LEVERAGING UPNP+®

THE NEXT GENERATION OF UNIVERSAL INTEROPERABILITY

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UPnP TECHNOLOGIES TRULY ARE UNIVERSAL

UPnP technologies have become ubiquitous with the UPnP protocol stack already embedded into just about every connected intelligent electronic device in the home. Among its many advantages, the UPnP architecture offers industry developed and standardized peer-to-peer communications between PCs of all form factors, wireless devices, content servers and renderers, intelligent appliances, lighting control systems, energy management platforms, and more. One reason UPnP technologies are so pervasive is that the UPnP architecture provides an open and free to download set of standards, which leverage IP networking and the Internet standards to enable seamless and distributed discovery and control of networked devices in the home, office, and everywhere in between. The core architecture enables any device to discover and control any number of other connected devices, in addition to providing standardized device eventing and presentation capabilities.

UPnP technologies are independent of any particular operating system, programming language, or network. The UPnP architecture supports zero-configuration and automatic discovery whereby a device can dynamically join a network, obtain an IP address, announce its name, convey its capabilities, learn about the presence and capabilities of other devices, and leave a network smoothly and automatically without leaving any unwanted state information behind.

UPnP Forum[sm], established in 1999, promotes the adoption of these uniform technical device interconnectivity standards and certifies devices conforming to these standards. Members of UPnP Forum include market leaders in computing, printing, networking, consumer electronics, home appliances, automation, control, security, and mobile products.

UPnP Forum has defined and published device and service specifications for Internet gateways, wireless access points, audio/video servers and renderers, printers, scanners, home automation-based sensors, climate control, lighting, solar blinds, security cameras, control points, and multiscreen user interface devices – all with standardized ways of implementing device management and remote access. Additionally, UPnP Forum has defined and published add-on services for security, low power, content synchronization, and quality of service (QoS), to highlight just a few. These device specifications enable many compelling usage scenarios including several other product categories found on UPnP Forum's website at http://upnp.org/.

ADVANTAGES OF THE UPnP ARCHITECTURE

Innovates on established Internet standards
- **XML, UDP/TCP/IP, and SOAP**

Creates an open and flexible architecture for service discovery and control
- **Simple Service Discovery Protocol (SSDP)**
- **Service Control Protocol Description/Device Description Document (SCPD/DDD)**
- **Generic Event Notification Architecture (GENA)**

Leverages the UPnP Device Architecture (UDA)
- **Addressing: IP assignment on any network (AutoIP)**
- **Discovery: Of services/devices (SSDP)**
- **Description: Syntax for devices/ services (SCPD/DDD)**
- **Control: Of device services (SOAP)**
- **Eventing: Updates of variables (GENA)**
- **Presentation: Access to a device's HTML page**

Defines Device Control Protocols (DCPs)
- **APIs for various device functionality**
- **Uses UDA description protocols and the SCPD syntax**

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MOVING UP TO UPnP+

UPnP+
Certification

Expanding
the
Ecosystem

UPnP+ is a new certification program within the UPnP ecosystem that greatly enhances the UPnP experience enabling any device to interact securely with any other UPnP device – anywhere in the world. **UPnP+** is the cornerstone for participation in the Internet of Things (IoT) while remaining backwards compatible with the previous iterations of UPnP technologies and architecture. **UPnP+** enables new, compelling, industry leading features and use case scenarios. There is a detailed webinar on why you should upgrade to **UPnP+** at https://www.youtube.com/watch?v=MtQYRLEqH-U.

EVOLUTIONARY

- Full integration of IPv6 with seamless backwards compatibility to IPv4
- Improved interoperability baseline incorporating the latest specifications including A/V, Device Protection, and Energy Management

REVOLUTIONARY

- Discovery of cloud services and content in addition to the secure sharing of devices across the Internet
- Data Model-based definitions for new devices
- Expandable protocol bridging using REST-based methodologies

To improve the reliability, security, and consistency of UPnP implementations, and to encourage the use of the latest version of UPnP specifications, UPnP Forum has created the **UPnP+** Certification Level. Some of the benefits include improved features and performance in:

- Interoperability
- Security
- Evolving standards (HTML5, IPv6, etc.)
- Cloud-based features
- New services

