universal plug & play c o n n e c t i o n s

Welcome to the UPnP Forum Newsletter

Salim AbiEzzi, Ph.D., Microsoft Corp., Steering Committee Chair

Welcome to the inaugural issue of the quarterly Universal Plug & Play (UPnP) Forum newsletter.

The Forum has the objective of launching an industry based on the vision of pervasive connectivity of all device types everywhere, to improve quality of life. If I'm browsing an electronic program guide while traveling, I should be able to order a specific program to be recorded on my digital video recorder at home. My calendar at work should be able to set my alarm clock at home when I have an unusually early appointment, such as a conference call to Europe. My personal computer in my home office should be able to service photo slide shows to my television and digital music play lists to my stereo system in the family room.

Today, we already have many of the building blocks to make this vision a reality. We do not need to invent cold fusion or solve hard technical problems. We simply need to provide a framework and define standards for device communication irrespective of type or vendor.

UPnP is the most natural extension of the Internet into everyday devices and intelligent appliances. It builds on IP, TCP, UDP, HTTP, and XML among other existing technologies, and its contract for device interoperability is based on declarative data over a wire protocol, namely XML over HTTP, which is similar to the Internet HTML over HTTP. In addition to learning from and leveraging proven success, this approach has the advantage of paving the way for connecting these devices to the Internet.

The UPnP device architecture version 1.0 was finalized in mid-June 2000. It defines protocols for peer-to-peer device networking, including zero-configuration, automatic discovery, description, control and eventing. Plug a device into the network and it just works — it obtains an IP address, announces its presence, provides a description of its capabilities to interested clients, and receives and acts upon control messages from such clients. So UPnP provides a driverless methodology for dynamic device connectivity. People that have worked with device drivers in the past will have an appreciation for this significant simplification.

The Forum, launched on October 18, 1999, is a consortium of more than 200 companies including industry leaders in consumer electronics, home appliances, home control

Why Join the UPnP Forum?

Richard Dunda, Microsoft Corp.,
Marketing Committee Chair

The UPnP Forum was formed to create communication standards for intelligent devices of all types and simplify networking and configuration of these devices on a network. Across a wide range of devices, UPnP Forum members are defining device descriptions.

Both UPnP and device descriptions are built around the same standards that made the Internet a worldwide success — HTTP, IP and now, XML. Because it's based on Internet standards like IP, UPnP provides a simple, media-independent, practical implementation of peer-to-peer, zero-configuration networking.

UPnP is also a lower-overhead, lower-cost method for incorporating device intelligence than alternative approaches, consuming less than 50Kb in its implementation. UPnP is the technology to provide the catalyst for manufacturers to produce, and consumers to buy, a wide range of cost-effective intelligent devices for the home and office and everywhere in between.

The UPnP Forum now has more than 200 member companies, representing a broad spectrum of industries. These companies are leaders. They are building the intelligent products and services of the future.

By joining the UPnP Forum, your company can position itself to take advantage of the opportunity that IP-based networking of intelligent devices will bring to consumers and businesses. UPnP Forum membership enables your company to:

• Be a leader in your industry. Design and drive the development and implementation of device descriptions for your products and services and the products with which they will interact. How will a stereo talk to a clock and a personal computer?

and automation, mobile devices, and computer peripherals. These industry leaders chair and staff Working Committees to establish device standards according to the common UPnP device architecture. The Working Committees include the Appliances Working Committee, the Audio/Video Working Committee, the Home Automation and Security Working Committee, the Imaging and Printing Working Committee, the Internet Gateway Working Committee and the Mobile Devices Working Committee. These committees are defining about 30 device standards in this first generation.

The Technical Committee coordinates and supports each of the Working Committees to promote efficient progress and produce a technically sound and synergistic family of standards. In addition, the Steering Committee is a group of 20 companies that provides general leadership and business direction for the Forum. Likewise, the Marketing Committee is chartered with worldwide recognition of the UPnP Forum, UPnP and the benefits it delivers. With the publishing of the version 1.0 device architecture and support material including templates, guidelines, and frequently asked questions (FAQ); the shipping of UPnP client support in Windows Millennium Edition (Me); and the availability of beta versions of two UPnP device kits, we have made significant progress against our vision and have paved the way for UPnP

device implementations. We expect to see pioneer products in the market place by the end of 2000, and many more by the 2001 end-of-year holiday season.

UPnP offers many benefits. One is platform independence, which allows any vendor, using any operating system and any programming language to build UPnP devices. The architecture is also media independent, since it is built on IP, which runs on a variety of physical media. As a natural extension of the Internet, UPnP uses the same approach and building blocks, hence it builds on proven success. UPnP is royalty-free — the UPnP Forum agreement states that UPnP member contributions are generally licensed royalty-free to other members. Finally, UPnP lends itself to low-cost and lightweight implementations, since it is based on sending and receiving data over wire protocol according to a simple device model.

Participation in the Forum only requires signing the membership agreement, bringing the member company diverse and significant benefits. Through broad industry support and participation, we can accomplish our goal of creating a standardized way for devices to speak to each other.

