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CONTENTS

1	Overview and Scope.....	3
1.1	Referenced Specifications	3
1.1.1	Normative References	3
1.1.2	Informative References	3
2	Service Modeling Definitions.....	4
2.1	ServiceType	4
2.2	Derived Data Types	4
2.2.1	XML Fragments as UPnP Arguments.....	4
2.2.2	Extensibility of XML	4
2.3	State Variables.....	6
2.3.1	A_ARG_TYPE_TrafficDescriptor	6
2.3.2	A_ARG_TYPE_TrafficPolicy.....	6
2.3.3	A_ARG_TYPE_ListOfTrafficDescriptors	8
2.3.4	A_ARG_TYPE_ListOfTrafficPolicies	8
2.3.5	A_ARG_TYPE_IsPreferred.....	9
2.3.6	A_ARG_TYPE_QphPolicyRule	9
2.3.7	A_ARG_TYPE_ListOfQphPolicyRule.....	13
2.3.8	A_ARG_TYPE_Position	14
2.3.9	A_ARG_TYPE_TIN	14
2.3.10	A_ARG_TYPE_IN	14
2.3.11	A_ARG_TYPE_ReasonCode.....	14
2.3.12	A_ARG_TYPE_PolicyHandle.....	15
2.3.13	A_ARG_TYPE_ListPolicyHandle	15
2.3.14	PolicyVersion.....	15
2.3.15	Relationships Between State Variables	15
2.4	Eventing and Moderation	16
2.4.1	Event Model.....	16
2.5	Actions.....	16
2.5.1	GetTrafficPolicy	17
2.5.2	GetListOfTrafficPolicies	18
2.5.3	SetAsPreferred	20
2.5.4	AddQphPolicy	22
2.5.5	RemoveQphPolicy	23
2.5.6	RetrieveQphPolicy	24
2.5.7	GetPolicyVersion	24
2.5.8	Non-Standard Actions Implemented by a UPnP Vendor	25
2.5.9	Error Code Summary	25
3	Theory of Operation (Informative)	27
3.1	Retrieving Policies.....	27
3.2	Preferred QosPolicyHolder Service Selection.....	27
3.3	QosPolicyHolder Service Configuration.....	28
4	XML Service Description	29
5	Test	32

Table 2-1 — State Variables	6
Table 2-2 — Event Moderation.....	16
Table 2-3 — Actions	16
Table 2-4 — Arguments for GetTrafficPolicy.....	17
Table 2-5 — Error Codes for GetTrafficPolicy.....	18
Table 2-6 — Arguments for GetListOfTrafficPolicies	18
Table 2-7 — Error Codes for GetListOfTrafficPolicies	19
Table 2-8 — Arguments for SetAsPreferred.....	20
Table 2-9 — Error Codes for SetAsPreferred	22
Table 2-10 — Arguments for <i>AddQphPolicy</i>	22
Table 2-11 — Reason code for AddQphPolicy	23
Table 2-12 — Error code for AddQphPolicy	23
Table 2-13 — Arguments for RemoveQphPolicy	23
Table 2-14 — Error code for RemoveQphPolicy	23
Table 2-15 — Arguments for RetrieveQphPolicy.....	24
Table 2-16 — Arguments for <i>GetPolicyVersion</i>	25
Table 2-17 — Common Error Codes	26

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INFORMATION TECHNOLOGY – UPNP DEVICE ARCHITECTURE –

Part 17-12: Quality of Service Device Control Protocol – Level 3 – Quality of Service Policy Holder Service

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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.

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.

This service type enables modeling of the '[QoSPolicyHolder](#)' function capabilities. The functionality for the [QoSPolicyHolder](#) Service can be implemented by any device on the network. The [QoSPolicyHolder](#) Service is responsible for providing the traffic policy values for any given traffic stream as requested by an entity that manages the network traffic, typically a [QoS Manager](#). The traffic policy values are determined by applying the policy rules, which are configured for the network, to the requested traffic information.

