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Foreword

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ISO/IEC 29341-24-3 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
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UPnP DimmableLight:1 Device	ISO/IEC 29341-7-2
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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
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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
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UPnP Feeder:1.0 Service	ISO/IEC 29341-9-11
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UPnP QosPolicyHolder:1 Service	ISO/IEC 29341-10-12
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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

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
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UPnP RemoteAccessArchitecture:1	ISO/IEC 29341-18-1:2011
UPnP InboundConnectionConfig:1 Service	ISO/IEC 29341-18-10:2011
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UPnP RAServer:1 Device	ISO/IEC 29341-18-3:2011
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UPnP AV Architecture:2	ISO/IEC 29341-20-1
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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
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UPnP MediaRenderer:3 Service	ISO/IEC 29341-20-2
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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
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UPnP TelephonyServer:2 Device	ISO/IEC 29341-26-3
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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

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 document specifies the characteristics of a UPnP embedded virtual device that models a physical Wide Area Network interface on an Internet gateway. This specification describes version 2 of the device named *WANDevice* (*WANDevice:2*). *WANDevice:2* also enables the control of the WAN interface, and is a required device in the UPnP Internet Gateway Device Control Protocol (as specified in [1]).

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] *InternetGatewayDevice:2*, version 1.00, UPnP Forum, December 10, 2010.
Available at http://upnp.org/specs/gw/UPnP-gw-InternetGatewayDevice-v2-Device.pdf

[2] *WANDevice:2*, version 1.0, UPnP Forum, September 10, 2010.
Available at http://upnp.org/specs/gw/UPnP-gw-WANDevice-v2-Device.pdf

[3] *WANConnectionDevice:2,* version 1.00, UPnP Forum, September 10, 2010.
Available at: http://upnp.org/specs/gw/UPnP-gw-WANConnectionDevice-v2-Device.pdf

[4] *WANIPConnection:2,* version 1.00, UPnP Forum, September 10, 2010.
Available at: http://upnp.org/specs/gw/UPnP-gw-WANIPConnection-v2-Service.pdf

[5] *WANIPv6FirewallControl:1,* version 1.0, UPnP Forum, December 10, 2010.
Available at: http://upnp.org/specs/gw/UPnP-gw-WANIPv6FirewallControl-v1-Service.pdf

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Available at: http://upnp.org/specs/gw/UPnP-gw-LANDevice-v1-Device.pdf.

[7] *LANHostConfigManagement:1,* version 1.0, UPnP Forum, November 19, 2001.
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[8] *Layer3Forwarding:1,* version 1.0, UPnP Forum, November 19, 2001.
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[10] *WANCommonInterfaceConfig:1,* version 1.0, UPnP Forum, November 19, 2001.
Available at: http://upnp.org/specs/gw/UPnP-gw-WANCommonInterfaceConfig-v1-Service.pdf.

[11] *WANDSLLinkConfig:1,* version 1.0, UPnP Forum, November 19, 2001.
Available at: http://upnp.org/specs/gw/UPnP-gw-WANDSLLinkConfig-v1-Service.pdf

[12] *WANEthernetLinkConfig:1,* version 1.0, UPnP Forum, November 19, 2001.
Available at: http://upnp.org/specs/gw/UPnP-gw-WANEthernetLinkConfig-v1-Service.pdf.

[13] *WANPOTSLinkConfig:1,* version 1.0, UPnP Forum, November 19, 2001.
Available at: http://upnp.org/specs/gw/UPnP-gw-WANPOTSLinkConfig-v1-Service.pdf.

[14] *WANPPPConnection:1,* version 1.0, UPnP Forum, November 19, 2001.
Available at: http://upnp.org/specs/gw/UPnP-gw-WANPPPConnection-v1-Service.pdf.

[15] Device Architecture, version 1.0, UPnP Forum, June 8, 2000.
Available at: http://upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.0.pdf.

[16] *UPnP Device Architecture*, version 1.1, UPnP Forum, October 15, 2008.
Available at: http://upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.1.pdf.

[17] Data elements and interchange formats – Information interchange -- Representation of dates and times, International Standards Organization, December 21, 2000.
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http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=26780&ICS1=1&ICS2=140&ICS3=30.