For more information about the benefits of joining the Forum, see "Why Join the UPnP Forum" in this newsletter. For details on all of the above please visit http://www.upnp.org/.

- Leverage your assets. Actively participate in the UPnP Forum to ensure both legacy products (via bridging) and new products (natively) can talk and interact dynamically on a UPnP network.
- Realize increased flexibility in users' interaction with your products and services by controlling the user interface of your device.
- Gain a broad understanding of UPnP technology and its opportunities for your products and industry. Learn more about the interaction between UPnP-enabled devices and downstream and upstream devices and services.
- Participate in marketing opportunities and events. Gain access to Universal Plug and Play Forum events including Plug Fest compatibility workshops, UPnP Partner Pavilions at major trade shows, and implementation workshops.
- Develop and form beneficial partnerships.
- Interact with and leverage the resources of companies actively creating and investing in UPnP. Exploit the opportunities for collaboration provided by a large, diverse grouping of companies.

The UPnP Forum is open to any company that wants to help drive the adoption of zero-configuration IP-based networking standards and UPnP technology. If your company has an interest in moving UPnP technology forward and capitalizing on building intelligent devices for IP-based networks and devices, join us and help build the technology by participating in the design of schema templates.

Membership in the UPnP Forum is free. Your industry, your products, your services and your customers are waiting for technology to save them time and money and make their lives easier and more enjoyable. UPnP can do that. You can do that. Join the UPnP Forum today.

The membership agreement can be found at http://www.upnp.org/membership.htm.

Fall Intel Developer Forum (IDF) with UPnP Pavilion

The Intel Developer Forum (IDF) scheduled for August 22 through 24, 2000 in San Jose, California, will feature a UPnP Implementers Workshop and UPnP Pavilion showcasing product demonstrations from early implementers. Intel Corp. is sponsoring the UPnP Pavilion to give early adopters an opportunity to show functional prototypes representing initial products available this year. There will be several multi-operating system development kits available as well. Current participants include Axis Communications AB; Hewlett-Packard Company; Intel Corp.; Invensys Controls; Lantronix, Inc.; Microsoft Corp.; Panja Inc.; Premise Systems, Inc.; Siemens AG; and Xerox Corp.

For complete information about the Intel Developer Forum Conference, see the Intel Developer Web site at http://developer.intel.com/design/idf/index.htm.

The Third Summit of the UPnP Forum

Arlene Binuya Murray, Microsoft Corp., Forum Executive Administrator

Microsoft hosted the third Summit of the UPnP Forum, June 15-16 in Redmond, Washington. Nearly 300 people attended the event, a record number!

The first day sessions were open to the general public with topics ranging from a keynote about the emerging market of home networking technology by Cahners In-Stat analyst Mike Wolf, to the UPnP Forum update and a review of UPnP device architecture version 1.0.

The second day, reserved for Forum members, covered technical topics in depth. Sessions included device description design guidelines, future design description test suites, as well as subsystem-specific sessions on UPnP architecture components: discovery, control and eventing.*

Nine companies demonstrated UPnP-enabled products at the Summit. Presentations included UPnP product prototypes from companies including Agranat Systems, Inc.; Broadcom Corp.; Hewlett-Packard Company; Honeywell, Inc.; Intel Corp.; Lantronix, Inc.; Panja, Inc.; and Siemens AG.

At the Summit, there were about twenty UPnP devices demonstrated as part of one network, together with a Windows® Millennium Edition (Me) personal computer acting as client and providing for the discovery and control of all these devices. More companies would have demonstrated products if there had been more time in the schedule. Already many companies are reserving presentation time at the Fourth Summit to be held November 9-10, 2000 in Redmond, Washington. Please be sure to mark your calendars!

Announcements at the Summit included two UPnP development kits and the first Plug Fest. Intel announced the Intel® UPnP Software Development Kit version 1.0 for Linux, and Microsoft announced the UPnP Device Kit for Windows Me. Intel Corp. in Beaverton, Oregon, will host the first Plug Fest in September 2000. The Plug Fest is an engineering opportunity for companies to bring existing product and/or prototypes, plug them in to an operating system and confirm interoperability. Company and device registration can be found on http://upnp.org/events.htm.

The two over-riding messages from the UPnP Forum Summit are that UPnP is real and first generation devices will ship this year. Industry stakeholders are on board. Key players are engaged in developing UPnP technology, driving toward standardization, and building products to enrich consumers' lives. The best is yet to come! ▦

* .PPT slide presentations and on-demand webcasts of both days of the Third UPnP Summit are available on the UPnP.org web site at http://www.upnp.org/events.htm.

