ISO/IEC 29341-3-13

Edition 1.0 2008-11

INTERNATIONAL STANDARD

Information technology – UPnP Device Architecture – Part 3-13: Audio Video Device Control Protocol – Rendering Control Service

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRICE CODE U

ICS 35.200

ISBN 2-8318-1005-7

CONTENTS

FOREWORD 5
ORIGINAL UPNP DOCUMENTS (informative) 7
1. Overview and Scope 9
1.1. Introduction 9
1.2. Multi-input Devices 9
2. Service Modeling Definitions 10
2.1. Service Type 10
2.2. State Variables 10
2.2.1. *LastChange* 13
2.2.2. *PresetNameList* 14
2.2.3. *Brightness* 15
2.2.4. *Contrast* 15
2.2.5. *Sharpness* 15
2.2.6. *RedVideoGain* 15
2.2.7. *GreenVideoGain* 15
2.2.8. *BlueVideoGain* 15
2.2.9. *RedVideoBlackLevel* 15
2.2.10. *GreenVideoBlackLevel* 16
2.2.11. *BlueVideoBlackLevel* 16
2.2.12. *ColorTemperature* 16
2.2.13. *HorizontalKeystone* 16
2.2.14. *VerticalKeystone* 17
2.2.15. *Mute* 17
2.2.16. *Volume* 17
2.2.17. *VolumeDB* 17
2.2.18. *Loudness* 18
2.2.19. *A_ARG_TYPE_Channel* 18
2.2.20. *A_ARG_TYPE_InstanceID* 18
2.2.21. *A_ARG_TYPE_PresetName* 18
2.2.22. Relationships Between State Variables 19
2.3. Eventing and Moderation 19
2.3.1. Event Model 20
2.4. Actions 21
2.4.1. *ListPresets* 22
2.4.2. *SelectPreset* 22
2.4.3. *GetBrightness* 23
2.4.4. *SetBrightness* 23
2.4.5. *GetContrast* 24
2.4.6. *SetContrast* 24
2.4.7. *GetSharpness* 24
2.4.8. *SetSharpness* 25
2.4.9. *GetRedVideoGain* 25
2.4.10. *SetRedVideoGain* 26
2.4.11. *GetGreenVideoGain* 26
2.4.12. *SetGreenVideoGain* 26
2.4.13. *GetBlueVideoGain* 27

2.4.14. *SetBlueVideoGain* 27
2.4.15. *GetRedVideoBlackLevel* 28
2.4.16. *SetRedVideoBlackLevel* 28
2.4.17. *GetGreenVideoBlackLevel* 29
2.4.18. *SetGreenVideoBlackLevel* 29
2.4.19. *GetBlueVideoBlackLevel* 30
2.4.20. *SetBlueVideoBlackLevel* 30
2.4.21. *GetColorTemperature* 31
2.4.22. *SetColorTemperature* 31
2.4.23. *GetHorizontalKeystone* 32
2.4.24. *SetHorizontalKeystone* 32
2.4.25. *GetVerticalKeystone* 33
2.4.26. *SetVerticalKeystone* 33
2.4.27. *GetMute* 34
2.4.28. *SetMute* 34
2.4.29. *GetVolume* 35
2.4.30. *SetVolume* 35
2.4.31. *GetVolumeDB* 36
2.4.32. *SetVolumeDB* 36
2.4.33. *GetVolumeDBRange* 37
2.4.34. *GetLoudness* 37
2.4.35. *SetLoudness* 38
2.4.36. Relationships Between Actions 38
2.4.37. Common Error Codes 38
2.5. Theory of Operation 39
2.5.1. Multi-input Devices 39
2.5.2. Presets 40
2.5.3. Controlling the Display of Visual Content 40
2.5.4. Controlling Audio Content 40
3. XML Service Description 42
4. Test 55
5. "LastChange" State Variable Schema 56

LIST OF TABLES

Table 1: State Variables 10
Table 2-1: allowedValueRange for *Brightness* 11
Table 2-2: allowedValueRange for *Contrast* 11
Table 2-3: allowedValueRange for *Sharpness* 11
Table 2-4: allowedValueRange for *RedVideoGain* 11
Table 2-5: allowedValueRange for *GreenVideoGain* 12
Table 2-6: allowedValueRange for *BlueVideoGain* 12
Table 2-7: allowedValueRange for *RedVideoBlackLevel* 12
Table 2-8: allowedValueRange for *GreenVideoBlackLevel* 12
Table 2-9: allowedValueRange for *BlueVideoBlackLevel* 12
Table 2-10: allowedValueRange for *ColorTemperature* 12
Table 2-11: allowedValueRange for *HorizontalKeystone* 12
Table 2-12: allowedValueRange for *VerticalKeystone* 13
Table 2-13: allowedValueRange for *Volume* 13
Table 2-14: allowedValueRange for *VolumeDB* 13
Table 2-15: allowedValueList for *A_ARG_TYPE_Channel* 13
Table 2-16: allowedValueList for *A_ARG_TYPE_PresetName* 13
Table 2: Event moderation 19
Table 3: Actions 21

INFORMATION TECHNOLOGY – UPNP DEVICE ARCHITECTURE –

Part 3-13: Audio Video Device Control Protocol – Rendering Control Service

FOREWORD

1) ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards. Their preparation is entrusted to technical committees; any ISO and IEC member body interested in the subject dealt with may participate in this preparatory work. International governmental and non-governmental organizations liaising with ISO and IEC also participate in this preparation.