[18] IETF RFC 3986, Uniform Resource Identifier (URI): Generic Syntax, T. Berners-Lee, R. Fielding, L.Masinter, January 2005.
Available at: http://tools.ietf.org/html/rfc3986.

[19] IETF RFC 3339, Date and Time on the Internet: Timestamps, G. Klyne, Clearswift Corporation, C. Newman, Sun Microsystems, July 2002.
Available at: http://tools.ietf.org/html/rfc3339.

[20] 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.

[21] 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.

3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the terms and definitions given in [15], [16], [1] and the following apply.

3.1 Abbreviated terms

3.1.1
IGD
Internet Gateway Device

3.1.2
WAN*LinkConfig
any or all of *WANPOTSLinkConfig*, *WANDSLLinkConfig*, *WANCableLinkConfig*, *WANEthernetLinkConfig*

[SOURCE: [1]]

3.1.3
WAN**Connection
either or both of *WANPPPConnection*, *WANIPConnection*

[SOURCE: [1]]

4 Device Model

4.1 Device Type

An instance of *WANDevice:2* is identified in UPnP messaging by the URN

urn:schemas-upnp-org:device:*WANDevice:2*

4.2 Device Architecture

4.2.1 Device Requirements

Each *WANDevice* models a physical WAN interface. A *WANDevice* shall contain one or more instances of *WANConnectionDevice* corresponding to one or more active links on the *WANDevice*. *WANCommonInterfaceConfig* is a service in *WANDevice* that models attributes and actions common across all links and all connection instances on a link.

All implementations of *WANDevice:2* shall comply with both versions 1.0 and 1.1 of the UPnP Device Architecture.

WANDevice:2 is a required embedded device for *InternetGatewayDevice:2* [1]. *WANDevice:2* may be embedded in other UPnP devices.

Figure 1 illustrates a generic Internet Gateway Device (IGD) consisting of one or more physical WAN and LAN interfaces. An implementation may host the WAN interface and LAN interface on the same physical network interface card. Some examples of technologies that provide WAN connectivity to the Internet include DSL, cable and POTS.

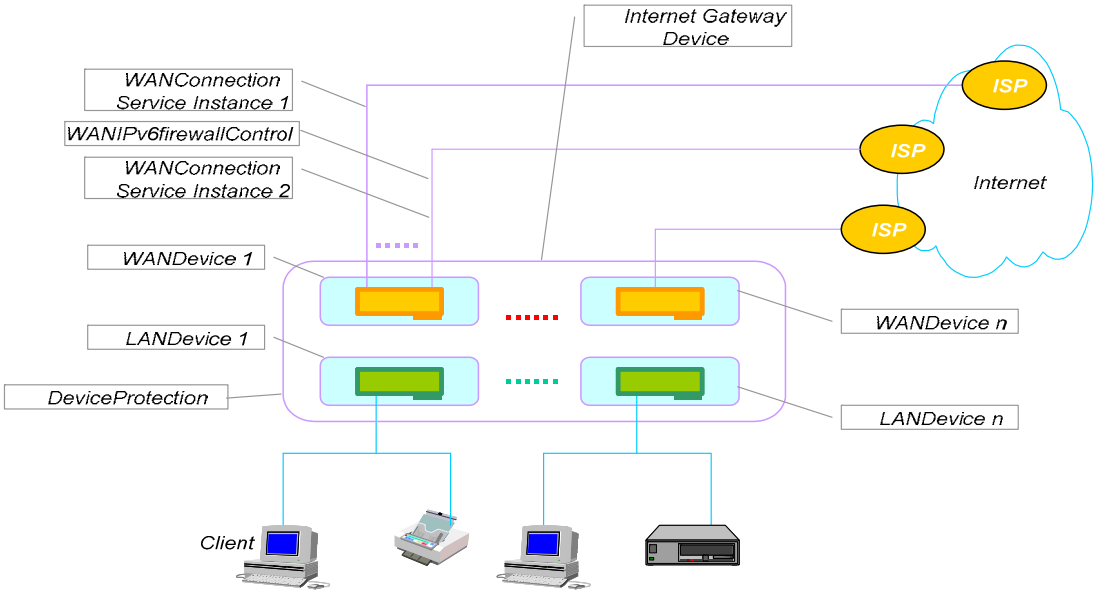

Figure 1 — *InternetGatewayDevice* with LAN and WAN Interfaces

Each WAN interface shall support one Internet connection, but may simultaneously support more than one Internet connection. The modeling of connections is described in Annex A.

