



**UPnP® CERTIFIED TECHNOLOGY—
YOUR SIMPLE SOLUTION FOR HOME,
OFFICE AND SMALL BUSINESS
INTEROPERABILITY**

September 2010

INTRODUCTION

Not long ago, consumers and small business owners were reasonably satisfied with a network consisting of a single known connection between computers that transferred and printed files and had a wireless router to allow work from a laptop within appropriate range. Gone are the days when that is enough. Today's fast-paced, ever-evolving technical landscape inspires consumers and small businesses to do much more with their networks and devices. They want to store and stream media, integrate TVs for data access and entertainment, use mobile phones to access and transport media, view or print photos directly from a camera, and more. The reality for most, however, is that the mere idea of investing in and installing a network to support such activities and purchasing devices that they know will work together seamlessly to enable these usages is daunting. They seek a simple solution and device selection criteria to ease their pain.

That is where UPnP Forum comes in. Formed in 1999, UPnP Forum is known for its dedication to providing simple connectivity among consumer electronics devices, intelligent appliances, computers, and mobile devices produced by various vendors to enable compelling usage scenarios. For the past decade, UPnP Forum has led the industry in driving development and adoption of standards for devices and interoperability for IP-based networked devices for compelling usage scenarios.

UPnP Forum specifications define technology that targets home networks, proximity networks and networks in small businesses and commercial buildings. It enables interoperability between any two UPnP Certified devices under the command of any control device on the network. UPnP Forum technology operates independently of any particular operating system, programming language, or network technology.

UPnP Forum technology is based upon the UPnP Forum Device Architecture specification that provides the framework to offer pervasive peer-to-peer interoperability of PCs of all form factors, consumer electronics devices, intelligent appliances, and **mobile** devices. But there is no restriction to prevent the UPnP Forum Device Architecture being used in any IP enabled device. The UPnP Forum Device Architecture is a distributed, open networking architecture that leverages TCP/IP and Web technologies to enable seamless proximity networking in addition to control and data transfer among networked devices in the home, office, and everywhere in between.

MARKET DRIVERS

Consumers expect the network enabled devices they purchase will work seamlessly with other network devices to realize their usages scenarios, such as streaming a music library to a home stereo system, even between different vendors. UPnP Forum, through its Device Architecture specification, provides the underlying framework to allow control devices and applications to

discover all UPnP Certified devices on the local network and the usage scenarios they are able to implement. For the last 10 years UPnP Forum Members™ have been actively developing Device Control Protocol (DCP) specifications that enable the implementation of compelling usage scenarios. These DCPs are based upon the underlying UPnP Forum Device Architecture, such as AV streaming, home automation, low power, device management, and others. UPnP Forum has aided in fulfilling this consumer expectation by facilitating a thriving certification program for UPnP Certified devices that implement DCPs defined by UPnP Forum Working Committees to enable implementation of usage scenarios. There are now 689 device implementations from 70 member companies used in more than 8,000 UPnP® Certified product models worldwide, with device implementations ranging from AV media servers, AV media renderers, Internet gateway devices, and printers. Additionally, the Digital Living Network Alliance (DLNA) has adopted UPnP Forum standards and UPnP Forum Certification program to certified DLNA products. ABI Research reports DLNA deployed 250 million devices in 2009 and projects the deployment of approximately 1 billion more in 2012, and an additional 2 billion in 2014.

If that was not compelling enough, the technology used in UPnP Certified devices has been recognized by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) as the world's first comprehensive international standard for device discovery and control on IP networks (ISO/IEC 29341). Gaining recognition as an international standard was an important milestone for UPnP Forum. This distinction solidified the UPnP Forum Device Architecture's position as the technology for discovery and control of networked devices. It also allows for further advancement and investment of this technology and broader possibilities for worldwide adoption, including open source, multiple vendors, multiple languages and multiple platforms. The big winners are small business and home network users who will have products and applications that works automatically and effortlessly over the local network.

To show that UPnP Forum is not standing on its laurels and is moving forward, it published new specifications (DCPs) for remote access in December 2009 and device management in July 2010 to enable new usage scenarios. UPnP Forum will soon publish updated DCPs for AV devices, Internet gateway devices, and remote access with enhanced functionality to enable additional usage scenarios. In addition, UPnP Forum will soon publish an updated add-on security service and a new DCP for telephony to reflect new usage scenarios. To address the home energy management activity occurring in the industry, UPnP Forum has also established a Smart Grid Task Force to examine opportunities across all of its activities to enable users of networked devices to monitor and manage electricity consumption throughout their homes, and to promote UPnP Forum technology as part of emerging Smart Grid standards worldwide. The implementation of these opportunities through updates to existing DCPs or new DCPs will be accomplished with the new Home Energy Management and SmartGrid (HEMS) Working Committee.

TECHNICAL OVERVIEW – SIMPLE NETWORKING AND FRAMEWORK

UPnP Forum technology is a broad industry initiative that is transforming and simplifying networking. It provides small businesses and consumers with the ability to easily connect computers and other devices into a local network in a home or business to access data, transport media content, and control devices to perform some action.



UPnP Certified devices seamlessly and transparently locate each other. UPnP Forum Device Architecture defines a standard way of controlling devices using Extensible Markup Language (XML) and Simple Object Access Protocol (SOAP), which is the standard for Web messaging used on the Internet. It also defines a mechanism for devices to event state changes asynchronously to controlling devices using the General Event Notification Architecture (GENA). UPnP Forum Device Architecture supports zero-configuration networking and automatic discovery whereby a device can dynamically join a network, obtain an IP address, announce its name, convey its capabilities upon request, and learn about the presence and capabilities of other devices. Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) servers are optional and are only used if available on the network. A device can smoothly and automatically leave or be removed from a network without leaving behind any unwanted state information.

UPnP Forum Device Architecture is a distributed open networking architecture that leverages existing and widely deployed Internet protocols like TCP/IP, HTTP, and UDP to enable this simple networking, in addition to data transfer among networked devices in the home and office. It offers network connectivity under the command of any control device on the network.

UPnP Forum Device Architecture and included DCPs can be implemented on any operating system. It works with any type of physical networking media that supports IP whether wired or wireless.

