WANConnectionDevice:2 Device Template Version 1.01

For UPnP Versions *1.0* and 1.1
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1. Overview and Scope

This device template is compliant with the Universal Plug and Play Architecture, Version *1.0* and *1.1*.

WANConnectionDevice is a REQUIRED virtual device defined under:

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

An instance of *WANDevice* is specified under the root device:

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

WANConnectionDevice is a container for a link and connection services specific to a link on a WAN interface. Most types of WAN interfaces can be modeled by a single instance of *WANConnectionDevice*. However, in the case of DSL, each VC can have unique link attributes and can be provisioned for connection services that are different from other VCs. In this case, each VC will be modeled by an instance of *WANConnectionDevice*. Also, in the case of a POTS modem based *InternetGatewayDevice* (IGD), each separate ISP instance can be modeled as an instance of *WANConnectionDevice*.

The *Theory of Operation* section describes the services contained in *WANConnectionDevice* in more detail.

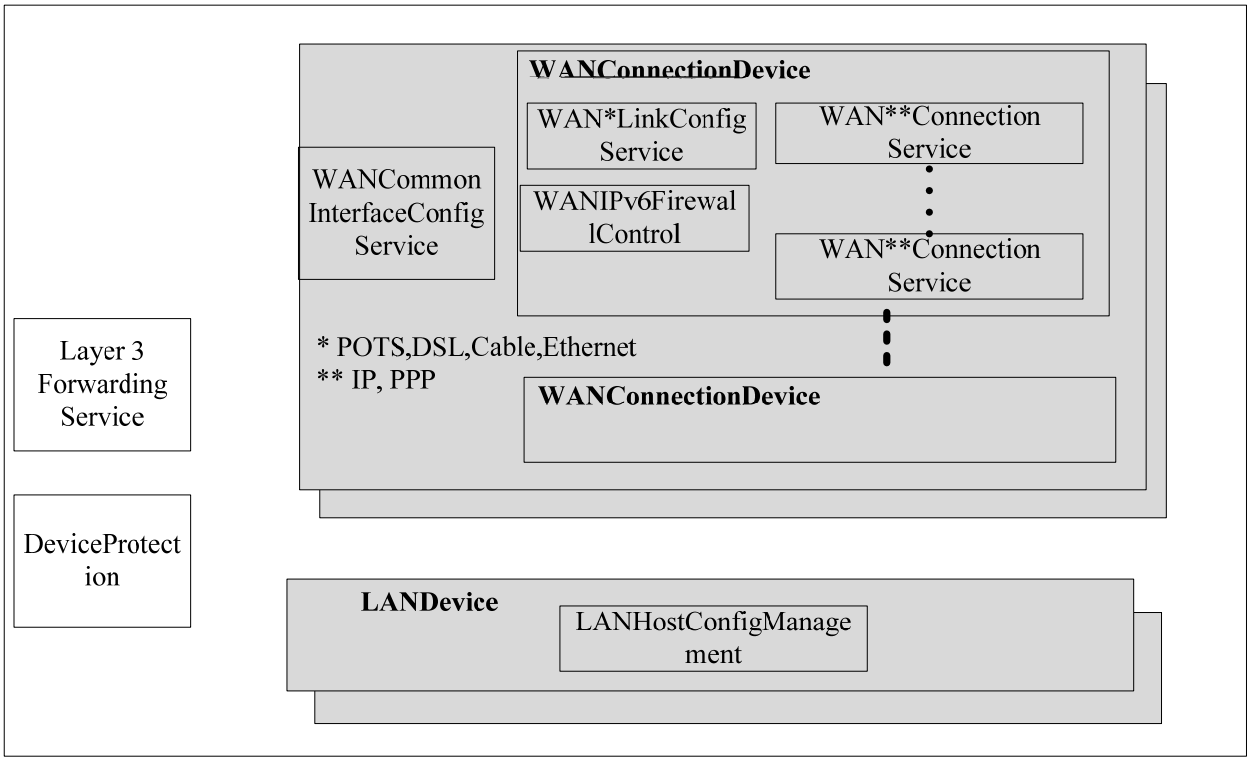

Figure 1: *WANConnectionDevice* Devices and Services Hierarchy

1.1. References

1.1.1. Normative References

This section lists the normative references used in this specification and includes the tag inside square brackets that is used for each such reference:

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Available at: http://upnp.org/specs/gw/UPnP-gw-WANEthernetLinkConfig-v1-Service.pdf

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

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

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

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

[XML SCHEMA-2] – 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.

