a> .....  | 61  |
| Table 2-37 — Arguments for <a href="#">ResetRecordTask()</a> .....  | 61  |
| Table 2-38 — Error Codes for <a href="#">ResetRecordTask()</a> .....  | 62  |
| Table 2-39 — Arguments for <a href="#">GetRecordScheduleConflicts()</a> .....   | 62  |
| Table 2-40 — Error Codes for <a href="#">GetRecordScheduleConflicts()</a> .....   | 63  |
| Table 2-41 — Arguments for <a href="#">GetRecordTaskConflicts()</a> .....   | 63  |
| Table 2-42 — Error Codes for <a href="#">GetRecordTaskConflicts()</a> .....   | 64  |
| Table 2-43 — Common Error Codes .....   | 65  |
| Table 2-44 — <a href="#">recordTask</a> State Timeline .....  | 75  |
| Table 2-45 — Example 1: Fewer <a href="#">recordSchedule</a> instances than the Number of Supported Priority Levels.....  | 76  |
| Table 2-46 — Example 2: More <a href="#">recordSchedule</a> instances than the Number of Supported Priority Levels.....   | 77  |
| Table 2-47 — Existing <a href="#">recordSchedule</a> Priorities .....   | 78  |
| Table 2-48 — <a href="#">desiredPriority</a> Property Set to “RS-C” .....   | 78  |
| Table 2-49 — <a href="#">desiredPriority</a> Property Set to “HIGHEST”, “L1_H”, or “RS-A” .....   | 78  |
| Table 2-50 — <a href="#">desiredPriority</a> Property Set to “LOWEST”, “L3_LOW”, or “RS-B” .....  | 79  |
| Table 2-51 — <a href="#">desiredPriority</a> Property Set to “RS-C” .....   | 79  |
| Table B.1 — Base Properties Overview.....   | 122 |
| Table B.2 — allowedValueList for the <a href="#">class</a> Property.....  | 123 |
| Table B.3 — Priority Properties.....  | 125 |
| Table B.4 — allowedValueList for the <a href="#">priority</a> Property.....   | 125 |
| Table B.5 — Primary allowedValueList for the <a href="#">desiredPriority</a> Property.....  | 126 |
| Table B.6 — Additional allowedValueList for the <a href="#">desiredPriority</a> Property .....  | 127 |
| Table B.7 — allowedValueList for the <a href="#">desiredPriority@type</a> Property.....   | 128 |
| Table B.8 — Output Control Properties .....   | 128 |
| Table B.9 — <a href="#">desiredRecordQuality</a> Example .....  | 131 |
| Table B.10 — allowedValueList for the <a href="#">desiredRecordQuality</a> Property.....  | 132 |
| Table B.11 — allowedValueList for the <a href="#">desiredRecordQuality@type</a> Property.....   | 132 |
| Table B.12 — Content Identification Related Properties .....  | 133 |
| Table B.13 — allowedValueList for the <a href="#">scheduledChannelID@type</a> Property .....  | 135 |
| Table B.14 — Matching Content Criteria Properties.....  | 138 |
| Table B.15 — allowedValueList for the <a href="#">matchingName@type</a> Property .....  | 139 |
| Table B.16 — allowedValueList for the <a href="#">matchingID@type</a> Property.....   | 140 |
| Table B.17 — Matching Qualifying Criteria Properties .....  | 140 |
| Table B.18 — allowedValueList for the <a href="#">matchingRatingLimit</a> Property Using the MPAA Rating System ( <a href="#">matchingRatingLimit@type</a> = “MPAA.ORG”) .....                | 143 |
| Table B.19 — allowedValueList for the <a href="#">matchingRatingLimit</a> Property Using the RIAA Rating System ( <a href="#">matchingRatingLimit@type</a> = “RIAA.ORG”) .....                | 144 |
| Table B.20 — allowedValueList for the <a href="#">matchingRatingLimit</a> Property Using the ESRB Rating System ( <a href="#">matchingRatingLimit@type</a> = “ESRB.ORG”).....                 | 144 |
| Table B.21 — allowedValueList for the <a href="#">matchingRatingLimit</a> Property Using the TVGUIDELINES Rating System ( <a href="#">matchingRatingLimit@type</a> = “TVGUIDELINES.ORG”) .... | 144 |
| Table B.22 — allowedValueList for the <a href="#">matchingRatingLimit@type</a> Property.....  | 145 |
| Table B.23 — allowedValueList for the <a href="#">matchingEpisodeType</a> Property .....  | 145 |