A [QoSPolicyHolder](#) is a dual-role entity that exposes a [QoSPolicyHolder](#) Service to the Control Point (mainly the [QoS Manager](#)) while acting as a Control Point for the [QoSDevice](#) Services running on the network. This document describes the components of the [QoSPolicyHolder](#) Service and the [QoS Policy Holder](#). The [QoS Policy Holder](#) provides the Control Point functionality that discovers and controls [QoSDevice](#) Services, mainly for the propagation and synchronization of the preferred [QoSPolicyHolder](#) Service information. Additional information concerning the [QoS Policy Holder](#) may be found in:

- UPnP-QoS Architecture document
- UPnP QoSDevice Service Definition Document

1.1 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.

1.1.1 Normative References

This clause lists the normative references used in this document and includes the tag inside square brackets that is used for each sub reference:

[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.

[DEVICE] - UPnP Device Architecture, version 1.0, UPnP Forum, July 20, 2006. Available at: <http://upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.0-20060720.pdf>
Latest version available at: <http://upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.0.pdf>

[QM] – UPnP QoSManager:3 Service Document: This reference is informative except for the definitions of the following state variables, which are normative: [A_ARG_TYPE_TrafficDescriptor](#), and [A_ARG_TYPE_ListOfTrafficDescriptors](#). Available at: <http://www.upnp.org/specs/qos/UPnP-qos-QosManager-v3-Service-20081130.pdf>
Latest version available at: <http://www.upnp.org/specs/qos/UPnP-qos-QosManager-v3-Service.pdf>

[RFC3339] – *Date and Time on the Internet: Timestamps*, G. Klyne, July 2002. <http://www.ietf.org/rfc/rfc3339.txt>

1.1.2 Informative References

This clause lists the informative references used in this document and includes the tag inside square brackets that is used for each sub reference:

[QoS Architecture] – UPnP QoS Architecture V3.0
 Available at: <http://www.upnp.org/specs/qos/UPnP-qos-Architecture-v3-20081130.pdf>
 Latest version available at: <http://www.upnp.org/specs/qos/UPnP-qos-Architecture-v3.pdf>

[QoS DEV] – UPnP QoSDevice:3 Service Document
 Available at: <http://www.upnp.org/specs/qos/UPnP-qos-QosDevice-v3-Service-20081130.pdf>
 Latest version available at: <http://www.upnp.org/specs/qos/UPnP-qos-QosDevice-v3-Service.pdf>

[IEEE 802.1D] – 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.

2 Service Modeling Definitions

2.1 ServiceType

The following service type identifies a service that is compliant with this template:

urn:schemas-upnp-org:service:QosPolicyHolder:3

The shorthand 'QosPolicyHolder Service' is used herein to refer to this service type.

2.2 Derived Data Types

This clause defines some derived data types that are represented as UPnP **string** data types with special syntax.

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2.2.1 XML Fragments as UPnP Arguments

UPnP-QoS often uses XML Fragments as arguments in UPnP actions. The containing UPnP data type is a **string**. This places restrictions on a string's content; it has to represent a well-formed XML fragment (this includes a complete XML document).

An XML fragment, in adherence to the UPnP Device Architecture 1.0 [DEVICE], MUST be escaped by using the normal XML rules, [XML] Clause 2.4 Character Data and Markup, before embedding it in a SOAP request / response message or an event notification message. The XML escaping rules are summarized:

- The (<) character is encoded as (<)
- The (>) character is encoded as (>)
- The (&) character is encoded as (&)
- The (") character is encoded as (")
- The (') character is encoded as (')

In their XML fragments, implementations MAY use an explicit reference to appropriate namespaces.

2.2.2 Extensibility of XML

The names of UPnP-QoS namespaces come in two flavors. The ones in HTTP-form are existing UPnP-QoS v1 and v2 namespace names. The ones in URN-form are introduced in UPnP-QoS v3 (or later).

In order to maintain the extensibility of a namespace, all future modifications of the schema definition will be proper supersets. The namespace name will not change even when the service version number changes.