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**:*WANConnectionDevice:2*

2.2. Device Model

Products that expose devices of the type **urn:schemas-upnp-org:device:***WANConnectionDevice:2* 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]
			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: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	*O for IPv6 enabled IGDs*	*Only 1 instance per WANIPv6FirewallCo*

					ntrol 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*
Non-standard devices embedded by an UPnP vendor go here.	*TBD*	*X*	*TBD*	*TBD*	*TBD*

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

Note: the word modem in the table above refers to the WAN interface (or *WANDevice*).

2.2.1. Description of Device Requirements

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

2.2.2. Relationships Between Services

The *DefaultConnectionService* state variable in the *Layer3Forwarding* service refers to the UDN of a *WANConnectionDevice* instance – this is an external dependency. There may also be dependencies between a specific instance of *WAN***LinkConfig* (where * can be POTS, DSL, Cable or Ethernet) and *WAN****Connection* service (where ** can be PPP or IP) or *WANIPv6FirewallControl* service in a *WANConnectionDevice*.

2.3. Theory of Operation

Connections to the Internet are initiated either from the WAN interface of an IGD or are relayed or bridged through the WAN interface. 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. 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 for IPv4 connections or *WANIPv6FirewallControl* service instances for IPv6 connections. Properties specific to a link are modeled in a *WAN{POTS/DSL/Cable/Ethernet}LinkConfig* service.

The definition of the *WAN*LinkConfig*[1], *WAN*Connection*[2] and *WANIPv6FirewallControl* services are based on the following broad objectives:

- To allow for the distinction between Internet access scenarios that are typically independent of the modem types used and configuration scenarios that are specific to modem types. This enables easier modeling of various connectivity scenarios independent of the underlying modem type or its configuration.
- To support most of the commonly deployed connection types (either originating at the WAN interface of the gateway or relayed/bridged through the gateway).
- To support manual (may need Out-Of-Band security and access control mechanisms) or automatic configuration of parameters on a modem.
- To ensure extensibility for new connection types in future.

Configuration and connectivity scenarios are independent of each other. However, there is an implied relationship in that control points will first need to complete configuration actions (unless this process is completed automatically) before initiating any connectivity related actions. It is also important to note that auto and manual configuration of a modem are mutually exclusive operations in most cases. Furthermore, in most deployment scenarios, auto configuration is given higher priority over manual configuration.

The process of configuration and subsequent management of WAN connections is via 3 variables:

- *LinkType*: This variable, if defined in a *WAN*LinkConfig* service, indicates the protocol configured on a specific link. This variable can be set manually, or through an automatic mechanism (for example, AutoConfig[3] specified by Broadband Forum).
- *PossibleConnectionTypes*: specifies only those connection types that are permissible in a particular implementation for a specific modem link configuration (as indicated by the value of *LinkType*). This variable is defined in *WAN*Connection* service.
- *ConnectionType*: indicates a specific connection type selected from those permissible on a link, as indicated by *PossibleConnectionTypes*. This variable is defined in *WAN*Connection* service.

Figure 2 illustrates the process of configuration and connection management, using a DSL modem as an example. Note that the configuring agent and subsequent user(s) of connections need not be the same network entities. The 4 conceptual steps are described below.

- **Step 1**: A configuring entity sets up the *LinkType* to an appropriate value.

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[1] Refer to companion DCP drafts for specific *WAN*LinkConfig* descriptions and description of variables such as *LinkType*.

[2] Refer to companion DCP drafts for specific *WAN*Connection* service descriptions and variables such as *PossibleConnectionTypes* and *ConnectionType*.

[3] Refer to the Broadband Forum website (http://www.broadband-forum.org) for more details.