|  |     |
|--|-----|
| Table B.24 — Content Control Properties.....   | 146 |
| Table B.25 — allowedValueList for the <u><a href="#">durationLimit@effect</a></u> Property .....       | 149 |
| Table B.26 — Storage Related Properties .....  | 150 |
| Table B.27 — Schedule State Properties .....   | 152 |
| Table B.28 — allowedValueList for the <u><a href="#">scheduleState</a></u> Property .....              | 152 |
| Table B.29 — allowedValueList for the <u><a href="#">scheduleState@currentErrors</a></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><a href="#">recordQuality</a></u> Example.....   | 160 |
| Table B.34 — allowedValueList for the <u><a href="#">recordQuality</a></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><a href="#">taskState</a></u> Property .....                  | 167 |
| Table B.40 — allowedValueList for the <u><a href="#">taskState</a></u> Property .....                  | 167 |
| Table B.41 — allowedValueList for the <u><a href="#">taskState@phase</a></u> Property .....            | 169 |
| Table B.42 — allowedValueList for the <u><a href="#">taskState@xxx</a></u> Properties .....            | 173 |
| Table C.1 — Class Properties Overview for <u><a href="#">recordScheduleParts</a></u> usage .....       | 183 |
| Table C.2 — Class Properties Overview for <u><a href="#">recordSchedule</a></u> usage .....            | 187 |
| Table C.3 — Class Properties Overview for <u><a href="#">recordTask</a></u> usage .....                | 191 |
| Table C.4 — <u><a href="#">object</a></u> Base Class Properties .....                                  | 193 |
| Table C.5 — <u><a href="#">object.recordSchedule</a></u> Base Class Properties .....                   | 194 |
| Table C.6 — <u><a href="#">object.recordSchedule.direct</a></u> Class Properties .....                 | 196 |
| Table C.7 — <u><a href="#">object.recordSchedule.direct.manual</a></u> Class Properties .....          | 197 |
| Table C.8 — <u><a href="#">object.recordSchedule.direct.cdsEPG</a></u> Class Properties.....           | 198 |
| Table C.9 — <u><a href="#">object.recordSchedule.direct.cdsNonEPG</a></u> Class Properties.....        | 201 |
| Table C.10 — <u><a href="#">object.recordSchedule.direct.programCode</a></u> Class Properties.....     | 202 |
| Table C.11 — <u><a href="#">object.recordSchedule.query</a></u> Class Properties .....                 | 203 |
| Table C.12 — <u><a href="#">object.recordSchedule.query.contentName</a></u> Class Properties .....     | 205 |
| Table C.13 — <u><a href="#">object.recordSchedule.query.contentID</a></u> Class Properties.....        | 206 |
| Table C.14 — <u><a href="#">object.recordTask</a></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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International Standard ISO/IEC 29341-4-14 was prepared by UPnP Forum Steering committee<sup>1</sup>, was adopted, under the fast track procedure, by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

This International Standard replaces ISO/IEC 29341-4-14, first edition, published in 2008, and constitutes a technical revision.

The list of all currently available parts of the ISO/IEC 29341 series, under the general title *Information technology – UPnP device architecture*, can be found on the IEC web site.

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.

<sup>1</sup> UPnP Forum Steering committee, UPnP Forum, 3855 SW 153<sup>rd</sup> 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   |
|----------|---|
| ::=      | <b>definition</b> – the non-terminal symbol on the left is defined by one or more alternative sequences of terminals and/or non-terminals to its right. |
|          | <b>alternative separator</b> – separates sequences on the right that are independently allowed definitions for the non-terminal on the left.            |
| *        | <b>null repetition</b> – means the expression to its left MAY occur zero or more times.   |
| +        | <b>non-null repetition</b> – means the expression to its left MUST occur at least once and MAY occur more times.  |
| [ ]      | <b>optional</b> – the expression between the brackets is optional.  |
| ( )      | <b>grouping</b> – groups the expressions between the parentheses.   |
| -        | <b>character range</b> – 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.