UPnP Certified devices on a network provide the following capabilities:

- **Media and device independence:** Technology defined by UPnP Forum can run on any network medium technology (i.e. PHY) that supports IP networking.
- **Platform independence:** Vendors can use any operating system and any programming language to build UPnP Certified products.
- **Internet-based technologies:** Technology defined by UPnP Forum is built upon IP, TCP, UDP, HTTP, XML, and SOAP, among others.
- **Programmatic control:** UPnP Forum Device Architecture enables conventional application programmatic control by controlling devices (applications).

- **Common base protocols:** Vendors agree on base protocol sets on a per-device basis to enable compelling usage scenarios. UPnP Forum Members, working within UPnP Forum Working Committees, define the protocols for devices categories (DCPs).
- **Extensibility:** Each UPnP Certified product can have value-added services and actions defined by an individual manufacturer layered on top of the UPnP Forum Device Architecture and DCPs defined by UPnP Forum Working Committees.
- **Product Differentiation:** Allows controlling devices (applications) accessing UPnP Certified devices the freedom to implement their user interfaces and functionality as they see fit for their customers and market.

UPnP Forum has defined and published device and service specifications (DCPs) for network (Internet gateways and wireless access points), audio-video media (AV servers and AV renderers), device management, basic, printers, scanners, home automation (climate control, lighting, solar blinds, security camera), remote access, remote and user interface devices. Additionally, UPnP Forum has defined and published add-on services for security, low power, content synchronization, and quality of service (QoS). These device specifications enable many compelling usage scenarios, including the product scenarios found on UPnP Forum’s website.

Some of the above DCPs have been deployed for some time now. This whitepaper will provide an overview of new and upcoming DCPs occurring within UPnP Forum.

ENHANCED SHARING AND CONTROL OF AV CONTENT

The AV DCPs has undergone many enhancements over the years. In its original incarnation (version 1) it basically enabled the usage scenario to allow AV content (video, music, and image) to be uploaded and exposed on an AV media server and then selected for streaming onto an AV media renderer. UPnP Certified AV media server and UPnP Certified AV media renderer devices defined in this DCP forms the core de-facto components of the modern home entertainment systems containing content. This DCP is chiefly referenced by the DLNA architecture and implemented by 7000+ mobile, computer, and CE product types in the market. This version of the AV DCP is currently the most popular DCP published by UPnP Forum. As mentioned, it allows easy, consistent, and transparent sharing of image, audio, and multimedia (audio-video) content between connected devices. UPnP Certified AV media server device provides the storing, organizing and offering this content; on the other side, UPnP Certified AV media renderer device provides the consuming (viewing, listening) this content. There is a third component, the AV controller or control point which initiates and controls the interaction between UPnP Certified AV media server and UPnP Certified media renderer devices. Typically the AV control point provides the user interface and the customizable smarts to uniquely differentiate the user experience. An AV control point may be stand-alone or imbedded with a UPnP Certified AV media server or UPnP Certified AV media renderer device, for example,

Windows Media 7 combines a UPnP Certified AV media server and control point on the same platform.

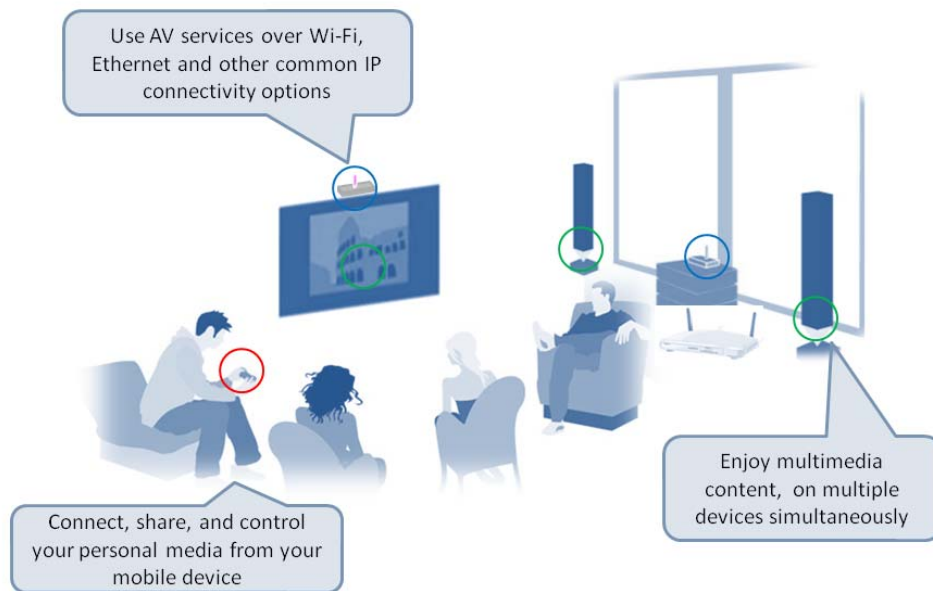
The next two revisions (version 2 and 3) of the AV DCP added to this base functionality by enabling the following usage scenarios:

- **Scheduled Recording:** Enables the scheduled recording functionality (i.e. DVR) on a UPnP Certified AV media server device.
- **Tuner:** Defines the UPnP Certified AV media server device metadata and semantics for describing a physical tuner asset.
- **Enhanced the metadata:** Defines additional content metadata that can be stored on a UPnP Certified AV media server device, including the addition of 3rd party metadata (i.e. Foreign Metadata in UPnP Forum parlance).
- **Content Tracking Changes:** Allows an AV control point to monitor granular changes to content and metadata changes on a UPnP Certified AV media server device. This enables applications (i.e. control points) to implement a rudimentary content synchronization between UPnP Certified AV media server devices.