- **Step 2**: The value of *LinkType* is combined with the capabilities of the modem to come up with a list of possible connection types appropriate for the particular configuration.
- **Step 3**: The variable *PossibleConnectionTypes* is updated with the list derived from step above.
- **Step 4**: A control point may subsequently initiate a connection by setting *ConnectionType* to a value from the allowable list specified in *PossibleConnectionTypes*. In this step, a control point evaluates its own capabilities vis-à-vis the capabilities exposed in *PossibleConnectionTypes* and selects one that is appropriate for its use. In some deployment scenarios, the value of *ConnectionType* may be strictly read-only from a control point perspective.

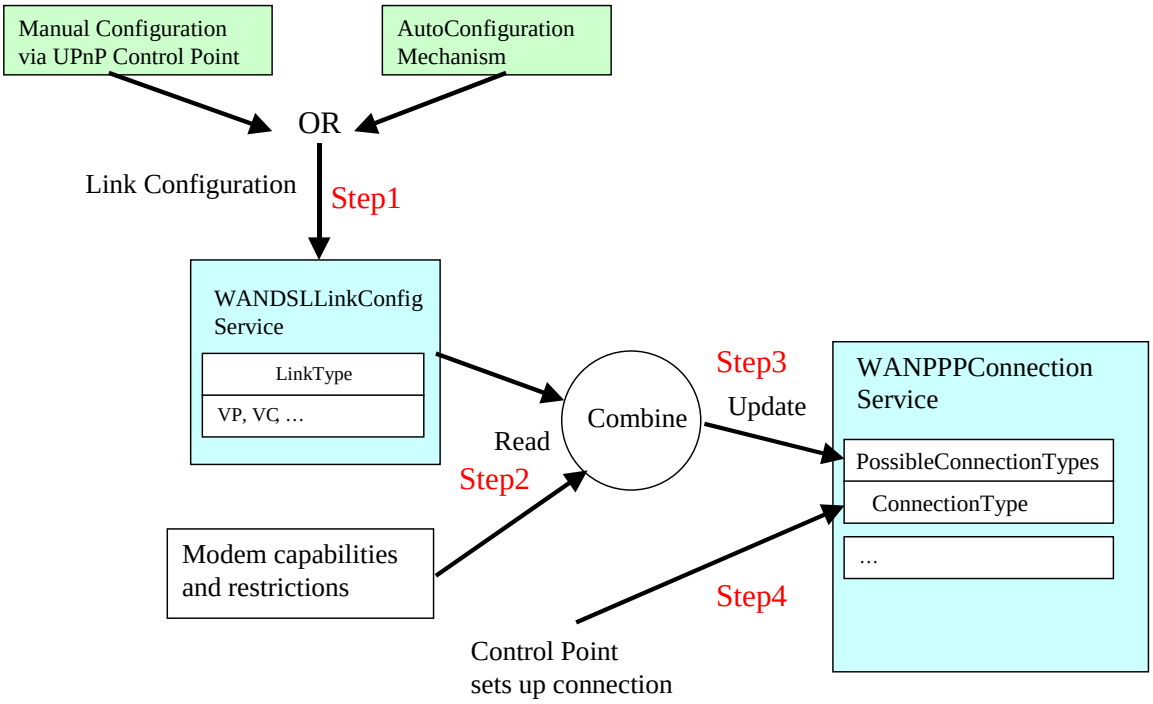

Figure 2: Configuration and Connection Management

The following table lists valid combinations of *LinkType* and *PossibleConnectionTypes* as well as connection service type for different types of WAN interfaces.

Table 2: Valid Combinations of *LinkType* and *PossibleConnectionTypes*

Modem Type	*LinkType*	Available Modem Capabilities	*PossibleConnectionTypes*	Connection Service Type
DSL	*Unconfigured*	Not Applicable	*Unconfigured*	Not Applicable
	EoA[4]	Bridge	*IP_Bridged*	*WANIPConnection*

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: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[5]: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[6]: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>
```

[5] 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.

[6] 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.

```
      <!-- 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>
</root>
```

4. Test

No semantic tests are defined for this device.