
**Information technology — UPnP
Device Architecture —**

**Part 24-1:
Internet gateway device control
protocol — Level 2 — Internet
gateway device**

Technologies de l'information — Architecture de dispositif UPnP —

*Partie 24-1: Protocole de contrôle de dispositif de passerelle
Internet — Niveau 2 — Dispositif de passerelle Internet*



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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see <http://www.iso.org/directives>).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of Standard, the meaning of the ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword – Supplementary information](#)

ISO/IEC 29341-24-1 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
UPnP HVAC_ZoneThermostat:1 Device	ISO/IEC 29341-6-2

UPnP BinaryLight:1 Device	ISO/IEC 29341-7-1
UPnP Dimming:1 Service	ISO/IEC 29341-7-10
UPnP SwitchPower:1 Service	ISO/IEC 29341-7-11
UPnP DimmableLight:1 Device	ISO/IEC 29341-7-2
UPnP InternetGatewayDevice:1 Device	ISO/IEC 29341-8-1
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 LANDevice:1 Device	ISO/IEC 29341-8-2
UPnP WANPPPPConnection:1 Service	ISO/IEC 29341-8-20
UPnP WLANConfiguration:1 Service	ISO/IEC 29341-8-21
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 Printer:1 Device	ISO/IEC 29341-9-1
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 Scanner:1.0 Device	ISO/IEC 29341-9-2
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 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 QOS v2 Schema Files	ISO/IEC 29341-11-2
UPnP RemoteUIClientDevice:1 Device	ISO/IEC 29341-12-1
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

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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
UPnP QoSDevice:3 Addendum	ISO/IEC 29341-17-13:2011
UPnP RemoteAccessArchitecture:1	ISO/IEC 29341-18-1:2011
UPnP InboundConnectionConfig:1 Service	ISO/IEC 29341-18-10:2011
UPnP RADAConfig:1 Service	ISO/IEC 29341-18-11:2011
UPnP RADASync:1 Service	ISO/IEC 29341-18-12:2011
UPnP RATAConfig:1 Service	ISO/IEC 29341-18-13:2011
UPnP RAClient:1 Device	ISO/IEC 29341-18-2:2011
UPnP RAServer:1 Device	ISO/IEC 29341-18-3:2011
UPnP RADiscoveryAgent:1 Device	ISO/IEC 29341-18-4:2011
UPnP SolarProtectionBlind:1 Device	ISO/IEC 29341-19-1:2011
UPnP TwoWayMotionMotor:1 Service	ISO/IEC 29341-19-10:2011
UPnP AV Architecture:2	ISO/IEC 29341-20-1
UPnP AVTransport:3 Service	ISO/IEC 29341-20-10
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
UPnP ScheduledRecording:2 Service	ISO/IEC 29341-20-14
UPnP MediaRenderer:3 Service	ISO/IEC 29341-20-2
UPnP MediaServer:4 Device	ISO/IEC 29341-20-3
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
UPnP WANIPv6FirewallControl:1 Service	ISO/IEC 29341-24-11
UPnP WANConnectionDevice:2 Service	ISO/IEC 29341-24-2
UPnP WANDevice:2 Device	ISO/IEC 29341-24-3
UPnP Telephony Architecture:2	ISO/IEC 29341-26-1
UPnP CallManagement:2 Service	ISO/IEC 29341-26-10
UPnP MediaManagement:2 Service	ISO/IEC 29341-26-11
UPnP Messaging:2 Service	ISO/IEC 29341-26-12
UPnP PhoneManagement:2 Service	ISO/IEC 29341-26-13
UPnP AddressBook:1 Service	ISO/IEC 29341-26-14
UPnP Calendar:1 Service	ISO/IEC 29341-26-15
UPnP Presense:1 Service	ISO/IEC 29341-26-16
UPnP TelephonyClient:2 Device	ISO/IEC 29341-26-2
UPnP TelephonyServer:2 Device	ISO/IEC 29341-26-3
UPnP Friendly Info Update:1 Service	ISO/IEC 29341-27-1
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

ISO/IEC 29341-24-1:2017(E)

UPnP DataStore:1 Service
UPnP IoT Management and Control Data Model:1 Service
UPnP IoT Management and Control Transport Generic:1
Service
UPnP IoT Management and Control:1 Device
UPnP Energy Management:1 Service

ISO/IEC 29341-30-10
ISO/IEC 29341-30-11
ISO/IEC 29341-30-12
ISO/IEC 29341-30-2
ISO/IEC 29341-31-1

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Introduction

Version 2 of the Internet Gateway Device Device Control Protocol (IGD DCP:2) was created to address limitations in version 1, with the following specific enhancements:

- Update [WANIPConnection](#) service based on developer feedback and maintenance need
 - NAT terminology update
 - New actions better suited for application development
 - Limited port mapping lease time
 - Enhanced security for the actions and parameters
- Security and access control support
 - Allow basic IGD:1 compliant functionality without requiring new protocols to be supported
 - Protect and require authentication on functionality potentially creating security threats. These features will not be available for legacy control points and backward compatibility is limited in these cases where other role than [Public](#) is recommended.
- Add support for IPv6 Firewall control ([WANIPv6FirewallControl](#)). This service allows creating and maintaining pinholes for inbound traffic from the Internet

Due to lack of developer interest, [WANPPPConnection](#) service was NOT updated to reflect the changes made to [WANIPConnection](#).