With such a large ecosystem and rapidly accelerating expectations, UPnP Forum AV Working Committee is preparing a suite of exciting new features for release in the later part of 2010. This revision (version 4) of the AV DCP will allow the following new usage scenarios:

- **DVD like Content Organization and Navigation:** This will be available for both paid content bundling and enhanced personal content editing on control points.
- **Richer (Multi-stream) Content:** This allows for enhanced metadata describing alternative language tracks, closed captioning, alternate camera angles and their synchronization; enhanced AV media renderer control to customize the Multi-stream experience.
- **Synchronized (Multi-device) Playback:** This enables interfacing with devices that support precision network clocks and rendering, such as whole home audio/video or networked speakers.
- **Content Privacy:** This defines customized content access and control based on user or control point identities. Includes base AV privacy concepts and is easily extensible by a vendor.
- **Device Resource Control:** This allows ownership of certain device assets, such as a tuner, or specialized configurations to accomplish specific tasks such as large synchronizations.
- **Dynamic Playlists:** This allows greater flexibility for control point (application) based (private) playlists including dynamic updates on aUPnP Certified AV media renderer device.
- **Renderer Content Matching:** This allows for a more reliable establishment of content playability prior to rendering the content, including DRM status.

AV Experience



ENABLING DEVICE MANAGEMENT USAGES

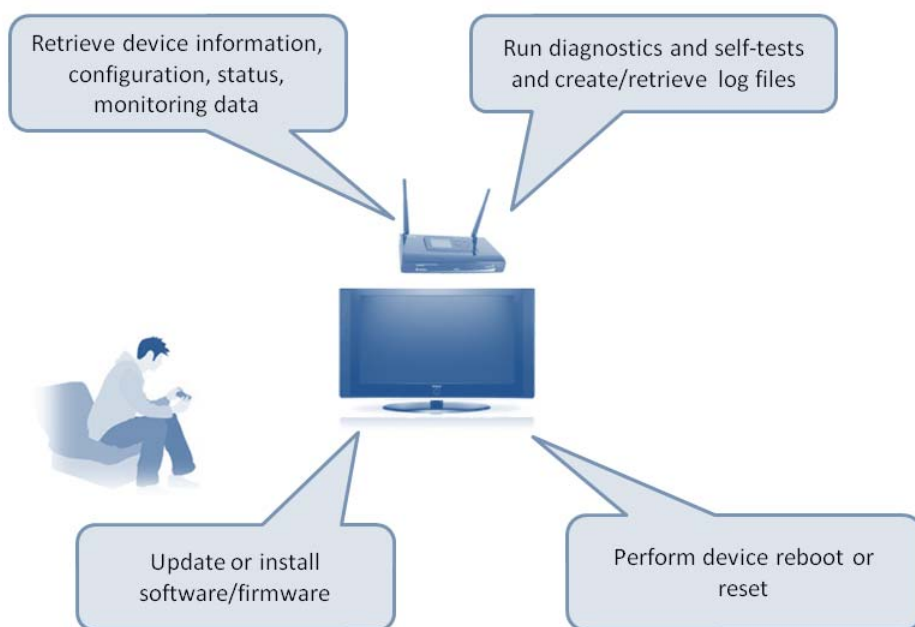
The new Device Management DCP is an example of a group of UPnP Forum Members banding together to fill a need that was not yet address by existing UPnP Forum DCPs. This DCP, published in July 2010, adds a new usage scenario to the ecosystem. It enables and allows for the management of UPnP Certified devices and their corresponding execution environment. The functionality provided by this DCP is to cover the management needs such as device configuration, software, and diagnostics. Specifically, this DCP enables the following functionality:

- **Maintenance:** This device management feature allows (1) Rebooting devices; (2) Resetting devices to predefined baselines; and (3) Resetting IP interfaces.
- **Diagnostic:** This device management feature allows (1) Engaging IP level tests in order to diagnose IP connectivity; (2) Launching an implementation-specific “self-test” in order to get the global image of the UPnP Certified device state; and (3) Enabling/disabling logging and the retrieval of log files.
- **Configuration and Status Management:** This device management feature allows (1) Retrieving device information (e.g. hardware and software versions) and device configuration; (2) Retrieving device status and monitoring data; and (3) Change device configuration.

- **Software Management:** This device management feature allows (1) Updating the device firmware; (2) Installing and uninstalling software modules; and (3) Starting and stopping applications.

There is currently activity within this UPnP Forum Working Committee to add a security component to this DCP.

Manageable Device Experience



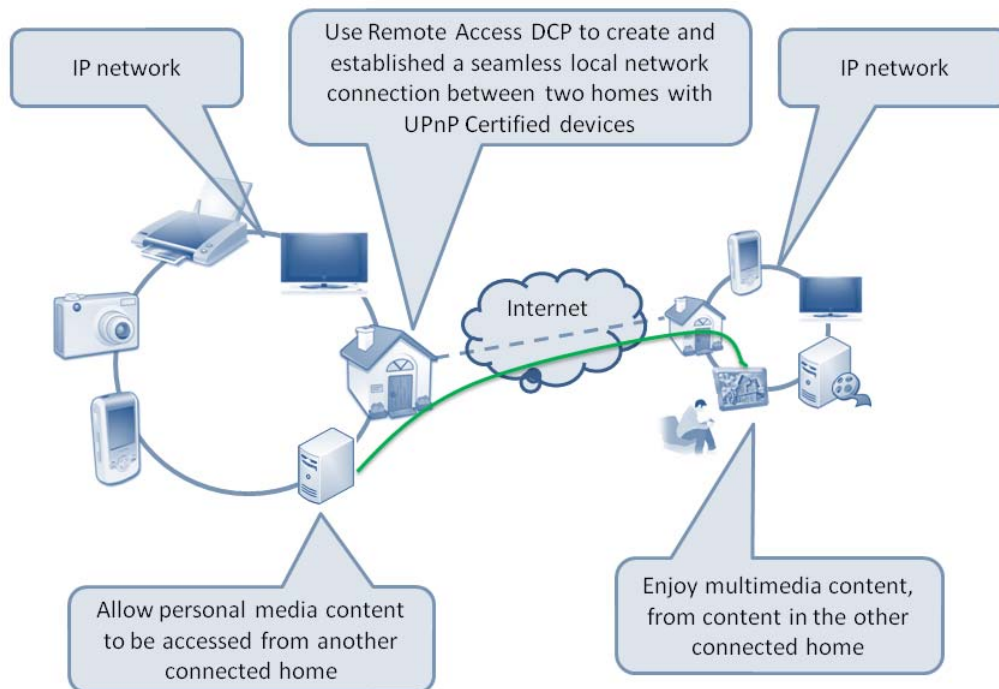
ENABLING REMOTE ACCESS USAGES

UPnP Forum has recently published the Remote Access specifications (DCP) in December 2009. This DCP enables the usage scenario to extend the existing home or small business network by allowing a UPnP Certified device or control point, such as a mobile phone, not currently located in the home or small business network to be securely bridged to the home or small business network so the remote UPnP Certified device or control point can discover and interact securely with any of the UPnP Certified devices and control points that are contained within the home or small business network. Once the remote UPnP Certified device is a member of the home or small business network, existing protocols in UPnP Certified devices are used for communications. In order to accommodate the above mentioned goals, this DCP provides the means to connect the two segments of the extended home network using established mechanisms. The DCP recognizes that there might be several possible alternative models to bridge the two network segments and will provide an interface that will allow them to be

