ISO/IEC 29341-8-3

Edition 1.0 2008-11

INTERNATIONAL STANDARD

Information technology – UPnP Device Architecture – Part 8-3: Internet Gateway Device Control Protocol – Wide Area Network Device



ISO/IEC 29341-8-3:2008(E)

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Information technology – UPnP Device Architecture – Part 8-3: Internet Gateway Device Control Protocol – Wide Area Network Device

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRICE CODE D

ICS 35.200

ISBN 2-8318-1009-4

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Part 8-3: Internet Gateway Device Control Protocol – Wide Area Network Device

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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.

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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

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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

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1. Overview and Scope

This device template is compliant with the UPnP Device Architecture, Version 1.0.

WANDevice is a REQUIRED virtual device under the root device
urn:schemas-upnp-org:device:*InternetGatewayDevice*

WANDevice is a standalone virtual device and may be included in other root devices if appropriate.

Figure 1 below illustrates a generic Internet Gateway Device (IGD) consisting of one or more physical WAN and LAN interfaces. The IGD MUST support one WAN interface, but MAY support more than one physical WAN interface to connect to the Internet. An implementation MAY host the WAN interface and LAN interface (mentioned above) on the same physical network interface card. Some examples of technologies that provide WAN connectivity to the Internet include DSL, cable and POTS.

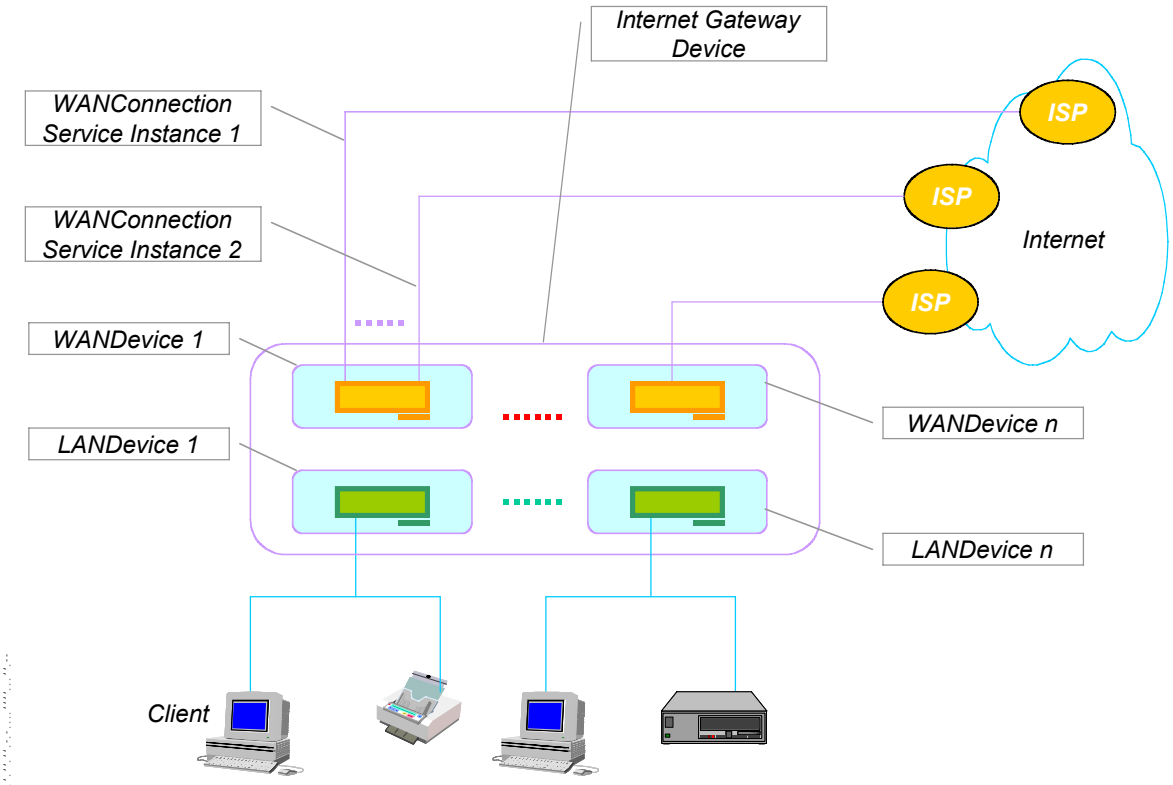

Figure 1: *InternetGatewayDevice* with WAN Interfaces

Each WAN interface MUST support one Internet connection, but MAY simultaneously support more than one Internet connection. The modeling of connections is described in the *Theory of Operation* section.

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. The *Theory of Operation* section describes the devices and services contained in ***WANDevice*** in more detail.