Each *WANDevice* is a virtual instantiation of a physical WAN interface on the Internet gateway. If an *InternetGatewayDevice* provides multiple WAN physical interfaces to UPnP clients, each of these will typically be included in the device description document as distinct *WANDevice* instances. However, an implementation may choose to encapsulate more than one physical WAN interface in a single *WANDevice*. This may be done, for example, in applications that use asymmetric connections like a satellite downlink and POTS uplink. Another example would be where multiple physical WAN interfaces are pooled and presented as one device. Aspects such as load balancing between the pooled resources would be transparent to UPnP clients in this case.

Figure 2 conceptually illustrates the hierarchy of devices and services in *WANDevice*. Each *WANDevice* has one or more instances of *WANConnectionDevice*. It also has a *WANCommonInterfaceConfig* service that models attributes and actions of the WAN interface, common across all connection service instances. Annex A describes the devices and services contained in *WANDevice* in more detail.

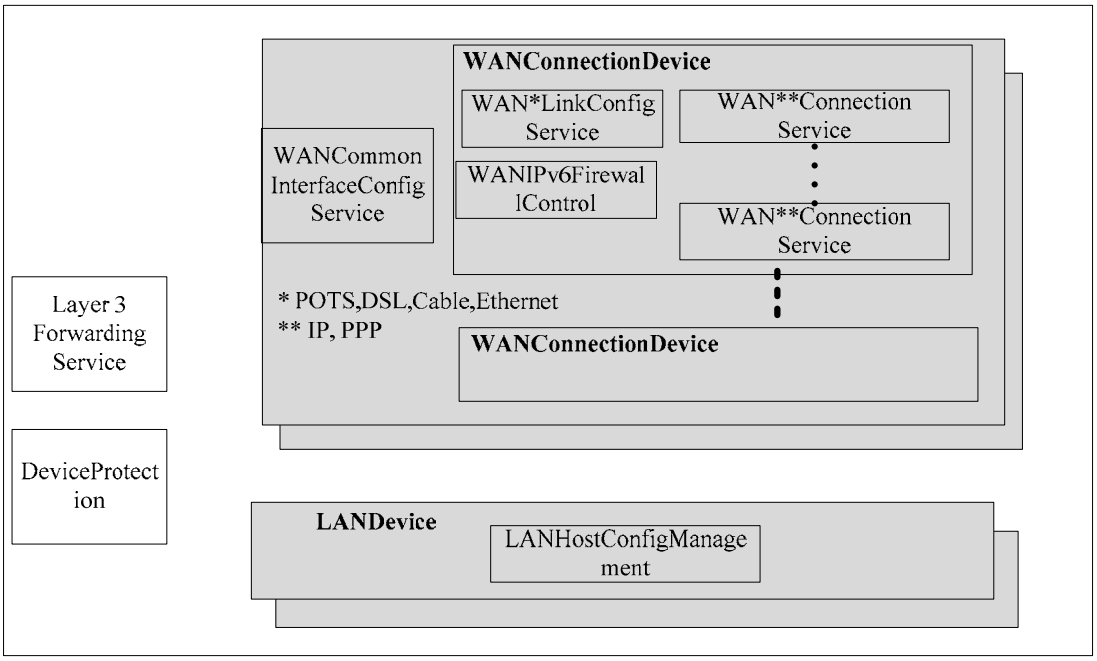

Figure 2 — *WANDevice* Devices and Services Hierarchy

Products that expose devices of the type **urn:schemas-upnp-org:device:***WANDevice:2* shall implement minimum version numbers of all required embedded devices and services specified in Table 1.