plugged in, while enforcing the same overall behavior of the whole system regardless of the model used.

UPnP Forum Remote Access Working Committee is actively preparing for the next logical extension to the existing DCP for release in the later part of 2010. This revision (version 2) will extend the existing usage scenario from just a remote UPnP Certified device or control point (e.g. mobile phone) accessing UPnP Certified devices and control points on a home or small network to allowing any UPnP Certified devices and control points on a home or small business network to securely bridge seamlessly with any of the UPnP Certified devices and control points on another remote home or small business network, such as a vacation home. Said another way, it logically combines two separate home or small business networks as if they were all on the same home and small business network. Once this bridging of networks is in place, all the UPnP Certified devices and control points on those two networks can discover and interact with each other using existing protocols within UPnP Certified devices. This DCP will also address a number of features including solutions for IP address collision when connecting two homes or small business networks with remote access, network address translation traversal problems, provisioning of remote access services, and quality of service for network-to-network use.

Remote Access Experience

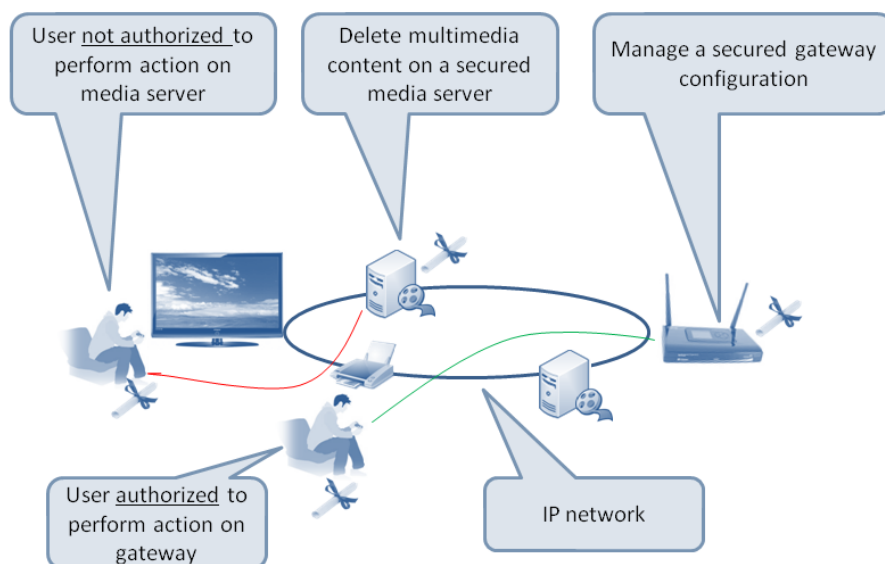


SIMPLIFYING SECURITY FOR UPnP CERTIFIED DEVICES

When DCPs defined by UPnP Forum were first created, such as the IGD DCP in 2001, they were developed to solve a usage scenario without regard to access control and user authentication (i.e. security). But it was realized that security has become more of an issue as more and more devices are being networked and malicious attempts to gain control of home or small business devices has increased. To address this issue, UPnP Forum in 2003 published a Security DCP. This DCP defined a DeviceSecurity service that could be added into existing DCPs to provide access control and user authentication. Additionally it defined a security management entity through the SecurityConsole service. After publication of this DCP, it did not generate any implementations by UPnP Forum Members.

UPnP Forum Members decided to define a simplified security DCP to be published in late 2010. As with the previous implementation, it defines a new service that can be added to existing DCPs. In fact, it will be an integral component for the updated IGD DCP, the new Content Privacy feature in the AV DCP, and the new security component being added to the Device Management and Telephony DCPs. This new security add-on service is called DeviceProtection. It's expected that the DeviceProtection service will become an integral addition to all DCPs defined by UPnP Forum in the future. The DeviceProtection service uses industry-standard protocols such as TLS, and it provides a user experience consistent with the Wi-Fi Protected setup (i.e. simplified user setup). The DeviceProtection service, in a typical usage, will allow for secured access and control of resources without requiring users to enter passwords or manually configure an access control policy.

Simplified Security Experience



ENHANCING INTERNET GATEWAY DEVICES

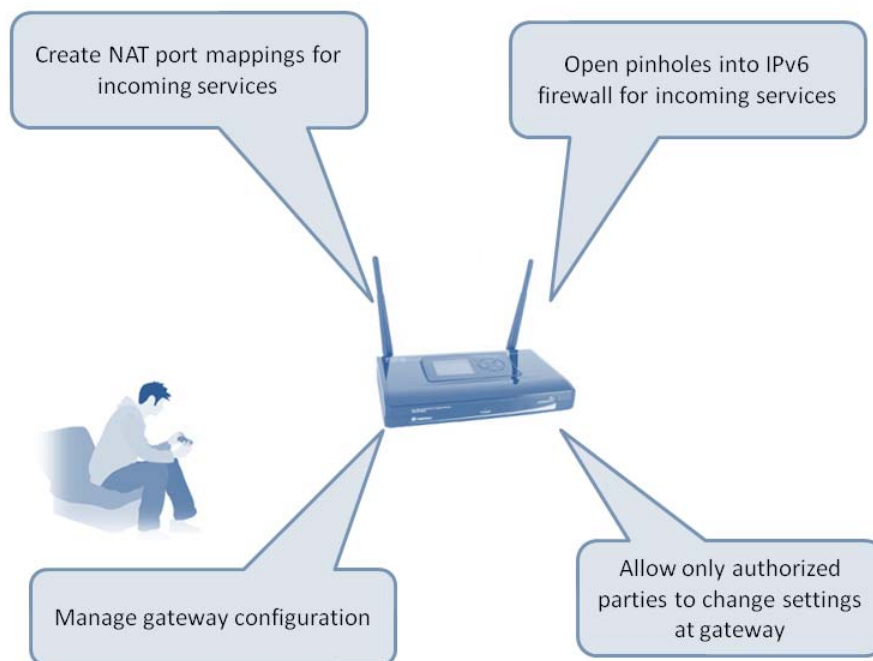
The Internet Gateway Device (IGD) DCP was the first DCP published in 2001 by UPnP Forum. This DCP controls various parameters including network settings, network address translation (NAT), port forwarding, and connectivity. This is possibly the most widespread implementation of a DCP defined by UPnP Forum as it is included in almost every commercial WLAN AP and Internet gateway device in the market (e.g. D-Link, Cisco Linksys, Netgear, and others).