1 Scope

This document specifies the characteristics of a device that manages connectivity to the Internet as an “edge” device between a residential Local Area Network and a Wide Area Network. The gateway can be physically implemented as a standalone device, or logically as a set of UPnP devices and services on a PC. This specified device is intended to be controlled from inside the home network. Control from outside the home network typically requires access control mechanisms that are outside the scope of this document. This specified device is also not intended for use with small business networks.

This document defines version 2 of the device named [InternetGatewayDevice](#). It is a UPnP root device, and is identified by the UPnP device type [InternetGatewayDevice:2](#). It is compliant with the UPnP Device Architecture, Versions 1.0 and 1.1 ([15] and [16], respectively). [InternetGatewayDevice:2](#) encapsulates several sub-devices and services that collectively comprise the Internet Gateway Device Control Protocol (DCP).

Figure 1 is a conceptual illustration of a generic Internet Gateway device consisting of one or more physical WAN and LAN interfaces.

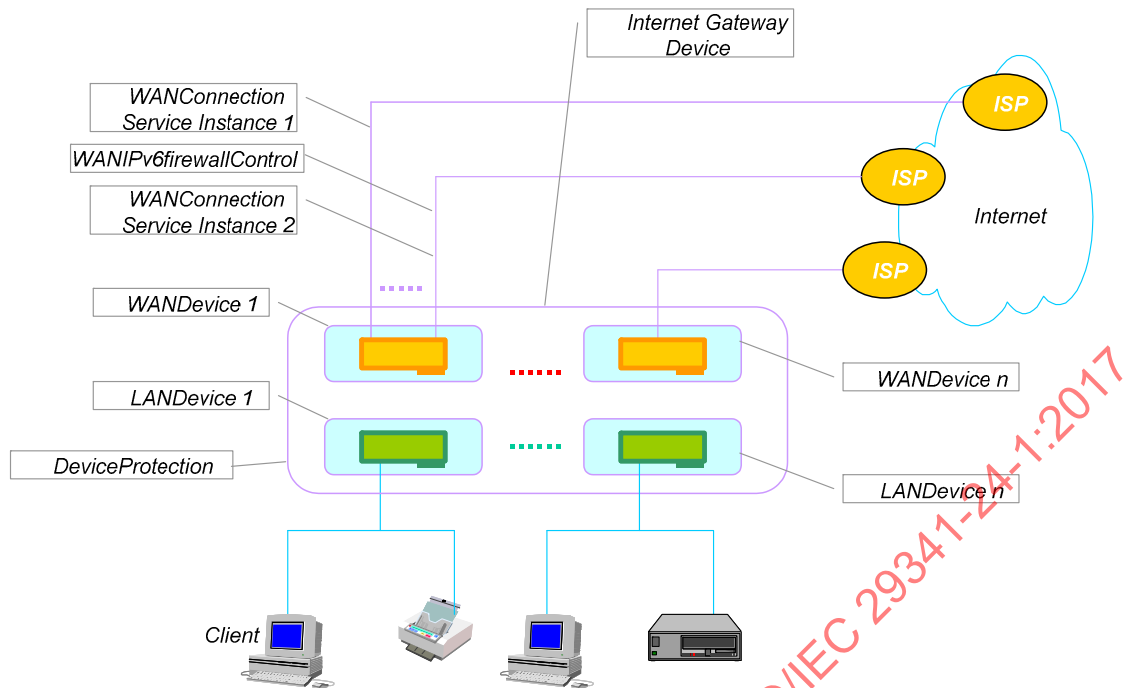


Figure 1 — InternetGatewayDevice with LAN and WAN Interfaces

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] DeviceProtection:1, version 1.0, UPnP Forum, February 24, 2011.
Available at: <http://upnp.org/specs/gw/UPnP-gw-DeviceProtection-v1-Service.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.
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- [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.
Available at: <http://upnp.org/specs/gw/UPnP-gw-LANHostConfigManagement-v1-Service.pdf>.
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Available at: <http://upnp.org/specs/gw/UPnP-gw-WANCableLinkConfig-v1-Service.pdf>.
- [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>.
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Available at: <http://upnp.org/specs/gw/UPnP-gw-WANPPPPConnection-v1-Service.pdf>.
- [15] *UPnP Device Architecture*, version 1.0, UPnP Forum, June 8, 2000.
Available at: http://upnp.org/specs/arch/UPnPDA10_20000613.pdf.
Latest version available at: <http://upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.0.pdf>.
- [16] *UPnP Device Architecture*, version 1.1, UPnP Forum, UPnP Forum, October 15, 2008.
Available at: <http://upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.1.pdf>.
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- [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 Security terms