The v2, v3, v4 tags within a schema allow for the UPnP Forum to add newly standardized elements to the schema definitions without impacting implementations based on previous version(s) of the schema. UPnP-QoS v3 introduces the v4 tags in a similar way as UPnP-QoS v2 defined the v3 tags. The contents of the v4 tags MAY be (re)defined in UPnP-QoS v4 depending on needs.

At several places in the XML schemas there is also room for vendor differentiation or future revisions through the use of the “any”-tag. This tag is placed both in the original schema as well as within the v2 and v3 tags to allow extensions related to those versions of the specification.

When extending UPnP-QoS with their own XML tags, vendors SHOULD use a namespace to prevent collisions of their tags with those of other vendors. It is RECOMMENDED that implementations are not required to retrieve the corresponding schemas from the Internet. For example, a vendor MAY provide its own enhancements within the schema.

Below is an example using extensions to TrafficPolicy v2

```
<TrafficPolicy
  xmlns="http://www.upnp.org/schemas/TrafficPolicy.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:prv="http://myPrivate.com"
  xmlns:prv2="http://myPrivate2.com"
  xmlns:prv3="urn:schemas-myprivate-com:v3Extensions"
  xmlns:prv4="urn:schemas-myprivate-com:v4Extensions"
  xsi:schemaLocation="http://www.upnp.org/schemas/TrafficPolicy.xsd
  http://www.upnp.org/schemas/qos/TrafficPolicyv2.xsd">
  <AdmissionPolicy>Enabled</AdmissionPolicy>
  <TrafficImportanceNumber>3</TrafficImportanceNumber>
  <UserImportanceNumber>128</UserImportanceNumber>
  <v2>
    <PolicyHolderId>
      uuid:2fac1234-31f8-11b4-a222-08002b34c003:serviceId:qph
    </PolicyHolderId>
    <PolicyLastModified>2004-11-26T15:03:23-08:00</PolicyLastModified>
    <PolicyModifyingUserName>Jimmy</PolicyModifyingUserName>
    <PolicyHolderConfigUrl>
      http://10.0.0.5/ConfPolicy.html
    </PolicyHolderConfigUrl>
    <v3>
      <!-- UPnP Forum v3 extensions go here -->
      <v4>
        <!-- UPnP Forum v4 extensions go here -->
        <prv4:MyPrivate4>whatever</prv4:MyPrivate4>
      </v4>
      <prv3:MyPrivate3>whatever</prv3:MyPrivate3>
    </v3>
    <prv2:MyPrivate2>whatever</prv2:MyPrivate2>
  </v2>
  <prv:MyPrivate1>whatever</prv:MyPrivate1>
</TrafficPolicy>
```

2.3 State Variables

The *QosPolicyHolder* Service is 'action' based. This service's state variables exist primarily to support argument passing of the service's actions. A client retrieves *QosPolicyHolder* Service information via the return parameters of the actions defined in clause 2.5.

Reader Note: For first-time reader, it may be more insightful to read the theory of operations first and then the action definitions before reading the state variable definitions.

Table 2-1 — State Variables

Variable Name	Req. or Opt. a	Data Type	Allowed Value	Default Value b	Eng. Units
A_ARG_TYPE_TrafficDescriptor	R	<u>string</u> (XML fragment)	See clause 2.3.1	n/a	n/a
A_ARG_TYPE_TrafficPolicy	R	<u>string</u> (XML fragment)	See clause 2.3.2	n/a	n/a
A_ARG_TYPE_ListOfTrafficDescriptors	R	<u>string</u> (XML fragment)	See clause 2.3.3	n/a	n/a
A_ARG_TYPE_ListOfTrafficPolicies	R	<u>string</u> (XML fragment)	See clause 2.3.4	n/a	n/a
A_ARG_TYPE_IsPreferred	O	<u>boolean</u>	See clause 2.3.5	False	n/a
A_ARG_TYPE_QphPolicyRule	O	<u>string</u> (XML fragment)	See clause 2.3.6	n/a	n/a
A_ARG_TYPE_ListOfQphPolicyRule	O	<u>string</u> (XML fragment)	See clause 2.3.7	n/a	n/a
A_ARG_TYPE_Position	O	ui4	See clause 2.3.8	n/a	n/a
A_ARG_TYPE_TIN	O	ui4	See clause 2.3.9	n/a	n/a
A_ARG_TYPE_IN	O	ui4	See clause 2.3.10	n/a	n/a
A_ARG_TYPE_ReasonCode	O	ui4	See clause 2.3.11	n/a	n/a
A_ARG_TYPE_PolicyHandle	O	ui4	See clause 2.3.12	n/a	n/a
A_ARG_TYPE_ListPolicyHandle	O	String (XML fragment)	See clause 2.3.13	n/a	n/a
PolicyVersion	O	ui4	See clause 2.3.14	n/a	n/a
<p>a R = Required, O = Optional, X = Non-standard</p> <p>b Values listed in this column are required. To specify standard optional values or to delegate assignment of values to the vendor, you must reference a specific instance of an appropriate table below.</p>					