When the IGD DCP was published, the main usage scenario was to solve the difficulty in configuring network settings and locating networked services. Since that time, security has become more of an issue as the IGD physically sits on the edge between the home or small business network and the global Internet. For this reason it is a device prone to malicious attack attempts.

Another development in the IP space for both the home and global Internet is the emergence of IPv6 as the number of available addresses in current Internet Protocol version (IPv4) will be depleted and the need for increased security as local devices communicate directly over the global Internet. For example, two friends want to play a networked game together, but they need to create a direct connection between servers. This is accomplished by creating a pinhole in the Internet gateway's firewall or NAT which allows the two friends to play and interact with each other. But the ability to create pinholes also creates a security risk. Anyone using the same network can make changes if no access control prevents them from doing so. There are possibly other security risks without having access control, like configuring a DNS server addresses to a rogue DNS server.

An updated revision to the IGD DCP is targeted for the end of 2010. This DCP is to enable various security enhancements to the existing IGD DCP services and adds IPv6 firewall control functionality (service) to the DCP. This update is to address the problems outlined in the previous two paragraphs.

IGD Experience



The key feature, in this update to the IGD DCP, is to enable security on an IGD device. This is achieved with a new security add-on service called DeviceProtection as described in the previous section, Simplifying Security for UPnP Certified Devices.

The Internet as it migrates from IPv4 to IPv6 over the next five years will require careful deployment and consideration within UPnP Forum Device Architecture. This change is driven by the depletion of IPv4 addresses. UPnP Forum has provided an update to the Device Architecture (both v1.0 and v1.1) that resulted in an update for IPv6 support for UPnP Certified devices on home and small business networks. This update was to address the evolution of IPv6 over the last few years. As mentioned earlier, a new service is being added to the updated IGD DCP to provide firewall control for IPv6 networks.

ENABLING TELEPHONY CONTROL USAGES

The new Telephony DCP, to be available in Q4 2010, allows mobile phone features and services to be accessible by other UPnP Certified devices on the home or small business network, such as a TV, set-top box, or computer. This DCP would allow mobile phone devices that implement this DCP to be discovered by Telephony controllers (control points) on the network.

The new Telephony DCP will extend telephony network integration to additional consumer devices, including call control, caller ID, voice/SMS, calendar management, and remoting the

phone's keyboard/touchpad. It will also extend the availability of mobile terminal capabilities to external UPnP Certified devices, i.e. television subscribers to receive incoming call alerts (e.g., via WLAN connectivity within the home).

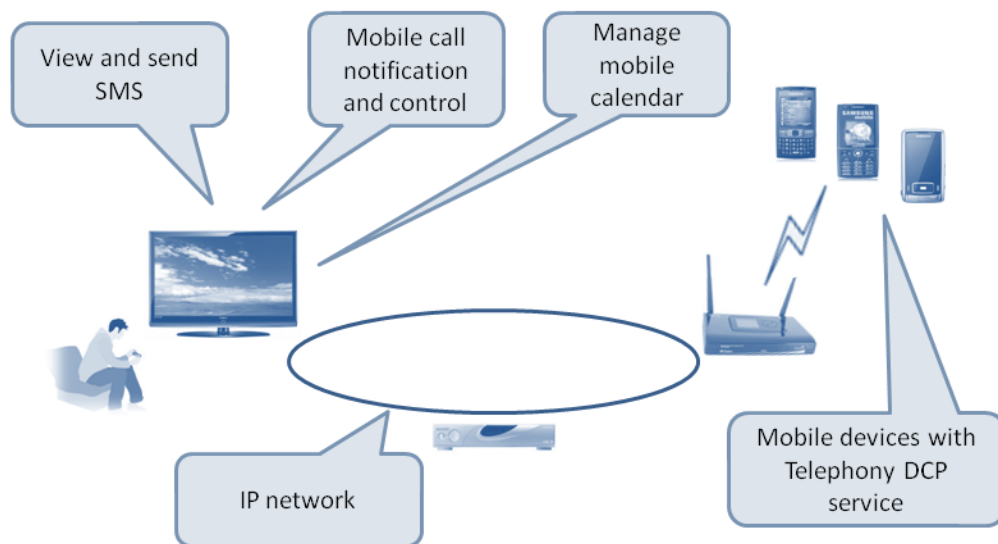
Users, manufacturers and service providers alike will benefit from the new DCP. It will allow users increased freedom, extending phone capabilities to other home devices. CE/mobile manufacturers and telco/cable service providers of Wi-Fi enabled phones who want to increase their customer base will have the ability to offer compelling extras for all phones. Service providers will have a scope for bundling mobile phone services with other home or business services.

The telephony DCP will enable (1) All interactions needed to handle voice calls and SMS; (2) All interactions needed to handle battery status, coverage status, memory status, etc.; (3) All interactions needed to handle remote management of phone book appointments including notification, creating new appointments, and deletion; (4) All interactions needed to handle volume setting, ring tone settings, Bluetooth settings, etc.; (5) Support for appropriate security mechanism such as authentication, privacy and confidentiality; (6) All interactions needed to use the mobile phone as an input device such as keyboard, keypad, touchpad, etc. by another device.