3.1.1

access level

a set of rights that allows a control point to control or query another device or service—used interchangeably in this document with the term role, as defined in [1]

3.2 Abbreviated terms

3.2.1

DCP

Device Control Protocol

3.2.2

IGD

Internet Gateway Device

3.2.3

WAN*LinkConfig

any or all of WANPOTSLinkConfig, WANDSLLinkConfig, WANCableLinkConfig, WANEthernetLinkConfig

3.2.4

WAN**Connection

any or both of WANPPPConnection, WANIPConnection

4 Device Model

4.1 Device Type

The following URN identifies a device that is compliant with this specification:

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

4.2 Requirements for an Internet Gateway Device

The following list of requirements has been identified on the capabilities of an Internet Gateway in coming up with the devices and services hierarchy for the gateway DCP.

- The InternetGatewayDevice shall support 1 WAN interface, but may support more than one physical WAN interface to connect to the Internet.
- The InternetGatewayDevice shall support 1 LAN interface, but may support more than one physical LAN interface to connect to the residential network.
- The InternetGatewayDevice should support DeviceProtection defined in [1].
- The InternetGatewayDevice shall support IGD. Specific security as defined in 4.4, but may implement stricter security policy.

An implementation may host the WAN interface and LAN interface (mentioned above) on the same physical network interface card (NIC).

- Each WAN interface shall support one Internet connection, but may simultaneously support more than one Internet connection. Each of these connections will be modeled as instances of a service in the DCP.
- The InternetGatewayDevice shall be IP addressable from the residential LAN at all times to be UPnP compliant. More specifically, in the case of gateways with broadband modems on the WAN side, the InternetGatewayDevice shall be addressable.
 - When the device is not configured for WAN access or does not have any WAN connectivity.
 - Before, during and after modem and link configuration with a head-end device in the Internet service provider's central office.
- Connectivity on the WAN side shall enable nodes on the residential LAN to access resources on the Internet. A gateway may support modems and/or connections on a modem to a service provider, not resulting in Internet connectivity – for example, POTS dial-up access to a modem bank of a home security monitoring service provider. Such connections are outside the scope and requirements of the gateway DCP.

In this document, an Internet connection implies IP connectivity to an Internet Service Provider. Figure 2 illustrates the hierarchy of devices and services in an InternetGatewayDevice. A physical modem on the WAN side and a connection interface/port on the LAN side of the InternetGatewayDevice are modeled by a WANDevice and a LANDevice instance respectively. Depending on the hardware capabilities of an Internet Gateway, more than 1 instance of WANDevice and/or LANDevice are possible in an actual implementation of the gateway DCP description document. Virtual connection interfaces – such as Virtual Circuits (VC) on a DSL modem, are modeled by one or more instances of WANConnectionDevice. Sub-devices and services mentioned in this document are defined in companion documents that together specify the DCP for an Internet Gateway. It is

recommended that [DeviceProtection](#) service will be connected to [InternetGatewayDevice](#) in the device and service hierarchy.