2) In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

3) The formal decisions or agreements of IEC and ISO on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC and ISO member bodies.

4) IEC, ISO and ISO/IEC publications have the form of recommendations for international use and are accepted by IEC and ISO member bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC, ISO and ISO/IEC publications is accurate, IEC or ISO cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.

5) In order to promote international uniformity, IEC and ISO member bodies undertake to apply IEC, ISO and ISO/IEC publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any ISO/IEC publication and the corresponding national or regional publication should be clearly indicated in the latter.

6) ISO and IEC provide no marking procedure to indicate their approval and cannot be rendered responsible for any equipment declared to be in conformity with an ISO/IEC publication.

7) All users should ensure that they have the latest edition of this publication.

8) No liability shall attach to IEC or ISO or its directors, employees, servants or agents including individual experts and members of their technical committees and IEC or ISO member bodies for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication of, use of, or reliance upon, this ISO/IEC publication or any other IEC, ISO or ISO/IEC publications.

9) Attention is drawn to the normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

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

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

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

Information may be obtained from:

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

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

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

Information may be obtained from:

Microsoft Corporation
One Microsoft Way
USA – Redmond WA 98052

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

Information may be obtained from:

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

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

Information may be obtained from:

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

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

Information may be obtained from:

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

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

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

Information may be obtained from:

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

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

Information may be obtained from:

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

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

ISO/IEC 29341-3-13 was prepared by UPnP Implementers Corporation and adopted, under the PAS procedure, by joint technical committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

The list of all currently available parts of the ISO/IEC 29341 series, under the general title *Universal plug and play (UPnP) 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.

ORIGINAL UPNP DOCUMENTS
(informative)

Reference may be made in this document to original UPnP documents. These references are retained in order to maintain consistency between the specifications as published by ISO/IEC and by UPnP Implementers Corporation. The following table indicates the original UPnP document titles and the corresponding part of ISO/IEC 29341:

UPnP Document Title	**ISO/IEC 29341 Part**
UPnP Device Architecture 1.0	ISO/IEC 29341-1
UPnP Basic:1 Device	ISO/IEC 29341-2
UPnP AV Architecture:1	ISO/IEC 29341-3-1
UPnP MediaRenderer:1 Device	ISO/IEC 29341-3-2
UPnP MediaServer:1 Device	ISO/IEC 29341-3-3
UPnP AVTransport:1 Service	ISO/IEC 29341-3-10
UPnP ConnectionManager:1 Service	ISO/IEC 29341-3-11
UPnP ContentDirectory:1 Service	ISO/IEC 29341-3-12
UPnP RenderingControl:1 Service	ISO/IEC 29341-3-13
UPnP MediaRenderer:2 Device	ISO/IEC 29341-4-2
UPnP MediaServer:2 Device	ISO/IEC 29341-4-3
UPnP AV Datastructure Template:1	ISO/IEC 29341-4-4
UPnP AVTransport:2 Service	ISO/IEC 29341-4-10
UPnP ConnectionManager:2 Service	ISO/IEC 29341-4-11
UPnP ContentDirectory:2 Service	ISO/IEC 29341-4-12
UPnP RenderingControl:2 Service	ISO/IEC 29341-4-13
UPnP ScheduledRecording:1	ISO/IEC 29341-4-14
UPnP DigitalSecurityCamera:1 Device	ISO/IEC 29341-5-1
UPnP DigitalSecurityCameraMotionImage:1 Service	ISO/IEC 29341-5-10
UPnP DigitalSecurityCameraSettings:1 Service	ISO/IEC 29341-5-11
UPnP DigitalSecurityCameraStillImage:1 Service	ISO/IEC 29341-5-12
UPnP HVAC_System:1 Device	ISO/IEC 29341-6-1
UPnP HVAC_ZoneThermostat:1 Device	ISO/IEC 29341-6-2
UPnP ControlValve:1 Service	ISO/IEC 29341-6-10
UPnP HVAC_FanOperatingMode:1 Service	ISO/IEC 29341-6-11
UPnP FanSpeed:1 Service	ISO/IEC 29341-6-12
UPnP HouseStatus:1 Service	ISO/IEC 29341-6-13
UPnP HVAC_SetpointSchedule:1 Service	ISO/IEC 29341-6-14
UPnP TemperatureSensor:1 Service	ISO/IEC 29341-6-15
UPnP TemperatureSetpoint:1 Service	ISO/IEC 29341-6-16
UPnP HVAC_UserOperatingMode:1 Service	ISO/IEC 29341-6-17
UPnP BinaryLight:1 Device	ISO/IEC 29341-7-1
UPnP DimmableLight:1 Device	ISO/IEC 29341-7-2
UPnP Dimming:1 Service	ISO/IEC 29341-7-10
UPnP SwitchPower:1 Service	ISO/IEC 29341-7-11
UPnP InternetGatewayDevice:1 Device	ISO/IEC 29341-8-1
UPnP LANDevice:1 Device	ISO/IEC 29341-8-2
UPnP WANDevice:1 Device	ISO/IEC 29341-8-3
UPnP WANConnectionDevice:1 Device	ISO/IEC 29341-8-4
UPnP WLANAccessPointDevice:1 Device	ISO/IEC 29341-8-5
UPnP LANHostConfigManagement:1 Service	ISO/IEC 29341-8-10
UPnP Layer3Forwarding:1 Service	ISO/IEC 29341-8-11
UPnP LinkAuthentication:1 Service	ISO/IEC 29341-8-12
UPnP RadiusClient:1 Service	ISO/IEC 29341-8-13
UPnP WANCableLinkConfig:1 Service	ISO/IEC 29341-8-14
UPnP WANCommonInterfaceConfig:1 Service	ISO/IEC 29341-8-15
UPnP WANDSLLinkConfig:1 Service	ISO/IEC 29341-8-16
UPnP WANEthernetLinkConfig:1 Service	ISO/IEC 29341-8-17
UPnP WANIPConnection:1 Service	ISO/IEC 29341-8-18
UPnP WANPOTSLinkConfig:1 Service	ISO/IEC 29341-8-19
UPnP WANPPPConnection:1 Service	ISO/IEC 29341-8-20
UPnP WLANConfiguration:1 Service	ISO/IEC 29341-8-21
UPnP Printer:1 Device	ISO/IEC 29341-9-1
UPnP Scanner:1.0 Device	ISO/IEC 29341-9-2
UPnP ExternalActivity:1 Service	ISO/IEC 29341-9-10
UPnP Feeder:1.0 Service	ISO/IEC 29341-9-11
UPnP PrintBasic:1 Service	ISO/IEC 29341-9-12
UPnP Scan:1 Service	ISO/IEC 29341-9-13
UPnP QoS Architecture:1.0	ISO/IEC 29341-10-1
UPnP QosDevice:1 Service	ISO/IEC 29341-10-10
UPnP QosManager:1 Service	ISO/IEC 29341-10-11
UPnP QosPolicyHolder:1 Service	ISO/IEC 29341-10-12
UPnP QoS Architecture:2	ISO/IEC 29341-11-1
UPnP QOS v2 Schema Files	ISO/IEC 29341-11-2
UPnP QosDevice:2 Service	ISO/IEC 29341-11-10

UPnP Document Title	ISO/IEC 29341 Part
UPnP QosManager:2 Service	ISO/IEC 29341-11-11
UPnP QosPolicyHolder:2 Service	ISO/IEC 29341-11-12
UPnP RemoteUIClientDevice:1 Device	ISO/IEC 29341-12-1
UPnP RemoteUIServerDevice:1 Device	ISO/IEC 29341-12-2
UPnP RemoteUIClient:1 Service	ISO/IEC 29341-12-10
UPnP RemoteUIServer:1 Service	ISO/IEC 29341-12-11
UPnP DeviceSecurity:1 Service	ISO/IEC 29341-13-10
UPnP SecurityConsole:1 Service	ISO/IEC 29341-13-11

1. Overview and Scope

This service template is compliant with the UPnP Device Architecture version 1.0. It defines a service type referred to herein as RenderingControl*:1*.

1.1. Introduction

Most rendering devices contain a number of dynamically configurable attributes that affect how the current content is rendered. For example, video rendering devices, such as TVs, allow user control of display characteristics such as brightness and contrast, whereas audio rendering devices allow control of audio characteristics such as volume, balance, equalizer settings, etc. The RenderingControl*:1* service is intended to provide Control Points with the ability to query and/or adjust any rendering attribute that the device supports.

The RenderingControl*:1* service enables a Control Point to:

- Discover the set of attributes supported by the device.
- Retrieve the current setting of any supported attribute
- Change the setting of (e.g. control) any modifiable attribute
- Restore the settings defined by a named Preset

The RenderingControl*:1* service DOES NOT:

- Control the flow of the associated content (e.g. Play, Stop, Pause, Seek, etc.).
- Provide a mechanism to enumerate locally stored content.
- Provide a mechanism to select the content that is to be rendered.
- Provide a mechanism to send content to another device (via the home network or direct connection).