Table 1 — Device Requirements

DeviceType	Root	R/A [a]	ServiceType	R/A [a]	Service ID [b]
WANDevice:2		*R*	*WANCommonInterfaceConfig:1*	*R*	*WANCommonIFC1*
			Non-standard services embedded by an UPnP vendor go here.	*X*	*TBD*
WANConnectionDevice:2 (an instance of WANDevice may include one or more WANConnectionDevice instances)		*R*	*WANPOTSLinkConfig:1*	*A for POTS modems*	*WANPOTSLinkC1*
			WANDSLLinkConfig:1	*A for DSL modems*	*WANDSLLinkC1*
			WANCableLinkConfig:1	*A for Cable modems*	*WANCableLinkC1*
			WANEthernetLinkConfig:1	*A for Ethernet attached modems*	*WANEthLinkC1*
			WANPPPConnection:1	*R for modems that support PPP based connections*	*Multiple instances possible within a WANConnectionDevice. ServiceIDs for multiple instances will be WANPPPConn1, WANPPPConn2, WANPPPConn3 and so on.*

DeviceType	Root	R/A [a]	ServiceType	R/A [a]	Service ID [b]
			WANIPConnection:2	*R for modems that support IPv4 based connections*	*Only 1 instance per WANConnectionDevice is envisioned at this time, although the design could support multiple instances in future. ServiceIDs for multiple instances will be WANIPConn1, WANIPConn2, WANIPConn3 and so on.*
			WANIPv6FirewallControl:1	*A for IPv6 enabled IGDs*	*Only 1 instance per WANIPv6FirewallControl is envisioned at this time, although the design could support multiple instances in future. ServiceIDs for multiple instances will be WANIPv6Firewall1, WANIPv6Firewall2, WANIPv6Firewall3 and so on.*
			Non-standard services embedded by an UPnP vendor go here.	*X*	*TBD*
LANDevice:1		*A*	*LANHostConfigManagement:1*	*A*	*LANHostCfg1*
Non-standard devices embedded by an UPnP vendor go here.	*TBD*	*X*	*TBD*	*TBD*	*TBD*

a R = Required, A = Allowed, X = Non-standard

b Prefixed by urn:**upnp-org**:**serviceId**:

4.2.2 Relationships Between Services

WANCommonInterfaceConfig defines variables and actions common across all instances of *WAN{PPP/IP}Connection*s and *WANIPv6FirewallControl*s in a *WANDevice*. There may also be dependencies between a specific instance of *WAN*LinkConfig* and *WAN**Connection* service or *WANIPv6FirewallControl* service in a *WANConnectionDevice*.

5 XML Device Description

```
<?xml version="1.0"?>
<root xmlns="urn:schemas-upnp-org:device-1-0">
  <specVersion>
    <major>1</major>
    <minor>0</minor>
  </specVersion>
  <URLBase>base URL for all relative URLs</URLBase>
  <device>
    <deviceType>urn:schemas-upnp-org:device:WANDevice:2</deviceType>
    <friendlyName>short user-friendly title</friendlyName>
    <manufacturer>manufacturer name</manufacturer>
    <manufacturerURL>URL to manufacturer site</manufacturerURL>
    <modelDescription>long user-friendly title</modelDescription>
    <modelName>model name</modelName>
    <modelNumber>model number</modelNumber>
    <modelURL>URL to model site</modelURL>
    <serialNumber>manufacturer's serial number</serialNumber>
    <UDN>uuid:UUID</UDN>
    <UPC>Universal Product Code</UPC>
    <iconList>
      <icon>
        <mimetype>image/format</mimetype>
        <width>horizontal pixels</width>
        <height>vertical pixels</height>
        <depth>color depth</depth>
        <url>URL to icon</url>
      </icon>
      <!-- XML to declare other icons, if any, go here -->
    </iconList>
    <serviceList>
      <service>
        <serviceType>urn:schemas-upnp-
org:service:WANCommonInterfaceConfig:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:WANCommonIFC1</serviceId>
        <SCPDURL>URL to service description</SCPDURL>
        <controlURL>URL for control</controlURL>
        <eventSubURL>URL for eventing</eventSubURL>
      </service>
      <!-- Declarations for other services added by UPnP vendor (if any) go here -->
    </serviceList>
    <deviceList>
      <device>
        <deviceType>urn:schemas-upnp-org:device:WANConnectionDevice:2</deviceType>
        <friendlyName>short user-friendly title</friendlyName>
        <manufacturer>manufacturer name</manufacturer>
        <manufacturerURL>URL to manufacturer site</manufacturerURL>
        <modelDescription>long user-friendly title</modelDescription>
        <modelName>model name</modelName>
        <modelNumber>model number</modelNumber>
        <modelURL>URL to model site</modelURL>
        <serialNumber>manufacturer's serial number</serialNumber>
        <UDN>uuid:UUID</UDN>
        <UPC>Universal Product Code</UPC>
        <iconList>
          <icon>
            <mimetype>image/format</mimetype>
            <width>horizontal pixels</width>
            <height>vertical pixels</height>
            <depth>color depth</depth>
            <url>URL to icon</url>
          </icon>
          <!-- XML to declare other icons, if any, go here -->
        </iconList>
        <serviceList>
```



```
          <service>
            <serviceType>urn:schemas-upnp-
org:service:WANDSLLinkConfig[1]:1</serviceType>
            <serviceId>urn:upnp-org:serviceId:WANDSLLinkC1</serviceId>
            <SCPDURL>URL to service description</SCPDURL>
            <controlURL>URL for control</controlURL>
            <eventSubURL>URL for eventing</eventSubURL>
          </service>
          <service>
            <serviceType>urn:schemas-upnp-
org:service:WANIPConnection[2]:2</serviceType>
            <serviceId>urn:upnp-org:serviceId:WANIPConn1</serviceId>
            <SCPDURL>URL to service description</SCPDURL>
            <controlURL>URL for control</controlURL>
            <eventSubURL>URL for eventing</eventSubURL>
          </service>
          <!-- Declarations for other services added by UPnP vendor (if any) go here
-->
        </serviceList>
        <deviceList>
          <!-- Description of embedded devices added by UPnP vendor (if any) go here
-->
        </deviceList>
        <presentationURL>URL for presentation</presentationURL>
      </device>
      <!-- Description of embedded devices added by UPnP vendor (if any) go here -->
    </deviceList>
    <presentationURL>URL for presentation</presentationURL>
  </device>
</root>
```