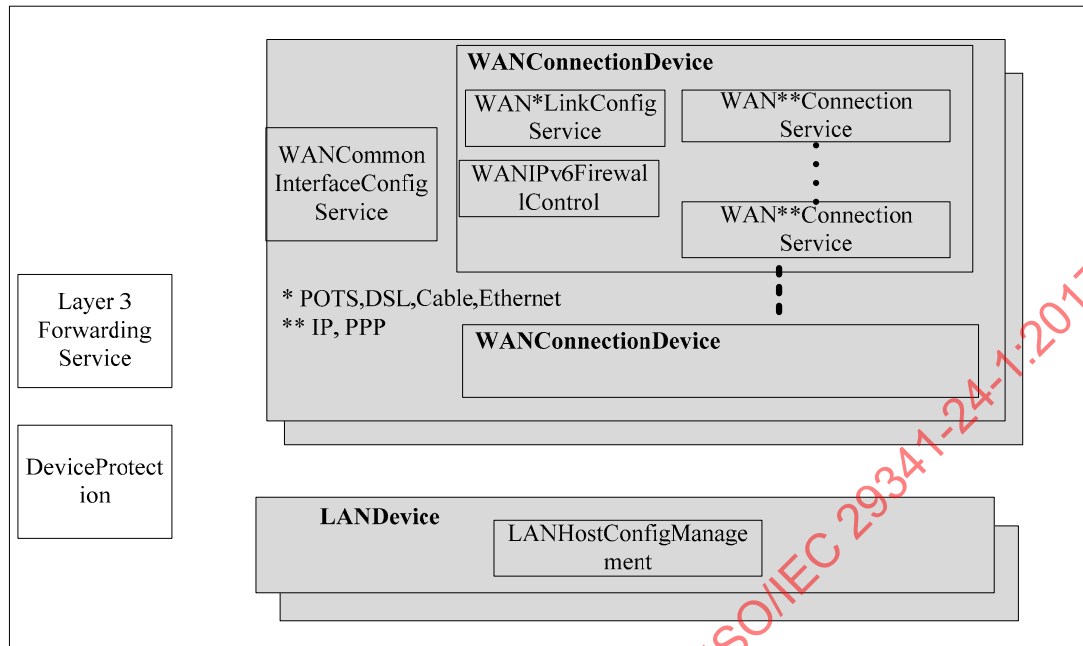


Figure 2 — [InternetGatewayDevice](#) Devices and Services Hierarchy

4.3 Device Architecture

Products that expose devices of the type [urn:schemas-upnp-org:device:InternetGatewayDevice: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
			Layer3Forwarding:1	A	L3Forwarding1
			DeviceProtection:1	A	DeviceProtection1
			Other standard UPnP devices and Services go here	X	TBD
			Non-standard services embedded by an UPnP vendor go here.	X	TBD
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	WANEthLinkC1

DeviceType	Root	R/A ^a	ServiceType	R/A ^a	Service ID ^b
				<u>attached modems</u>	
			<u>WANPPPConnection:1</u>	<u>R for modems that support PPP based connections</u>	<u>Multiple instances possible within a WANConnectionDevice. ServiceIDs for multiple instances will be WANPPPConn1, WANPPPConn2, WANPPPConn3 and so on.</u>
			<u>WANIPConnection:2</u>	<u>R for modems that support IPv4 based connections</u>	<u>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.</u>
			<u>WANIPv6FirewallControl:1</u>	<u>A for IPv6 enabled IGDs</u>	<u>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.</u>
			Non-standard services embedded by an UPnP vendor go here.	X	TBD
<u>LANDevice:1</u>		<u>A</u>	<u>LANHostConfigManagement:1</u>	<u>A</u>	<u>LANHostCfq1</u>
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:

4.3.1 Device Requirements

As shown in Table 1, the DCP defines 3 Connection services (WANIPConnection, WANPPPConnection and WANIPv6FirewallControl) and 4 LinkConfig services to accommodate various types of WAN interfaces and connection types. In addition, it includes DeviceProtection service for managing access control. Table 2 briefly describes the purpose of each of the services. An actual implementation of the DCP will instance only those Connection and LinkConfig services that are appropriate for the gateway device being modeled.

Table 2 — Service Descriptions

Service Name	Service Description
<u>WANPPPConnection</u>	PPP connections originating at the gateway or relayed or bridged through the gateway [14]
<u>WANIPConnection</u>	IPv4 connections originating or relayed or bridged through the gateway [4]
<u>WANPOTSLinkConfig</u>	Configuration parameters associated with a WAN link on a Plain Old Telephone Service (POTS) modem [13]

Service Name	Service Description
<u>WANDSLLinkConfig</u>	Configuration parameters associated with a WAN link on a Digital Subscriber Link (DSL) modem [11]
<u>WANCableLinkConfig</u>	Configuration parameters associated with a WAN link on a cable modem [9]
<u>WANEthernetLinkConfig</u>	Configuration parameters associated with an Ethernet- attached external modem (cable or DSL). If proprietary mechanisms are available to discover and configure an external modem, it is recommended that modem-specific <u>LinkConfig</u> services be modeled instead of this service. [12]
<u>WANIPv6FirewallControl</u>	Allows controlling IPv6 firewall to open Pinholes [5]
<u>DeviceProtection</u>	This service facilitates authentication and access control in the gateway device [1]

4.3.2 Relationships between Services

[Layer3Forwarding](#) identifies a default service, which is a specific instance of [WAN**Connection](#) for IPv4 connections (or [WANIPv6FirewallControl](#) for IPv6 connections) in a [WANConnectionDevice](#). [WANCommonInterfaceConfig](#) defines variables and actions common across all instances of [WAN**Connections](#) and [WANIPv6FirewallControl](#)s in a [WANDevice](#). There may also be dependencies between a specific instance of [WAN*LinkConfig](#) and [WAN**Connection](#) or [WANIPv6FirewallControl](#) service in a [WANConnectionDevice](#).

[DeviceProtection](#) is used to create trusted relationship between [InternetGatewayDevice](#) and a control point. If an action requires authentication and authorization, then this service is used to create the relationship and to verify that the relationship exists. Subclause 4.4 defines what actions can be used without authentication, and also what level of authorization is recommended for the rest of the actions that require higher level of security.

4.4 Security policies

Subclause 4.4 describes the recommended set of default security policies for roles and for assigning roles to services and actions.