The new Telephony DCP would enable the following usage scenarios:

- **Incoming calls/SMS notification:** The user is watching TV and an incoming call or SMS indication is displayed on the TV. The user might answer the call or reply to the SMS message from another UPnP Certified device. It would also be possible to route the incoming call to another mobile phone by initiating the outgoing call and connecting the two calls. For privacy, the user might need to input phone password to access call/SMS notification.
- **Find a phone:** The user is unable to locate their phone in the house. They use their TV remote controller to choose the "find my phone" option from a menu item on the TV. The phone starts ringing and the phone can now be located. This would work even when the phone is in silent or vibrate only mode.
- **Charge a phone:** The user is watching TV and receives a notification on the TV that their mobile phone battery is low. The TV displays an alert instructing how to charge the phone. The user plugs in the charger and continues to watch TV. When the phone is completely charged the TV displays an alert that the phone is fully charged.
- **Phone as an input device:** The user wants to reply to an SMS message displayed on the TV by using the input keyboard of mobile phone. Another scenario would be to use the mobile phone keyboard and touchpad to interact with a browser on an Internet enabled TV.

Telephony Experience



QUALITY OF SERVICE (QOS) USAGES

As more and more content is being streamed and transferred over the home and small business



network, there is an increasing possibility that network bandwidth could be taxed to the point that content being streamed for real-time rendering could exhibit breakups in its display, thus affecting the expected user experience. There is an increasing need to identify and provision which kind of network traffic needs the most responsive access to the network. This is where UPnP Forum

QoS solution comes in.

UPnP Forum’s QoS Working Committee has been active over the last few years in defining add-on services to address the Quality of Service (QoS) for all media related services. UPnP Forum has published three versions of QoS DCP. The first two versions define a **priority-based QoS** mechanism that used “tags” within the IP packets to indicate the priority of a particular network packet. This “tag” is used by the underlying network technologies to give network access to those IP packets “tagged” with a higher priority. The underlying network technologies allow from 4 to 8 priority levels. This allows giving network traffic with a higher priority “tag” (i.e. voice and streaming AV content) more access to the available bandwidth on a congested network. In summary, the QoS version 1 and version 2 DCP provides a **priority-based QoS** solution to ensure a voice call or streaming AV content would get greater access to a congested network over a data-only application where real-time access is not a necessary requirement and thus a smaller percentage of available bandwidth is sufficient.

More recently, as the majority of media users have begun to use more streams or trick modes (fast forward, rewind, etc), individuals are demanding a much larger percentage of network bandwidth. There is even a requirement to prioritize content streams, such as premium content purchased from service provider versus home video content. The **priority-based QoS** solution offered by the QoS version 1 and 2 DCPs continues to be sufficient in instances where overall network bandwidth is sufficient and not oversubscribed. But as users continue to demand larger percentages of available network bandwidth, often no one can get access to the network because it has become oversubscribed (i.e. always congested). The QoS version 3 DCP provides a **reservation-based QoS** solution for this problem.

The QoS version 3 DCP defines an IP **reservation-based QoS** protocol. Using **reservation-based QoS**, entities communicate with the network to reserve the amount (i.e. mega-bytes per second) of bandwidth deemed necessary for its network traffic. They are ensured this bandwidth over those who have only **priority-based QoS** networks like those offered in QoS versions 1 and 2 DCPs. High definition video was one of the main drivers in the creation of **reservation-based QoS**. Also video delivering service providers, cable companies, people who provided hardware to support gaming, and others demanded extra and guaranteed bandwidth for their content.

A typical video-based usage scenario would go something like this:

A video stream (i.e. set-up box to a television) would make a request to a network layer: “I need 20MB per second.” A QoS managing entity would ask all of the devices in the network path if they have sufficient bandwidth available. When the stream starts it would be tagged uniquely as part of the stream. The QoS managing entity would then see a reservation has been made and allow priority. The QoS managing entity polices bandwidth requests at the time of the reservation and may reject the reservation if more bandwidth than is available is requested. The QoS managing entity continues to police the network after the reservation is made and can drop the reservation if the stream decides to go over its reserved bandwidth, though sometimes if bandwidth is available the QoS managing entity may allow priority slightly over the amount that was reserved. An application planning to set up a stream must use any available content metadata to determine the bandwidth requirements. The QoS DCP defines such metadata for the AV DCP’s content directory service.

SYNCHRONIZATION OF AV CONTENT ACROSS CONTENT SERVERS

In 2009, UPnP Forum published an add-on service to enable an additional AV usage to the ecosystem. There is a need for users to have their music and video content libraries to be automatically synchronized and available across all media server devices in their home or business. This DCP enables the automatic synchronization of AV content across multiple media server devices. In particular, this DCP allows applications to setup and manage relationships of

content items the user wants to be automatically synchronized between two or more media server devices. The following figure illustrates this model:

Content Synchronization Experience

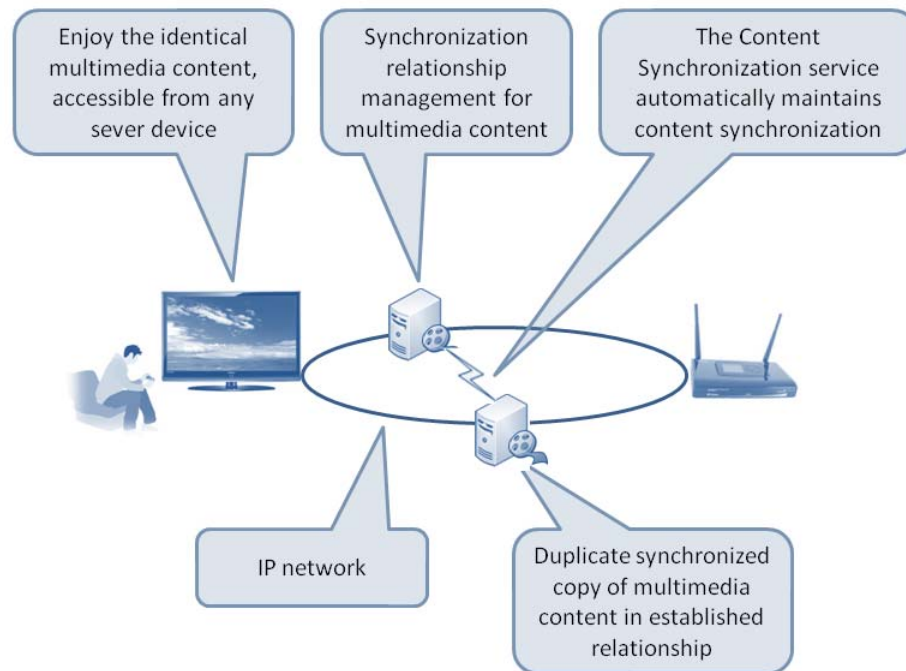
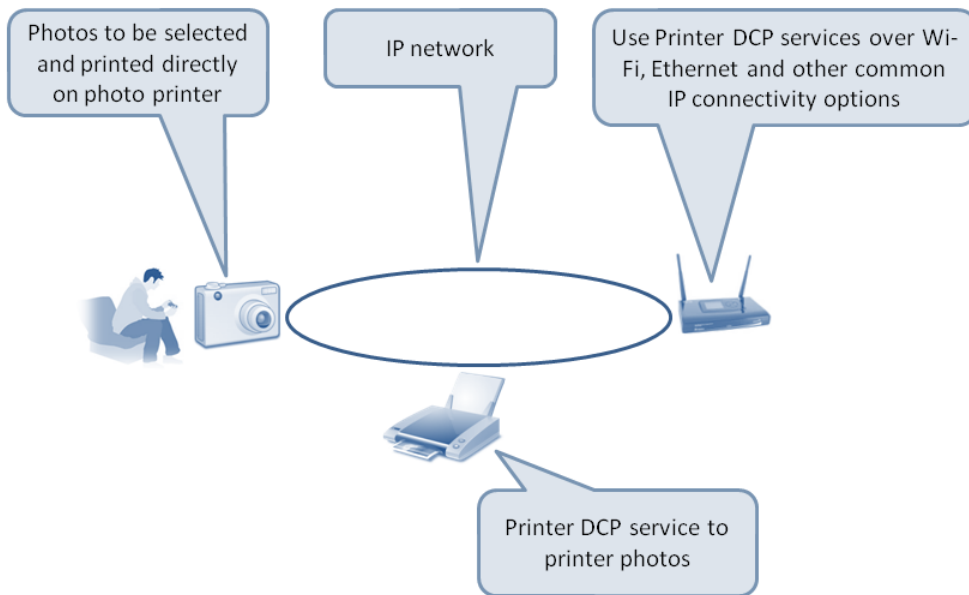


IMAGE PRINTING USAGES

In 2002 and updated in 2005, UPnP Forum published the Printer DCP. This activity had active participation by UPnP Forum Members made up from worldwide printer vendors (e.g. HP, Epson, Lexmark, and Canon). This added to the ecosystem the ability to create and print jobs with special emphasis on the printing of images (i.e. photographs) seamlessly over the home or small business network. The success of this DCP is demonstrated by being adopted and referenced by DLNA for implementing its printing system usages. Usage scenarios enabled by this DCP include allowing devices (e.g. camera or mobile phones) to print directly to UPnP Certified photo printers without the need to download images to a computer for printing.

Printer Experience



FRAMEWORK TO REMOTE USER INTERFACES (RUI)

Many vendors identified a need to remote their device's user interfaces on any capable display device. In 2004, UPnP Forum published the Remote User Interface (RUI) DCP to address this challenge. This DCP provides a framework for vendors to accomplish this between their devices (RUI servers) and UPnP Certified RUI display devices (RUI clients). The Consumer Electronic Association (CEA) referenced this RUI framework defined by UPnP Forum to create the CEA-2014-A specification for consumer devices to remote their user interfaces onto consumer display devices (i.e. TVs). This same DCP with CEA-2014-A has also been adopted by DLNA to implement its Remote User Interface system usage.

HOME AUTOMATION USAGES

Home automation is another important usage in both the home and business environment. With the recent activity occurring in the management of energy usage (e.g. Smart Grid initiative in the US), home automation will become even more important. UPnP Forum has been an active player in the home automation arena throughout its history with published DCPs for heating ventilating and air conditioning (HVAC), security cameras, lighting controls, and most recently, published in 2009, solar protection blinds.



UPnP Forum is continually cultivating new opportunities and industry trends in home automation to create new DCPs or updates to existing home automation DCPs.

LEVERAGING UPnP FORUM TECHNOLOGY FOR SMART GRID INITIATIVES

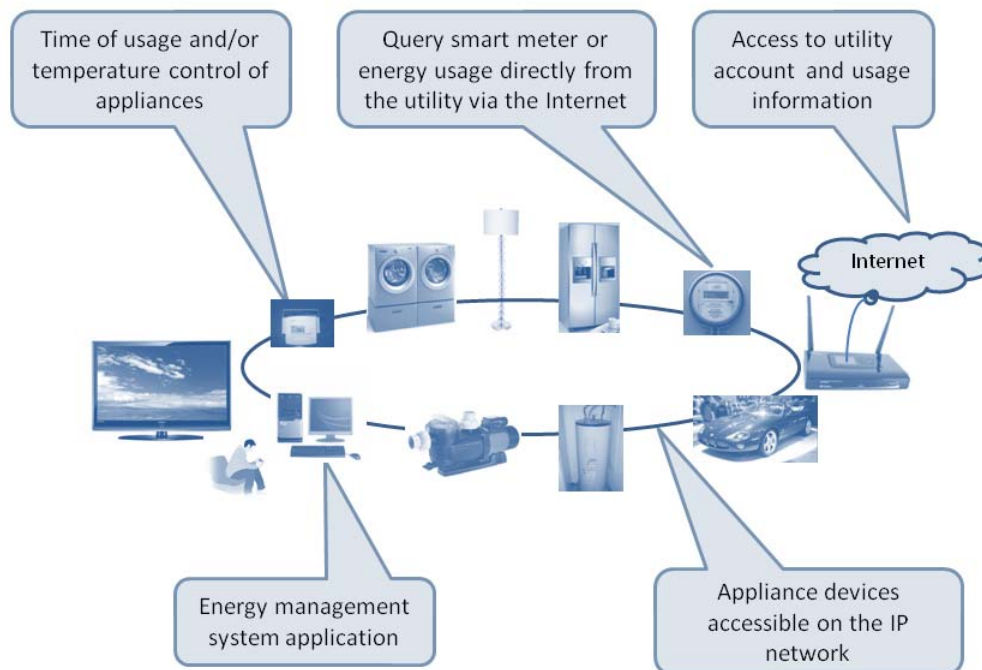
Smart Grid is the U.S. initiative to develop a comprehensive electrical grid with the intelligence to improve efficiency, lower energy costs, and provide energy management features. Similar programs are in development in other countries. The part of the Smart Grid that involves energy markets and distribution between producers and suppliers is beyond the scope of UPnP Forum. However, UPnP Forum technology is very relevant to energy management within a customer's home. UPnP Forum standards provide the common communication between intelligent devices in the home.