2.3.1 A_ARG_TYPE_TrafficDescriptor

This is a string containing an XML fragment. It contains information describing a traffic descriptor. Refer to the UPnP *QosManager:3* [QM] for details of this XML document using the namespace.

2.3.2 A_ARG_TYPE_TrafficPolicy

This is a string containing an XML fragment. It contains information describing TrafficPolicy information. The XML fragment in this argument MUST validate against the XML schema for TrafficPolicy in the XML namespace

["http://www.upnp.org/schemas/TrafficPolicy.xsd"](http://www.upnp.org/schemas/TrafficPolicy.xsd) which is located at <http://www.upnp.org/schemas/qos/TrafficPolicy-v2.xsd>.

2.3.2.1 Description of fields in the TrafficPolicy structure

TrafficPolicy structure consists of the following seven elements:

- [AdmissionPolicy](#) is a required field and is set to "Enabled".
- [TrafficImportanceNumber](#) is a required field of type integer with values in the range of 0 through 7. This value conforms to the numbering scheme for traffic classes as described in IEEE 802.1D Annex G [IEEE 802.1D] and with additional traffic classes described in the [QosManager:3](#) [QM]. This value is used by [QosDevice](#) service(s) in the traffic's path to indicate what priority level to utilize when priority tagging the traffic's network packets.
- [UserImportanceNumber](#) is a required field of type integer with values in the range of 0 through 255. This is used by a [QoS Manager](#) for Preemption. This value is applicable only when the [AdmissionPolicy](#) is enabled. Note that a value of 255 is the highest user importance and 0 is the lowest.
- [PolicyHolderId](#) is an optional field. Refer to the [PolicyHolderId](#) field in the [TrafficDescriptor](#) structure in the [QosManager:3](#) [QM] for the definition and more details.
- [PolicyLastModified](#) is an optional field. Refer to the [PolicyLastModified](#) field in the [TrafficDescriptor](#) structure in the [QosManager:3](#) [QM] for the definition and more details.
- [PolicyModifyingUserName](#) is an optional field. Refer to the [PolicyModifyingUserName](#) field in the [TrafficDescriptor](#) structure in the [QosManager:3](#) [QM] for the definition and more details.
- [PolicyHolderConfigUrl](#) is an optional field. Refer to the [PolicyHolderConfigUrl](#) field in the [TrafficDescriptor](#) structure in the [QosManager:3](#) [QM] for the definition and more details.

2.3.2.2 Sample Argument XML String

Illustrated below are two separate examples of TrafficPolicy structure.