4.4.1 Access control and user roles

InternetGatewayDevice:2 that implements the DeviceProtection service implements following user roles as defined in [1]:

- Public requires neither authentication nor authorization. This user role is intended for applications making e.g. port mappings for themselves and do not require any other sort of configuration.
- Basic level requires authentication and authorization as specified in this document. Authentication is based on [1]. Basic role is intended for standard operation like creating port mappings for other devices or controlling on-demand connectivity. Usually, Basic role is assigned to actions making impact on single device's service. It is expected that when a new device is introduced, it is in IGD case automatically granted Basic access level.
- Admin access is intended for management of settings and risky actions that are not required in normal usage. It is recommended that administration interface SHOULD REQUIRE additional security measures. This access level is recommended, if the changes made impact to whole network's service or has impact to the several services. For instance, configuring DNS or DHCP settings would be a good example.
- Vendor-defined roles can be created, but it is required that all other roles are implemented and supported. It is also required that control points supporting three predefined roles are able to operate with the gateway. Role names shall be maximum 64 characters long and shall not contain spaces. Role names not defined by the Forum shall be prefixed with a Vendor Domain Name followed by a colon (such as "example.com:"). Forum-defined Role names shall be defined in service specifications and/or DCP-specific security considerations documents published by Working Committees.

This document recommends the default access level to be applied for each action of the legacy services (version 1 and version 2). In other words, this document does not require that a vendor shall implement the access level defined in this document for each action of his InternetGatewayDevice:2 implementation. As a result, vendors are allowed to implement different access control policies than defined in this document. For example, a vendor can decide to set a Public access level for opening port mappings with ports lower than or equal to 1023 instead of a Basic access level.

When new users/control points are introduced and authorized with IGD, they should be automatically granted Basic access role. Admin level should be granted as defined in [1].

4.4.2 General policies

It is required that InternetGatewayDevice:2 contains the newest version of each service. Therefore, earlier versions must not be used if newer version exists.

It is recommended that DeviceProtection service is implemented and applied. If DeviceProtection service is not implemented and applied it is recommended that control points only be allowed to access actions and parameters defined as Public role in this document. Refer to access levels in the Actions table for each service in the remaining subclauses of 4.4.

UPnP IGD shall expose UPnP services only over the LAN interface. IGD shall reject UPnP requests from the WAN interfaces.

4.4.3 WANIPConnection:2

Table 3 — Recommended access levels for WANIPConnection:2 actions

Name	Access level	Description
<u>SetConnectionType()</u>	<u>Admin</u>	Impacts connectivity for all applications

Name	Access level	Description
<u>GetConnectionTypeInfo()</u>	<u>Public</u>	Allows retrieving information
<u>RequestConnection()</u>	<u>Basic</u>	Starting a connection is normal operation and should not require strict security, but <u>Basic</u> authentication is recommended
<u>RequestTermination()</u>	<u>Admin</u>	Ending connection impacts connectivity for all applications
<u>ForceTermination()</u>	<u>Admin</u>	See previous
<u>SetAutoDisconnectTime()</u>	<u>Admin</u>	IGD configuration – not part of normal usage
<u>SetIdleDisconnectTime()</u>	<u>Admin</u>	IGD configuration – not part of normal usage
<u>SetWarnDisconnectDelay()</u>	<u>Admin</u>	IGD configuration – not part of normal usage
<u>GetStatusInfo()</u>	<u>Public</u>	Allows retrieving information – does not change operation
<u>GetAutoDisconnectTime()</u>	<u>Public</u>	Allows retrieving information – does not change operation
<u>GetWarnDisconnectDelay()</u>	<u>Public</u>	Allows retrieving information – does not change operation
<u>GetNATRSIPStatus()</u>	<u>Public</u>	Allows retrieving information – does not change operation
<u>GetGenericPortMappingEntry()</u>	<u>Public</u> for CP's IP address and ports greater than or equal to 1024	Allows retrieving information on device's own port mappings when ports <i>are not</i> well-known ports
	<u>Basic</u> for CP's IP address and ports lower than or equal to 1023	Allows retrieving information on device's own port mappings when ports <i>are</i> well-known ports
	<u>Basic</u> for other IP addresses and ports greater than or equal to 1024	<u>Basic</u> level access is recommended for 3-box scenario <i>without</i> well-known ports
	<u>Admin</u> for other IP addresses and ports lower than or equal to 1023	<u>Admin</u> level access is recommended for 3-box scenario <i>with</i> well-known ports
<u>GetSpecificPortMappingEntry()</u>	<u>Public</u> for CP's IP address and ports greater than or equal to 1024	Allows retrieving information on device's own port mappings when ports <i>are not</i> well-known ports
	<u>Basic</u> for CP's IP address and ports lower than or equal to 1023	Allows retrieving information on device's own port mappings when ports <i>are</i> well-known ports
	<u>Basic</u> for other IP addresses and ports greater than or equal to 1024	<u>Basic</u> level access is recommended for 3-box scenario <i>without</i> well-known ports
	<u>Admin</u> for other IP addresses and ports lower than or equal to 1023	<u>Admin</u> level access is recommended for 3-box scenario <i>with</i> well-known ports
<u>AddPortMapping()</u>	<u>Public</u> for CP's IP address and ports greater than or equal to 1024	Allows setting port mappings for device itself when ports <i>are not</i> well-known ports
	<u>Basic</u> for CP's IP address and ports lower than or equal to 1023	Allows setting port mappings for device itself when ports <i>are</i> well-known ports
	<u>Basic</u> for other IP addresses and ports greater than or equal to 1024	<u>Basic</u> level access is recommended for 3-box case <i>without</i> well-known ports
	<u>Admin</u> for other IP addresses and ports lower than or equal to 1023	<u>Admin</u> level access is recommended for 3-box case <i>with</i> well-known ports
<u>DeletePortMapping()</u>	<u>Public</u> for CP's IP address and ports greater than or equal to 1024	Allows removing port mappings for device itself when ports <i>are not</i> well-known ports

