
**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

ISO (the International Organization for Standardization) and IEC (the 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 through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see <http://www.iso.org/directives>).

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For an explanation on the voluntary nature of Standard, the meaning of the ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword – Supplementary information](#)

ISO/IEC 29341-20-14 was prepared by UPnP Forum 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 ISO/IEC 29341 series, under the general title *Information technology — UPnP Device Architecture*, can be found on the [ISO web site](#).

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Original UPnP Document

Reference may be made in this document to original UPnP documents. These references are retained in order to maintain consistency between the specifications as published by ISO/IEC and by UPnP Implementers Corporation 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

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.

[1] – *XML Schema for RenderingControl AllowedTransformSettings*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/schemas/av/AllowedTransformSettings-v1-20130331.xsd>.

Latest version available

at: <http://www.upnp.org/schemas/av/AllowedTransformSettings.xsd>.

[2] – *AV Datastructure Template:1*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/specs/av/UPnP-av-AVDataStructureTemplate-v1-20130331.pdf>.

Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-AVDataStructureTemplate-v1.pdf>.

[3] – *XML Schema for UPnP AV Common XML Data Types*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/schemas/av/av-v3-20130331.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/av.xsd>.

[4] – *XML Schema for UPnP AV Common XML Structures*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/schemas/av/avs-v3-20130331.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/avs.xsd>.

[5] – *AVTransport:3*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/specs/av/UPnP-av-AVTransport-v3-Service-20130331.pdf>.

Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-AVTransport-v3-Service.pdf>.

[6] – *XML Schema for AVTransport LastChange Eventing*, UPnP Forum, September 30, 2008.

Available at: <http://www.upnp.org/schemas/av/avt-event-v2-20080930.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/avt-event.xsd>.

[7] – *ContentDirectory:4*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/specs/av/UPnP-av-ContentDirectory-v4-Service-20130331.pdf>.

Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-ContentDirectory-v4-Service.pdf>.

[8] – *XML Schema for ContentDirectory LastChange Eventing*, UPnP Forum, September 30, 2008.

Available at: <http://www.upnp.org/schemas/av/cds-event-v1-20080930.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/cds-event.xsd>.

[9] – *ConnectionManager:3*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/specs/av/UPnP-av-ConnectionManager-v3-Service-20130331.pdf>.

Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-ConnectionManager-v3-Service.pdf>.

[10] – *XML Schema for ConnectionManager DeviceClockInfoUpdates*, UPnP Forum, December 31, 2010.

Available at: <http://www.upnp.org/schemas/av/cm-deviceClockInfoUpdates-v1-20101231.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/cm-deviceClockInfoUpdates.xsd>.

[11] – *XML Schema for ConnectionManager Features*, UPnP Forum, December 31, 2010.

Available at: <http://www.upnp.org/schemas/av/cm-featureList-v1-20101231.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/cm-featureList.xsd>.

[12] – *XML Schema for UPnP AV Dublin Core*.

Available at: <http://www.dublincore.org/schemas/xmls/simpledc20020312.xsd>.

[13] – *DCMI term declarations represented in XML schema language*.

Available at: <http://www.dublincore.org/schemas/xmls>.

[14] – *UPnP Device Architecture, version 1.0*, UPnP Forum, October 15, 2008.

Available at: <http://www.upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.0-20081015.pdf>.

Latest version available at: <http://www.upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.0.pdf>.

[15] – *XML Schema for ContentDirectory Structure and Metadata (DIDL-Lite)*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/schemas/av/didl-lite-v3-20130331.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/didl-lite.xsd>.

[16] – *XML Schema for ContentDirectory DeviceMode*, UPnP Forum, December 31, 2010.

Available at: <http://www.upnp.org/schemas/av/dmo-v1-20101231.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/dmo.xsd>.

[17] – *XML Schema for ContentDirectory DeviceModeRequest*, UPnP Forum, December 31, 2010.

Available at: <http://www.upnp.org/schemas/av/dmor-v1-20101231.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/dmor.xsd>.

[18] – *XML Schema for ContentDirectory DeviceModeStatus*, UPnP Forum, December 31, 2010.

Available at: <http://www.upnp.org/schemas/av/dmos-v1-20101231.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/dmos.xsd>.

[19] – ISO/IEC 14977, *Information technology - Syntactic metalanguage - Extended BNF*, December 1996.

[20] – *XML Schema for ContentDirectory PermissionsInfo*, UPnP Forum, December 31, 2010.

Available at: <http://www.upnp.org/schemas/av/pi-v1-20101231.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/pi.xsd>.

[21] – *RenderingControl:3*, UPnP Forum, March 31, 2013.

Available at: <http://www.upnp.org/specs/av/UPnP-av-RenderingControl-v3-Service-20130331.pdf>.

Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-RenderingControl-v3-Service.pdf>.

[22] – *XML Schema for RenderingControl LastChange Eventing*, UPnP Forum, December 31, 2010.

Available at: <http://www.upnp.org/schemas/av/rcs-event-v3-20101231.xsd>.

Latest version available at: <http://www.upnp.org/schemas/av/rcs-event.xsd>.

[23] – *XML Schema for ConnectionManager RendererInfo*, UPnP Forum, December 31, 2010.

Available at: <http://www.upnp.org/schemas/av/rrii-v1-20101231.xsd>.
Latest version available at: <http://www.upnp.org/schemas/av/rrii.xsd>.

[24] – *XML Schema for AVTransport PlaylistInfo*, UPnP Forum, March 31, 2013.
Available at: <http://www.upnp.org/schemas/av/rpl-v1-20130331.xsd>.
Latest version available at: <http://www.upnp.org/schemas/av/rpl.xsd>.

[25] – *ScheduledRecording:2*, UPnP Forum, March 31, 2013.
Available at: <http://www.upnp.org/specs/av/UPnP-av-ScheduledRecording-v2-Service-20130331.pdf>.
Latest version available at: <http://www.upnp.org/specs/av/UPnP-av-ScheduledRecording-v2-Service.pdf>.

[26] – *XML Schema for ScheduledRecording Metadata and Structure*, UPnP Forum, March 31, 2013.
Available at: <http://www.upnp.org/schemas/av/srs-v2-20130331.xsd>.
Latest version available at: <http://www.upnp.org/schemas/av/srs.xsd>.

[27] – *XML Schema for ScheduledRecording LastChange Eventing*, UPnP Forum, September 30, 2008.
Available at: <http://www.upnp.org/schemas/av/srs-event-v1-20080930.xsd>.
Latest version available at: <http://www.upnp.org/schemas/av/srs-event.xsd>.

[28] – *XML Schema for RenderingControl TransformSettings*, UPnP Forum, March 31, 2013.
Available at: <http://www.upnp.org/schemas/av/TransformSettings-v1-20130331.xsd>.
Latest version available at: <http://www.upnp.org/schemas/av/TransformSettings.xsd>.

[29] – *XML Schema for ContentDirectory Metadata*, UPnP Forum, March 31, 2013.
Available at: <http://www.upnp.org/schemas/av/upnp-v4-20130331.xsd>.
Latest version available at: <http://www.upnp.org/schemas/av/upnp.xsd>.

[30] – *The “xml:” Namespace*, November 3, 2004.
Available at: <http://www.w3.org/XML/1998/namespace>.

[31] – *XML Schema for the “xml:” Namespace*.
Available at: <http://www.w3.org/2001/xml.xsd>.

[32] – *Namespaces in XML*, Tim Bray, Dave Hollander, Andrew Layman, eds., W3C Recommendation, January 14, 1999.
Available at: <http://www.w3.org/TR/1999/REC-xml-names-19990114>.

[33] – *XML Schema Part 1: Structures, Second Edition*, Henry S. Thompson, David Beech, Murray Maloney, Noah Mendelsohn, W3C Recommendation, 28 October 2004.
Available at: <http://www.w3.org/TR/2004/REC-xmlschema-1-20041028>.

[34] – *XML Schema Part 2: Data Types, Second Edition*, Paul V. Biron, Ashok Malhotra, W3C Recommendation, 28 October 2004.
Available at: <http://www.w3.org/TR/2004/REC-xmlschema-2-20041028>.

[35] – *XML Schema for XML Schema*.
Available at: <http://www.w3.org/2001/XMLSchema.xsd>.

[36] – *Unicode Technical Standard #10, Unicode Collation Algorithm, version 4.1.0, revision 14*, M. Davis, K. Whistler, May 5, 2005.
Available at: <http://www.unicode.org/reports/tr10/tr10-14.html>.

[37] – *Unicode Standard Annex #15, Unicode Normalization Forms, version 4.1.0, revision 25*, M. Davis, M. Dürst, March 25, 2005.
Available at: <http://www.unicode.org/reports/tr15/tr15-25.html>.

[38] – *Unicode Technical Standard #35, Locale Data Markup Language, version 1.3R1, revision 5*, M. Davis, June 2, 2005.

Available at: <http://www.unicode.org/reports/tr35/tr35-5.html>.

[39] – *Extensible Markup Language (XML) 1.0 (Third Edition)*, François Yergeau, Tim Bray, Jean Paoli, C. M. Sperberg-McQueen, Eve Maler, eds., W3C Recommendation, February 4, 2004.

Available at: <http://www.w3.org/TR/2004/REC-xml-20040204>.