ISO/IEC 29341-10-1

Edition 1.0   2008-11

INTERNATIONAL STANDARD

Information technology – UPnP Device Architecture –
Part 10-1: Quality of Service Device Control Protocol – Quality of Service Architecture

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ISO/IEC 29341-10-1 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
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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
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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
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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 Document Title	ISO/IEC 29341 Part
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 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. Glossary

Access Domain

A set of LAN or MAN stations together with interconnecting data transmission media
and related equipment (e.g., connectors, repeaters), in which the LAN or MAN stations use the same MAC
protocol to establish the sequence of stations that are in temporary control of the shared transmission media.

Access Priority

The Access Priority is a parameter that indicates the priority handling when accessing the communication
resource. The range of access priorities is defined by the layer 2 networking technology.

Best Effort

A general method of accessing a network communications medium to deliver a message. Best effort access is not
guaranteed, and therefore the message may not get delivered. Many communication protocols mediums use this
approach. Higher layers of protocol are needed to provide reliability or QoS. Best Effort is typically the default
grade of service provided in a network when no specific QoS is requested.

Bridge

A functional unit that interconnects two or more LANs that use the same Data Link layer protocols above the
MAC sublayer, but can use different MAC protocols

Hub

A device, with two or more physical ports, that forwards all traffic received on any individual port to all other
ports. This device is also referred to as a "repeater". In a home network, a hub connects networks segments of the
same physical medium.

IGD

Internet Gateway Device: a border device physically connects the Home LAN with a WAN. This device
performs routing. QoS mechanisms associated with routing are not addressed by this architecture, the IGD may
present a QosDevice interface on the Home LAN.

Intermediate Device

An intermediate device is physically connected between the Source and Sink device data flow. There may be
more than one intermediate device in the Source to Sink connection.

Path

The physical course that traffic will flow on from source to sink. For UPnP QoS, a path must reside within a
single IP subnet, but a path may comprise multiple segments.

Packet Priority

The Packet Priority is a layer 2 parameter that indicates the priority handling requested by the originating service.
Typically this parameter is part of a packet header and indicates the relative importance of the packet compared
to other packets. It is used to differentiate packets to determine which are given preferential access to the
communication medium. This parameter is typically mapped to an Access Priority value supported by the
network device.

Parameterized Services

Parameterized services refer to a general methodology for obtaining QoS. A contract is made with the network
using a set of parameters that define the application's traffic requirements. The parameters typically include
bandwidth and delay.

Policy Management

A function that makes decisions on the traffic streams allowed to use network resources.

Prioritized Services

Prioritized services refer to a general methodology for providing QoS by differentiating traffic. Messages types are grouped by order of importance and assigned a priority. Message types assigned a higher priority are given preferential access to the communications medium. There are no limits to the number of messages using a given priority, and the bandwidth of the network may be less than the bandwidth of the messages.

Quality of Service (QoS)

The term QoS refers to a broad collection of networking capabilities and techniques. The goal of QoS is to improve the user experience of a network's ability to deliver predictable results for sensitive applications such as audio, video, and voice applications.. Elements of network performance within the scope of QoS often include bandwidth (throughput), latency (delay), and error rate. There are two broad classes of QoS: data reliability and temporal reliability. Each makes different demands on network technologies. This architecture is primarily concerned with delivering temporal reliability

Router

A device, with two or more physical ports, that makes port to port traffic forwarding decisions based on layer 3 information (source and destination IP addresses).

Segment

A segment refers to a section of a network that shares a common physical medium. The boundaries of a network segment are established by devices capable of regulating the flow of traffic into and out of the segment. This includes routers, bridges, hubs, switches, adapters (e.g., PCI, PCCard, or USB NICs). With particular relevance to UPnP QoS, a segment is typically a physically distinct portion of a larger network that is in turn defined logically by devices residing on a common IP subnet.

Sink Device

A Sink device provides media data receiving, playback, storage, or rendering capabilities. Some examples include TV monitors, Stereo and Home Theaters, PDAs, Wireless Monitors, recordable DVDs, and Printers.

Source Device

A Source device provides media transmission and data sourcing capabilities. Examples include STBs, PVRs, PCs, Music Servers, Broadcast Tuners and Video Imaging Capture Devices. It acts as the source of a traffic stream, regardless of other functions on the device.

Subnet

Subnet as defined in IETF Zeroconf in RFC 3927:

ftp://ftp.isi.edu/internet-drafts/draft-ietf-zeroconf-ipv4-linklocal-18.txt .

Traffic Class

The Traffic Class indicates the kind of traffic in the traffic stream. The Traffic Class is used to distinguish, for example, audio from video. The distinction is at the application layer and the Traffic Class is mapped into the applicable layer 2 representations for the technology bearing the stream. An example is the mapping in 802.1D, Annex G.

Traffic Identifier (TID)

A Traffic Identifier is a set of information that uniquely identifies a set of data packets as belonging to a traffic stream. This information is typically used by a packet classifier function to associate a Traffic Specification's QoS contract to the service provided to the Traffic stream. Other technologies may refer to this as a Filter Spec (RFC2205) or Traffic Classifier (802.11e).

Traffic Specification (TSPEC)

A Traffic Specification contains a set of parameters that define the characteristics of the traffic stream. The TSPEC may be used to define the operating requirement for carrying the traffic stream and may define the operation of the packet scheduling function.

Traffic Stream (TS)

Traffic Stream is a unidirectional flow of data that originates at a source device and terminates at one or more sink device(s).

2.   Introduction

This architecture document describes the motivation, use and interaction of the three services that comprise the UPnP QoS Framework:

- QosDeviceService
- QosPolicyHolder Service
- QosManager Service

It should be noted that while UPnP QoS defines three new services (listed above), it does not define a new device type.

Since Quality of Service issues need to be solved for multiple usage scenarios, it is expected that vendors may use any UPnP device as a container for the services defined in UPnP QoS. The Control Points and QoS Management Entities must look for UPnP QoS Services embedded in all UPnP device types.

The UPnP QoS Framework is compliant with the UPnP Device Architecture version 1.0.

2.1.   Referenced Specifications

Unless explicitly stated otherwise herein, implementation of the mandatory provisions of any standard referenced by this specification shall be mandatory for compliance with this specification.

 [Annex_G] – IEEE 802.1D-2004, Annex G, *IEEE Standard for Information technology - Telecommunications and information exchange between systems - IEEE standard for local and metropolitan area networks - Common specifications - Media access control (MAC) Bridges*, 2004.

[XML] – *Extensible Markup Language (XML) 1.0 (Second Edition)*, T. Bray, J.Paoli, C. M. Sperberg-McQueen, E Maler, eds. W3C Recommendations, 6 October 2000.

[QM] – UPnP™ QosManager:1 Service Document:

[QD] – UPnP™ QosDevice:1 Service Document:

[QPH] – UPnP™ QosPolicyHolder:1 Service Document:

[AV] – UPnP™ AV Architecture Document V0.83

[DEVICE] - *UPnP Device Architecture, version 1.0*.