Name	Access level	Description
	<u>Basic</u> for CP's IP address and ports lower than or equal to 1023	Allows removing port mappings for device itself when ports are well-known ports
	<u>Basic</u> for other IP addresses and ports greater than or equal to 1024	<u>Basic</u> level access is recommended for 3-box case <i>without</i> well-known ports
	<u>Admin</u> for other IP addresses and ports lower than or equal to 1023	<u>Admin</u> level access is recommended for 3-box case <i>with</i> well-known ports
<u>DeletePortMappingRange()</u>	<u>Public</u> for CP's IP address and ports greater than or equal to 1024	Allows removing device's port mappings for device itself when ports are <i>not</i> well-known ports
	<u>Basic</u> for CP's IP address and ports lower than or equal to 1023	Allows removing device's port mappings for device itself when ports are well-known ports
	<u>Basic</u> for other IP addresses and ports greater than or equal to 1024	<u>Basic</u> level access is recommended for 3-box case <i>without</i> well-known ports
	<u>Admin</u> for other IP addresses and ports lower than or equal to 1023	<u>Admin</u> level access is recommended for 3-box case <i>with</i> well-known ports
<u>GetExternalIPAddress()</u>	<u>Public</u>	Allows retrieving WAN interface's IP address
<u>GetListOfPortMappings()</u>	<u>Public</u> for CP's IP address and ports greater than or equal to 1024	Allows retrieving information on device's own port mappings when ports are <i>not</i> well-known ports
	<u>Basic</u> for CP's IP address and ports lower than or equal to 1023	Allows retrieving information on device's own port mappings when ports are well-known ports
	<u>Basic</u> for other IP addresses and ports greater than or equal to 1024	<u>Basic</u> level access is recommended for 3-box scenario <i>without</i> well-known ports
	<u>Admin</u> for other IP addresses and ports lower than or equal to 1023	<u>Admin</u> level access is recommended for 3-box case <i>with</i> well-known ports
<u>AddAnyPortmapping()</u>	<u>Public</u> for CP's IP address and ports greater than or equal to 1024	Allows setting port mappings for device itself when ports are <i>not</i> well-known ports
	<u>Basic</u> for CP's IP address and ports lower than or equal to 1023	Allows setting port mappings for device itself when ports are well-known ports
	<u>Basic</u> for other IP addresses and ports greater than or equal to 1024	<u>Basic</u> level access is recommended for 3-box case <i>without</i> well-known ports
	<u>Admin</u> for other IP addresses and ports lower than or equal to 1023	<u>Admin</u> level access is recommended for 3-box case <i>with</i> well-known ports

4.4.4 WANPPPConnection:1Table 4 — Recommended access levels for WANPPPConnection:1 actions

Name	Access level	Description
<u>GetConnectionTypeInfo()</u>	<u>Public</u>	Allows retrieving information
<u>SetConnectionType()</u>	<u>Admin</u>	Impacts connectivity for all applications
<u>GetConnectionTypeInfo()</u>	<u>Public</u>	Allows retrieving information
<u>RequestConnection()</u>	<u>Basic</u>	Starting a connection is normal operation and should not require strict security, but <u>Basic</u> authentication is recommended
<u>RequestTermination()</u>	<u>Admin</u>	Ending connection impacts connectivity for all applications