6 Test

No semantic tests are defined for this device.

[1] NOTE to implementers: This template is representative of one link type; DSL in this case. Depending on the type of modem, substitute or add device specific service names.

[2] NOTE to implementers: This template is representative of one connection type; IP in this case. Depending on the type of connection, substitute or add service names.

Annex A
(informative)

Theory of Operation

WANDevice models a physical WAN interface. Connections to the Internet are initiated either from the WAN interface or are relayed or bridged through the WAN interface. For example,

- DSL can be provisioned to support multiple Virtual Circuits (VCs) simultaneously. Each VC can in turn be provisioned to support one or more PPP connections or an IP connection.
- Connections to multiple ISPs can be provisioned / configured on a POTS modem.

To handle these scenarios, each *WANDevice* includes one or more instances of *WANConnectionDevice*. A *WANConnectionDevice* encapsulates a logical or physical link on a WAN interface over which connections are modeled. Furthermore, connections on a WAN interface can be of type PPP or IP. These are modeled by corresponding *WAN**Connection* service instances for IPv4 connections or *WANIPv6FirewallControl* service instances for IPv6 connections. Properties specific to a link are modeled in a *WAN*LinkConfig* service.

Some examples best illustrate this hierarchy:

- A cable modem and IP router-integrated gateway supports one always-on IP connection. This can be modeled by a *WANConnectionDevice* that includes a *WANCableLinkConfig* service and one instance of *WANIPConnection* service.
- A POTS modem needs to be setup for 2 ISPs, each with a list of phone numbers and a set of user accounts each. This is modeled by 2 *WANConnectionDevice* instances, one for each ISP. In each *WANConnectionDevice*, the *WANPOTSLinkConfig* service specifies the list of ISP phone numbers. Each individual user account is modeled by an instance of *WANPPPConnection* service in the *WANConnectionDevice*.
- A DSL modem has been provisioned with 2 PVCs. Each VC is auto-configured for classical IP over ATM. This is modeled by 2 *WANConnectionDevice* instances, one for each VC. Each *WANConnectionDevice* contains a *WANDSLLinkConfig* service instance and one instance of *WANIPConnection*.
- An Internet gateway supports an external Ethernet-attached modem (cable or DSL). This can be modeled by a *WANConnectionDevice* instance that includes a *WANEthernetLinkConfig* service and one instance of *WANIPConnection* service.

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