UPnP Forum's new **UPnP+** certification program uses new and existing UPnP Device Control Protocols (DCPs) and UPnP architecture enhancements. These provide UPnP protocols focused on delivering new technical capabilities that enhance functionality and increase customer satisfaction in today's ever-changing market of always-on connectivity. **UPnP+** technologies are an evolution of previous UPnP capabilities that assist developers trying to integrate new paradigms like mobile connected computing, cloud-based service delivery, smartphone content sharing, and the Internet of Things.
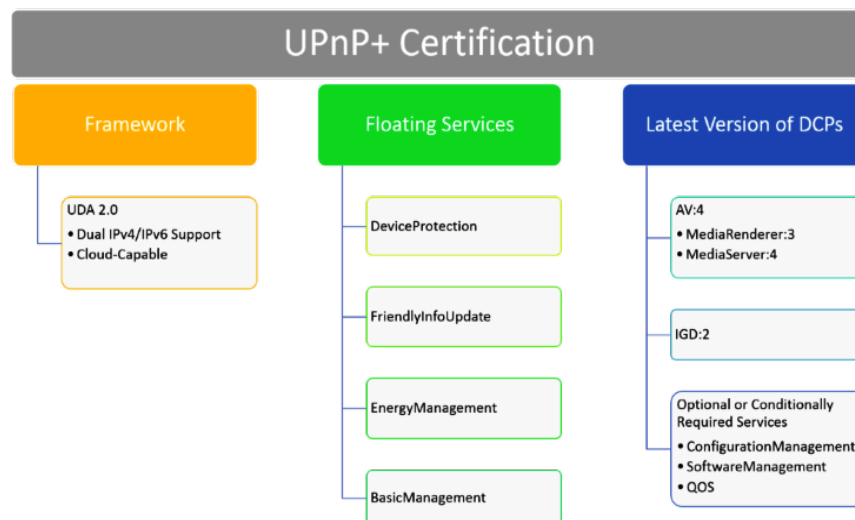
To support this effort, UPnP Forum has updated and released the **UPnP Certification Test Tool for UPnP+**, which is available now. It also has expanded its testing program to improve the quality of open source implementations in addition to closing previous security vulnerabilities that were a result of poor or improper implementations.

The new UPnP Device Architecture V2.0 (UDA 2.0) is the basis for **UPnP+** certification. The UDA 2.0 is an integral part of **UPnP+** development, yet still is backwards compatible with UDA 1.x devices The UDA 2.0 enhances and expands the breadth of UPnP experiences towards the cloud in a secure, interactive, and interoperable way. It enables additional features including cloud based sharing that takes advantage of new and exciting social media scenarios using "virtual secure rooms" that can be implemented using the XMPP functionality leveraged by **UPnP+**, event subscriptions to individual state variables, updated IPv6 requirements and includes a number of clarifications.

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UPnP+ AND THE INTERNET OF THINGS

UPnP+ allows for the development of future-proof interoperable solutions for the Internet of Things (IoT). The new specifications allow for integrating non-IP connected devices while adding enhanced security, and cloud connectivity for virtualizing and enabling secure sharing of devices over the Internet.

UPnP Forum has created a strategy around using new and existing UPnP Device Control Protocols (DCPs) as well as UPnP architecture enhancements, in order to provide UPnP protocols specifically for IoT applications. These technologies at the core of **UPnP+** provide a base for IoT applications, bridging devices on local area networks, wide area networks and non-IP networks. The Forum has already produced DCPs for lights, thermostats, automatic blinds, and security cameras. In addition, support for any device with a combination of sensors and/or actuators can be added easily thanks to the use of extensible data models. Development is now ongoing to provide improved support for new IoT devices, specifically those with constrained resources.

UPnP+ certification provides a solid, future-proof basis for integration of cloud-based content and services. One important and fast-growing user requirement is accessing devices from remote locations, often using a mobile device. Home connectivity from outside the home (or workplace) allows for the development of new integrated capabilities, use cases, and business models. Security is a vital element in the design of such applications and **UPnP+** has this built in, along with user or group-level access control configurability.

To provide reliable cloud connectivity, **UPnP+** leverages the industry standard Extensible Messaging and Presence Protocol (XMPP), a communications protocol for

message-oriented middleware based on Extensible Markup Language (XML). Requiring SASL for authentication and TLS link encryption, XMPP is considered very secure, no matter the network. An open standard, XMPP uses an open systems approach for development by which anyone may implement an XMPP service and interoperate with any other organization's XMPP implementations and services.

UPnP CLOUD

- Builds upon mature UPnP core technologies that already provide a base for IoT (currently with billions of UPnP devices deployed)
- Uses commonly used web technologies to create secure communication between devices
- Bridges local UPnP networks together through the Internet
- Enables existing UPnP specifications and devices to be UPnP Cloud capable
- Provides a path for low-risk and rapid implementations of UPnP Cloud solutions
- Enables device and service discovery through the UPnP Cloud
- Combines UPnP and XMPP ecosystems to enable new IoT possibilities
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UPnP BRIDGING

- Allows different local communication and protocol networks to interact as one
- Includes seamless bridging to existing device network protocols such as Bluetooth, Z-Wave, or ZigBee
- Supports simple, data-based device descriptions for the incorporation of resource-constrained devices
- Provides a development platform for "home automation hub" manufacturers to integrate with the billions of UPnP devices already in the home

UPnP+ supports the implementation of web browser controls for a wide range of functions, ensuring future connectivity and making new services possible in areas such as health and fitness, security, energy management, and sustainability. **UPnP+** enables entirely new levels of interoperability and interactivity leveraging the rise of the Internet of Things and Cloud computing.