Name	Access level	Description
<u>ForceTermination()</u>	<u>Admin</u>	Ending connection impacts connectivity for all applications
<u>SetAutoDisconnectTime()</u>	<u>Admin</u>	IGD configuration – not part of normal usage
<u>SetIdleDisconnectTime()</u>	<u>Admin</u>	IGD configuration – not part of normal usage
<u>SetWarnDisconnectDelay()</u>	<u>Admin</u>	IGD configuration – not part of normal usage
<u>GetStatusInfo()</u>	<u>Public</u>	Allows retrieving information – does not change operation
<u>GetAutoDisconnectTime()</u>	<u>Public</u>	Allows retrieving information – does not change operation
<u>GetWarnDisconnectDelay()</u>	<u>Public</u>	Allows retrieving information – does not change operation
<u>GetNATRSIPStatus()</u>	<u>Public</u>	Allows retrieving information – does not change operation
<u>GetGenericPortMappingEntry()</u>	<u>Public</u> for CP's IP address and ports greater than or equal to 1024	Allows retrieving information on device's own port mappings when ports <i>are not</i> well-known ports
	<u>Basic</u> for CP's IP address and ports lower than or equal to 1023	Allows retrieving information on device's own port mappings when ports <i>are</i> well-known ports
	<u>Basic</u> for other IP addresses and ports greater than or equal to 1024	<u>Basic</u> level access is recommended for 3-box scenario <i>without</i> well-known ports
	<u>Admin</u> for other IP addresses and ports lower than or equal to 1023	<u>Admin</u> level access is recommended for 3-box scenario <i>with</i> well-known ports
<u>GetSpecificPortMappingEntry()</u>	<u>Public</u> for CP's IP address and ports greater than or equal to 1024	Allows retrieving information on device's own port mappings when ports <i>are not</i> well-known ports
	<u>Basic</u> for CP's IP address and ports lower than or equal to 1023	Allows retrieving information on device's own port mappings when ports <i>are</i> well-known ports
	<u>Basic</u> for other IP addresses and ports greater than or equal to 1024	<u>Basic</u> level access is recommended for 3-box scenario <i>without</i> well-known ports
	<u>Admin</u> for other IP addresses and ports lower than or equal to 1023	<u>Admin</u> level access is recommended for 3-box scenario <i>with</i> well-known ports
<u>AddPortMapping()</u>	<u>Public</u> for CP's IP address and ports greater than or equal to 1024	Allows setting port mappings for device itself when ports <i>are not</i> well-known ports
	<u>Basic</u> for CP's IP address and ports lower than or equal to 1023	Allows setting port mappings for device itself when ports <i>are</i> well-known ports
	<u>Basic</u> for other IP addresses and ports greater than or equal to 1024	<u>Basic</u> level access is recommended for 3-box case <i>without</i> well-known ports
	<u>Admin</u> for other IP addresses and ports lower than or equal to 1023	<u>Admin</u> level access is recommended for 3-box case <i>with</i> well-known ports
<u>DeletePortMapping()</u>	<u>Public</u> for CP's IP address and ports greater than or equal to 1024	Allows removing device's port mappings when ports <i>are not</i> well-known ports
	<u>Basic</u> for CP's IP address and ports lower than or equal to 1023	Allows removing device's port mappings when ports <i>are</i> well-known ports
	<u>Basic</u> for other IP addresses and ports greater than or equal to 1024	<u>Basic</u> level access is recommended for 3-box case <i>without</i> well-known ports

Name	Access level	Description
	<u>Admin</u> for other IP addresses and ports lower than or equal to 1023	<u>Admin</u> level access is recommended for 3-box case with well-known ports
<u>GetExternalIPAddress()</u>	<u>Public</u>	Allows retrieving WAN interface's IP address
<u>RequestConnection()</u>	<u>Basic</u>	Starting a connection is normal operation and should not require strict security, but <u>Basic</u> authentication is recommended
<u>ConfigureConnection()</u>	<u>Admin</u>	Allows configuring password and user name for PPP – hence <u>Admin</u> level access is recommended
<u>GetLinkLayerMaxBitRates()</u>	<u>Public</u>	Informational action, no security threat
<u>GetPPPEncryptionProtocol()</u>	<u>Public</u>	Informational action, limited security threat
<u>GetPPPCompressionProtocol()</u>	<u>Public</u>	Informational action
<u>GetPPPAAuthenticationProtocol()</u>	<u>Public</u>	Informational action, limited security threat
<u>GetUserName()</u>	<u>Admin</u>	User names should not be accessed via UPnP, serious security threat
<u>GetPassword()</u>	<u>Admin</u>	User names should not be accessed via UPnP, serious security threat

Vendors, ISP, or users may disable GetPassword() and GetUsername() actions, if so desired. This would be recommendable for added security.