A primary use case is "demand response." In this scenario, instantaneous pricing information and home consumption information is communicated to the customer or the customer's designated agent. Based on this information, smart appliances in the home can be automatically adjusted to switch to low-power modes, or to prioritize energy intensive tasks.

Leveraging IP utilized by more than 1 billion connected users, UPnP Certified devices on existing home networks provides a perfect platform for communicating energy-related messages. IP is the primary platform for technology innovation, it's easy to scale and secure, and IP equipment is inexpensive and robust. Smart Grid communications (pricing, alerts, meter readings, etc.) can easily bridge to IP-based home or small business networks allowing users to communicate with providers over the Internet or via a private IP backbone. Customers will be more likely to use Smart Grid applications that leverage technologies, devices and services that are already installed and familiar.

UPnP Forum's DCPs facilitate Smart Grid standards that leverage broad adoption and foster healthy competition, utilizing the many network infrastructure options already available today. Users adopting UPnP Forum standards for their home and small business networks, using IP as the basic interoperability technology, can maximize the utilization of existing and emerging data communications technologies (i.e., XML) in order to provide standard data-messaging. Using UPnP Forum technology, the Smart Grid in the home could leverage existing cyber security and QoS protections already capable of providing secure and reliable communications over insecure networks.

Smart Grid Experience



UPnP Forum is staying on top of this activity through its Smart Grid Task Force to identify UPnP Forum opportunities and UPnP Forum Home Energy Management and SmartGrid (HEMS) Working Committee to execute on these opportunities through enhancements to existing DCPs or new DCPs.

CONCLUSION / CALL TO ACTION

UPnP Forum provides a worldwide recognized architecture for device network addressing, discovery, and control that has been widely adapted and supported by many vendors into their products and software. UPnP Forum continues to be active in developing improvements and enhancements to this architecture as demonstrated with the release of the UPnP Forum Device Architecture v1.1. The members in UPnP Forum are what is driving the deployment of new and enhancements to existing device protocols (DCPs) to enable new and compelling usage scenarios, such as telephony, content synchronization, device management, and other.

UPnP Forum celebrated its ten year anniversary in October 2009, marking yet another year of continued success. UPnP Forum continues to receive tremendous industry support and UPnP Forum technology continues its reign as the leading solution for discovery and control of networked devices. Building on the momentum of ten increasingly successful years, UPnP Forum is driving networking into the next decade by continuing to offer users access to the

latest and greatest features and capabilities in an open, interoperable environment. Users of UPnP Certified devices can look forward to an array of exciting innovations and announcements both in the short and long-term.

It's not too late to join the movement to simplify home, office and small business networking. Join the forum that continues to produce the leading solution for the discovery and control of networked devices. UPnP Forum technology is your answer for simplified home, office and small business networking.

JOIN UPnP FORUM

UPnP Forum is open to any company interested in making home or office networking easy for users. UPnP Forum seeks to facilitate seamless connectivity of devices and simplify network implementation in home and small business environments. Toward this end, UPnP Forum Members work together to define and publish Device Control Protocols (DCPs) built upon open, Internet-based communications standards. UPnP Forum offers two levels of membership—basic and implementer, catering to a variety of member needs.

Basic Membership offers the following opportunities with no annual fee:

- **Leadership.** Design and drive the device descriptions for your industry's products and services and the products with which they will interact.
- **Leverage your assets.** Ensure that your legacy products and new products can talk and interact dynamically on UPnP network.
- **Learn more.** Gain a broad understanding of UPnP Forum technology and its opportunities for your products and industry.
- **Leverage Forum market development.** Gain access to UPnP Forum events including Plugfest compatibility workshops, UPnP Forum Partner Pavilions at major trade shows, use of the UPnP Forum Member logo, and public relations support.
- **Find partners.** Interact with and leverage the resources of the large, diverse group of organizations actively creating and investing in UPnP Forum technology.

UPnP Forum certification process is open to vendors who are Implementer level members of UPnP Forum and have devices that support UPnP Forum technology. The annual fee for implementer membership in UPnP Forum is US \$5,000.

Implementer Members enjoy all the benefits of Basic Members and the following additional benefits:

- Access to the official UPnP Certification test tool and ability to test devices for UPnP® Certification.

- Special assistance in obtaining technical support from the test tool product support team.
- License to the UPnP® Certification Mark for display on certified products and associated product marketing collateral.
- Ability to include the member company's certified devices in the online listing of certified devices.

Steering Committee Members provides UPnP Forum leadership and business direction, while delegating to several technical working committees to identify and define UPnP services, device controls and protocols (DCPs) and usage scenarios. Membership to the Steering Committee is by election which is open to any Implement Member. Currently, the UPnP Forum Steering Committee is composed of representatives from the following companies:



For more information about joining UPnP Forum or about certifying your product, visit: <http://www.upnp.org>. Send questions of an administrative nature to UPnP Forum upnpadmin@forum.upnp.org with the text "UPnP Administration Request" in the subject line of your message.

Contact

Dr. Alan Messer
President and Chairman
UPnP Forum
upnpadmin@forum.upnp.org
+1 503-619-5223