UPnP+ CERTIFICATION REQUIREMENTS

The following requirements are for **UPnP+** certification compared to UPnP certification for all UPnP certified devices.

Specification	UPnP Certification	UPnP+ Certification
UDA	UPnP version 1.0 is a minimum requirement, UPnP version 1.1 is optional	UPnP version 2.0 is a minimum requirement
IPv6 Annex	UPnP certification requires IPv4 support IPv6 support is optional and the currently published IPv6 annex is out of date	UPnP+ certification requires dual-stack (IPv4/IPv6) implementation as described in the new UPnP UDA annex
UDA Cloud Annex	UDA V1.0 devices cannot be certified as cloud devices, however legacy UDA V1.0 devices can be bridged to the cloud using a UPnP+ certified CPDev Cloud Proxy device	UPnP cloud device support (UCCD) is mandatory for UPnP+ device certification. UPnP cloud control point support (UCC-CP) is mandatory for UPnP+ control point certification

The following are the requirements for **UPnP+** certification compared to UPnP certification for floating services. These services can be added to other device types.

Service	UPnP Certification	UPnP+ Certification
DeviceProtection	DeviceProtection:1 is optional	DeviceProtection:1 is required for UPnP+ certification - an open source implementation from Orange includes DeviceProtection, DeviceManagement: BMS & CMS & SMS
FriendlyInfoUpdate	FriendlyInfoUpdate: 1 support is optional	FriendlyInfoUpdate:1 support is mandatory for UPnP+ certification
EnergyManagement	EnergyManagement :1 is optional	EnergyManagement:1 support is mandatory in UPnP+ certification EnergyManagement proxy is mandatory for mains powered devices
BasicManagement Service	BasicManagement Service:1 is optional	BasicManagementService:2 is mandatory
Configuration Management Service	Configuration Management Service:1 is optional	ConfigurationManagementService:2 is optional
SoftwareManagement Service	SoftwareManageme nt Service:1 is optional	SoftwareManagementService:2 is optional
QOS	QOS:2 is optional	QOS:2 is optional
QOS	QOS:3 is optional	QOS:3 is optional

The following are the requirements for **UPnP+** certification compared to UPnP certification for individual Device Control Protocols. If a particular DCP is used, the **UPnP+** requirements for that device must be met for **UPnP+** certification. DCPs not listed in this table have no additional requirements for **UPnP+** certification.

Specification	UPnP Certification	UPnP+ Certification
IGD	IGD:1	IGD:2
AV	AV:1	AV:4
MediaServer	MediaServer:1	MediaServer:4 MULTI_STREAM feature CONTAINER_SHORTCUTS feature CDS Search() MULTI_STREAM properties are conditionally required Relaxed Tracking Changes Option TCO properties are conditionally required
MediaRenderer	MediaRenderer:1	MediaRenderer:3 Trickmode Pause() is required SetStaticPlaylist(), SetStreamingPlaylist() and GetPlaylistInfo() are required GetRendererItemInfo() is required GetAllowedTransforms(), GetTransforms(), SetTransforms() and GetAllAvailableTransforms() are required

IN SUMMARY

UPnP+ provides the confidence of proven security, superior interoperability, and the new features that make it the most complete and open solution for the Internet of Things.

- The cloud solution of **UPnP+** is the simplest and most complete way to share devices and content securely
- **UPnP+** certification is inexpensive and open source solutions can validate implementations for free
- **UPnP+** certification is available today

UPnP: Promoting Interconnectivity

UPnP Forum, established in 1999, is an impartial global industry standards body that has paved the way for seamless connectivity between more than a billion devices. Its 1000+ companies and organizations work together to enable device-to-device interoperability in addition to facilitating easier and better home networking. UPnP Forum promotes adoption of uniform technical device interconnectivity standards and certifies devices conforming to these, thus paving the way for seamless connectivity between more than a billion devices in the home running above the IP layer.

UPnP Forum has widened its scope to encompass the cloud, including integration for content and services, as well as bridging to non-UPnP networks (ZigBee, Z-Wave, Bluetooth, ANT+...). This enables a broad range of applications including health and fitness, energy management, and home automation.

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