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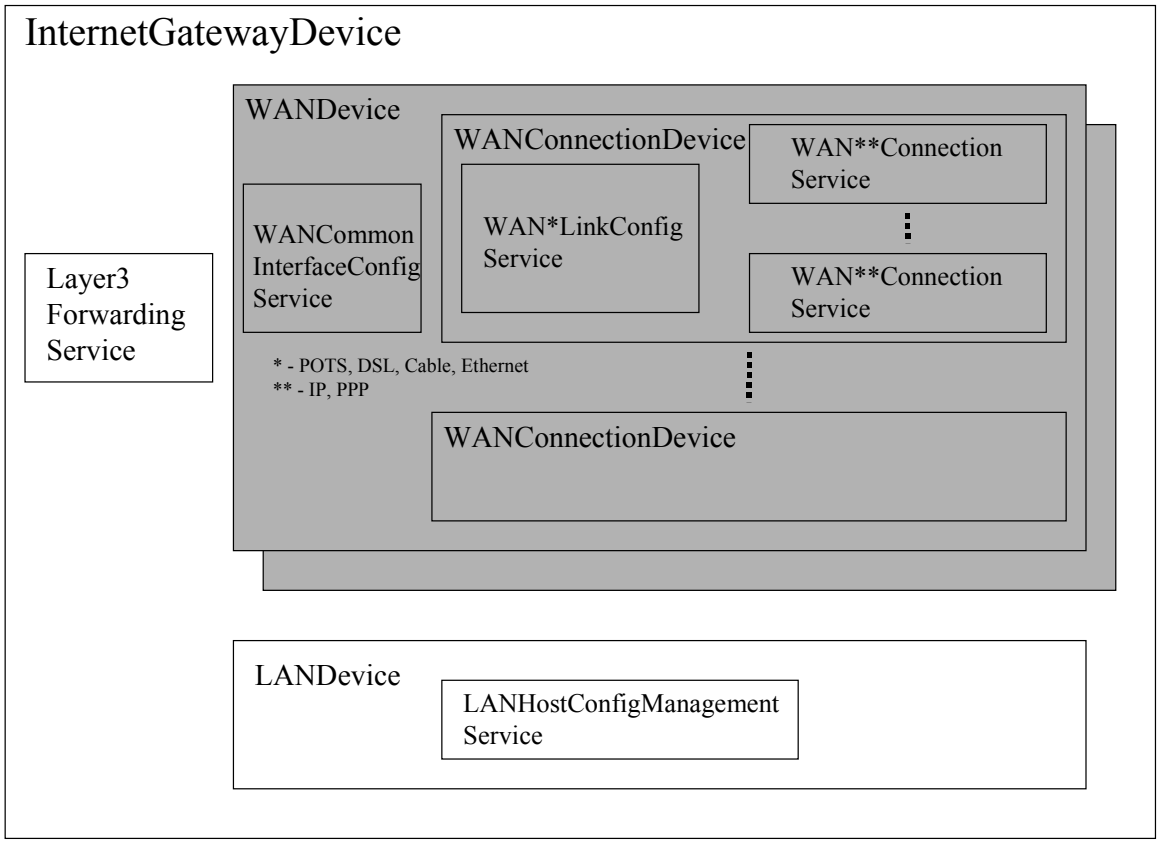

Figure 2: *WANDevice* Devices and Services Hierarchy

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2. Device Definitions

2.1. Device Type

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

urn:**schemas-upnp-org:device**:*WANDevice:1*

2.2. Device Model

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

Table 1: Device Requirements

DeviceType	Root	Req. or Opt.[1]	ServiceType	Req. or Opt.[1]	Service ID[2]
			WANCommonInterfaceConfig:1	*R*	*WANCommonIFC1*
			Non-standard services embedded by an UPnP vendor go here.	*X*	*TBD*
WANConnectionDevice:1 (an instance of WANDevice may include one or more WANConnectionDevice instances)		*R*	*WANPOTSLinkConfig:1*	*O for POTS modems*	*WANPOTSLinkC1*
			WANDSLLinkConfig:1	*O for DSL modems*	*WANDSLLinkC1*
			WANCableLinkConfig:1	*O for Cable modems*	*WANCableLinkC1*
			WANEthernetLinkConfig:1	*O 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.*
			WANIPConnection:1	*R for modems that support IP 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*

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					so on.
			Non-standard services embedded by an UPnP vendor go here.	*X*	*TBD*
Non-standard devices embedded by a UPnP vendor go here.	*TBD*	*X*	*TBD*	*TBD*	*TBD*

[1] R = Required, O = Optional, X = Non-standard.
[2] Prefixed by urn:**upnp-org**:**serviceId**: .

2.2.1. Description of Device Requirements

Each ***WANDevice*** models a physical WAN interface. A ***WANDevice*** may 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.

2.2.2. Relationships Between Services

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

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2.3. Theory of Operation

As described earlier, ***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{PPP/IP }Connection*** service instances. Properties specific to a link are modeled in a ***WAN{POTS/DSL/Cable/Ethernet}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.

In accordance with UPnP Device Architecture version 1.0, the maximum number of ***WANConnectionDevice*** instances is static and specified in the ***InternetGatewayDevice*** description document. Each ***WANConnectionDevice*** may hold a static number of ***WAN{PPP/IP }Connection*** service instances.

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3. 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:1</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:1</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>
```

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```
            <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:WANPPPConnection[2]:1</serviceType>
            <serviceId>urn:upnp-org:serviceId:WANPPPConn1</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>
```

[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; PPP in this case. Depending on the type of connection, substitute or add service names.

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4. Test

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