Example 1:

```
<?xml version="1.0" encoding="UTF-8"?>
<TrafficPolicy
  xmlns="http://www.upnp.org/schemas/TrafficPolicy.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.upnp.org/schemas/TrafficPolicy.xsd
    http://www.upnp.org/schemas/qos/TrafficPolicy-v2.xsd">
  <AdmissionPolicy>Enabled</AdmissionPolicy>
  <TrafficImportanceNumber>3</TrafficImportanceNumber>
  <UserImportanceNumber>128</UserImportanceNumber>
  <v2>
    <PolicyHolderId>
      uuid:2fac1234-31f8-11b4-a222-08002b34c003:urn:upnp-
org:serviceId:QosPolicyHolder-3a
    </PolicyHolderId>
    <PolicyLastModified>2004-11-26T15:03:23-08:00</PolicyLastModified>
    <PolicyModifyingUserName>Jimmy</PolicyModifyingUserName>
    <PolicyHolderConfigUrl>
      http://10.0.0.50/ConfigPolicy.html
    </PolicyHolderConfigUrl>
  </v2>
</TrafficPolicy>
```

Example 2:

```
<?xml version="1.0" encoding="UTF-8"?>
```

```

<TrafficPolicy
  xmlns="http://www.upnp.org/schemas/TrafficPolicy.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.upnp.org/schemas/TrafficPolicy.xsd
    http://www.upnp.org/schemas/qos/TrafficPolicy-v2.xsd">
  <AdmissionPolicy>Enabled</AdmissionPolicy>
  <TrafficImportanceNumber>5</TrafficImportanceNumber>
  <v2>
    <PolicyHolderId>
      uuid:2fac1234-31f8-11b4-a222-08002b34c003:urn:upnp-
org:serviceId:QosPolicyHolder-3b
    </PolicyHolderId>
    <PolicyHolderConfigUrl>
      http://10.0.0.50/ConfigPolicy.html
    </PolicyHolderConfigUrl>
  </v2>
</TrafficPolicy>

```

2.3.3 A_ARG_TYPE_ListOfTrafficDescriptors

This is a **string** containing an XML fragment. It contains information describing [ListOfTrafficDescriptors](#) structure. This structure contains a list of traffic descriptor each with the information for a traffic stream. Refer to the UPnP [QoSManager:3](#) [QM] for details of this XML document using the namespace.

2.3.4 A_ARG_TYPE_ListOfTrafficPolicies

This is a **string** containing an XML fragment. It contains information describing the [ListOfTrafficPolicies](#) structure. This structure contains traffic policies for a list of traffic streams. The XML fragment in this argument MUST validate against the XML schema for [ListOfTrafficPolicies](#) in the XML namespace "urn:schemas-upnp-org:qos:ListOfTrafficPolicies" which is located at <http://www.upnp.org/schemas/qos/ListOfTrafficPolicies-v3.xsd>.

[https://standards.ieht.ai/catalog/standards/sist/b7595aafe97f4eccd-b291-](https://standards.ieht.ai/catalog/standards/sist/b7595aafe97f4eccd-b291-448170780511/standards/29341-17-12-2011)

2.3.4.1 Description of fields in the ListOfTrafficPolicies structure

The [ListOfTrafficPolicies](#) structure consists of the following elements.

AdmissionPolicy: This is a required field. Refer to clause 2.3.2.1 for details.

PolicyHolderId: This is a required field. Refer to the [PolicyHolderId](#) field in the [TrafficDescriptor](#) structure in the [QoS Manager:3](#) [QM] for the definition and more details.

PolicyHolderConfigUrl: This is a required field. Refer to the [PolicyHolderConfigUrl](#) field in the [TrafficDescriptor](#) structure in the [QoS Manager:3](#) [QM] for the definition and more details.

PolicyLastModified: This is a required field. Refer to the [PolicyLastModified](#) field in the [TrafficDescriptor](#) structure in the [QoS Manager:3](#) [QM] for the definition and more details.

PolicyModifyingUserName: This is a required field. Refer to the [PolicyModifyingUserName](#) field in the [TrafficDescriptor](#) structure in the [QoS Manager:3](#) [QM] for the definition and more details.

TdPolicy: This is a required structure. This contains traffic policies per TSPEC for different traffic descriptors identified by a [TrafficHandle](#).

2.3.4.2 Description of fields in the TdPolicy structure

TrafficHandle: This is a required field. It identifies a traffic descriptor in the list. Refer to the [TrafficHandle](#) field in the [TrafficDescriptor](#) structure in the [QoS Manager:3](#) [QM] for the definition and more details.