4.4.5 WANIPv6FirewallControl:1

Table 5 — Recommended access levels for WANIPv6FirewallControl:1 actions

Name	Access level	Description
<u>GetFirewallStatus()</u>	<u>Public</u>	This allows knowing if the firewall is active and if pinholes can be made through UPnP
<u>AddPinhole()</u>	<u>Basic</u> for a non-wildcarded <u>InternalPort</u>	<u>Basic</u> level access is recommended to create any firewall pinholes as firewall control impacts the security of the local network
	<u>Admin</u> for a wildcarded <u>InternalPort</u>	<u>Admin</u> level access is recommended to open a firewall pinhole with a wildcarded <u>InternalPort</u> as the pinhole created by this action could enable port scans for the specified destination address
<u>UpdatePinhole()</u>	<u>Basic</u> for a non-wildcarded <u>InternalPort</u>	<u>Basic</u> level access is recommended to update any firewall pinholes as firewall control impacts the security of the local network
	<u>Admin</u> for a wildcarded <u>InternalPort</u>	<u>Admin</u> level access is recommended to update a firewall pinhole with a wildcarded <u>InternalPort</u> as the pinhole updated by this action could enable port scans for the specified destination address
<u>DeletePinhole()</u>	<u>Basic</u> for a non-wildcarded <u>InternalPort</u>	<u>Basic</u> level access is recommended to delete any firewall pinholes as firewall control impacts the security of the local network
	<u>Admin</u> for a wildcarded <u>InternalPort</u>	<u>Admin</u> level access is recommended to delete a firewall pinhole with a wildcarded <u>InternalPort</u> as this level access is recommended to create this type of pinhole
<u>CheckPinholeWorking()</u>	<u>Basic</u> for a non-wildcarded <u>InternalPort</u>	<u>Basic</u> level access is recommended to check that a firewall pinhole is working as firewall control impacts the security of the local network
	<u>Admin</u> for a wildcarded <u>InternalPort</u>	<u>Admin</u> level access is recommended to check that a firewall pinhole with a wildcarded <u>InternalPort</u> is working as this level access is recommended to create this type of pinhole
<u>GetOutboundPinholeTimeout()</u>	<u>Public</u>	Information retrieval to allow CP's to know automatic pinhole expiration time

4.4.6 LANHostConfigManagement:1

LANHostConfigManagement:1 is risky service that should be implemented with minimal features and potentially also be disabled in normal operation, as it is not needed for typical IP configuration. Also it is recommended that maximum level of security would be applied.

Table 6 — Recommended access levels for LANHostConfigManagement:1 actions

Name	Access level	Description
<u>SetDHCPServerConfigurable()</u>	<u>Admin</u>	Allows enabling, disabling DHCP configuration – impacts to basic settings of the network -> <u>Admin</u>
<u>GetDHCPServerConfigurable()</u>	<u>Public</u>	Allows knowing if DHCP server can be configured over UPnP -> <u>Public</u>
<u>SetDHCPRelay()</u>	<u>Admin</u>	Allows enabling DHCP relay service, Impacts basic settings of the network-> <u>Admin</u>
<u>GetDHCPRelay()</u>	<u>Public</u>	Allows knowing if DHCP relay service is active or not. Informational action -> <u>Public</u>
<u>SetSubnetMask()</u>	<u>Admin</u>	Sets used subnet mask - > impacts basic setting of a network -> <u>Admin</u>
<u>GetSubnetMask()</u>	<u>Public</u>	Informational action -> <u>Public</u>
<u>SetIPRouter()</u>	<u>Admin</u>	Allows setting routers information in DHCP – impacts the network -> <u>Admin</u>
<u>DeleteIPRouter()</u>	<u>Admin</u>	Allows deleting a router's information in DHCP – impacts the network -> <u>Admin</u>
<u>GetIPRoutersList()</u>	<u>Public</u>	Allows getting information of current routers. Informational action, no serious threats as the information is provided by DHCP -> <u>Public</u>
<u>SetDomainName()</u>	<u>Admin</u>	Impacts basic network settings -> <u>Admin</u>
<u>GetDomainName()</u>	<u>Public</u>	Information provided also by DHCP and this is informational action - > <u>Public</u>
<u>SetAddressRange()</u>	<u>Admin</u>	This does impact basic settings of the network -> <u>Admin</u>
<u>GetAddressRange()</u>	<u>Public</u>	Informational action-> <u>Public</u>
<u>SetReservedAddress()</u>	<u>Admin</u>	Allows setting addresses that are not distributed by DHCP. Impacts basic network settings -> <u>Admin</u>
<u>DeleteReservedAddress()</u>	<u>Admin</u>	Allows removing addresses the list of reserved addresses that are not distributed by DHCP. Impacts basic network settings -> <u>Admin</u>
<u>GetReservedAddresses()</u>	<u>Admin</u>	DHCP specific configuration -> <u>Admin</u>
<u>SetDNSServer()</u>	<u>Admin</u>	Impacts basic settings of the network-> <u>Admin</u>
<u>DeleteDNSServer()</u>	<u>Admin</u>	Impacts basic settings of the network-> <u>Admin</u>
<u>GetDNSServers()</u>	<u>Public</u>	Information distributed by DHCP -> <u>Public</u>

4.4.7 Layer3Forwarding:1**Table 7 — Recommended access levels for Layer3Forwarding:1 actions**

Name	Access level	Description
<u>SetDefaultConnectionService()</u>	<u>Admin</u>	Impacts basic settings of the network-> <u>Admin</u>
<u>GetDefaultConnectionService()</u>	<u>Public</u>	Informational action -> <u>Public</u>

4.4.8 WANEthernetLinkConfig:1**Table 8 — Recommended access levels for WANEthernetLinkConfig:1 actions**

Name	Access level	Description
<u>GetEthernetLinkStatus()</u>	<u>Public</u>	Informational action -> <u>Public</u>