UPnP Partner Pavilion at CEDIA Expo 2000

Be part of the first Universal Plug & Play Partner Pavilion at CEDIA Expo 2000. This event is an excellent opportunity to engage the top home electronics and home automation installers and integrators of your technology, channel and product plans for Universal Plug & Play. Theatre presentation and kiosks are available to UPnP Forum members. For more information see the registration form and floor plan available on the http://www.upnp.org Web site. ▦

First UPnP Plug Fest September 2000

The UPnP Interoperability Plug Fest is scheduled for September 20 through 21, 2000 and will be hosted by Intel Corp. in Beaverton, Oregon. This will be a hands-on engineering event focused on multi-vendor interoperability. Details, including registration information, are available on the UPnP Web site. ▦

Election 2000 for UPnP Steering Committee Seats

Election 2000 is officially launched. Based on the membership agreement of the UPnP Forum, nine seats on the Steering Committee are up for election this year. The newly configured Steering Committee must be in place by the anniversary of the Forum's founding - October 18, 2000. Below is a target timeline for the election process:

7/26	Begin accepting nominations
8/15	Close nominations (midnight PST)
8/15	All member companies identify unique voting member (midnight PST)
8/18	Post nominations to UPnP web site
8/18	Seated Steering Committee publishes recommended slate
8/21	Begin voting
9/8	Close voting and begin tally
9/15	Verify and announce results
10/18	First meeting of new Steering Committee

The elections provide an opportunity to create diversity within the group and ensure the committee represents a variety of device categories.

Self-nominations from any member company interested in joining the Steering Committee, including incumbents, are welcome. Nominees must sign a Steering Committee member commitment form to confirm their nomination. Companies interested in nominations should be prepared to provide the following information:

• What is your company's business as it relates to UPnP?

• Why does your company want to participate in the Steering Committee?

• What plans does your company have for building UPnP products, including devices, bridges, hardware, tools, etc.?

• In what way do you expect your company to contribute to the success of UPnP?

Active members of the UPnP Forum are eligible to vote upon signing the applicable UPnP Forum member commitment form.

Official forms will be sent via e-mail to the general membership and will also be posted to a special election page on the http://upnp.org Web site. Please visit the Web site for specific election details including the nomination and commitment forms. ▦

UPnP Template Process and Device Model

Steve Timm, Microsoft Corp., Forum Program Manager

How UPnP Templates are developed and approved

UPnP templates work through an approval process, starting with assigning an author, achieving Template Preliminary Design (TPD) status and ending with Template Design Complete (TDC) status.

We now have drafts of 45 design templates posted on the UPnP Forum archive, up from 25 in June! 24 templates have reached TPD status so far. We expect to have templates for 20 devices and their 40 services by August 2000.

Some of the UPnP devices being designed are a thermostat, a security camera, an audio-video switch, an Internet gateway, a printer, and a refrigerator. Some of the services contained by these device types include a temperature sensor, motion-image service for a camera (describing parameters of the video source), audio-video transport, a connection linking a Wide Area Network (WAN) with a telephone wiring system (POTS), and a print service.

To begin, within each Working Committee, authors are assigned to draft templates for device and service descriptions based on product scenarios and submit them to the committee for design review. Initial reviews focus on device modeling and, in particular, on the definition of services, service state variables and action sets. After incorporating committee feedback,

draft designs are given Template Preliminary Design (TPD) status.

Once template designs reach TPD status, vendors can begin sample implementations. Early implementations help prove the completeness of a design. Many sample implementations have been committed, but many more are still needed.

The next step focuses on confirming device and service model usability and testability. For example, the committee ensures that the XML template allows vendors to specify appropriate device specific parameters at implementation time, and that the device is factored into appropriate device and service modules. The committee makes sure interactions between services within a device are specified in the test portion of the template. After completing this phase according to a consensus of the committee, a design is considered Template Design Complete (TDC).

At Template Design Complete (TDC), a device or service design includes the completed XML template. Sample implementers use the templates to create the XML code for the XML device description, including messaging for the device's discovery and control servers.

UPnP Design overview

Standard design templates simplify the

design process discussed above while maintaining flexibility through support of standard options and vendor extensions. UPnP templates (one for devices, one for services) include placeholders for Working Committees to specify modeling parameters and XML description of the design.

Design options can be included in a standard template, offering vendors flexibility. For example, the light switch device template includes an optional dimming service. Similarly, standard services may include optional state variables and actions. While templates define the standard for UPnP compliance and interoperability, vendors can add extensions to their implementation. These vendor extensions may be certified UPnP-compliant as long as they do not break the behavior of a device as defined by the standard template.

Re-using standard device and service template designs further simplifies device development. While some templates apply to a single device application, other templates define common services across device categories. Some generic templates include: a power switch, a clock service, and a configuration service for common setup functions. As a repository for Working Committee results, the UPnP Forum Archive is a growing resource for developing interoperable, Internet-aware devices. ▦

Axis Communications Brings UPnP Implementation Aid to Device Builders

Bengt Christensson, Axis Communications Inc., Forum member

UPnP is a cross-industry specification that is designed to be truly operating system and program language independent. Serving as a proof source for this objective, one of the first implementations of UPnP functionality was demonstrated on an embedded Linux network device. Axis Communications developed a UPnP version of the AXIS 2100 Network Camera, a Linux-based device with a built-in Web server that can attach directly to a network. This solution has been demonstrated at a number of events, including Connections 2000, Fall COMDEX 1999, and as part of a home security system in the Microsoft Home living room concept demonstration.

The demonstration of this solution provoked significant interest from hardware and software developers, particularly in the open source com-

of UPnP to the Linux platform. However, as with any embedded device, minimizing footprint is important because of the impact memory usage has on performance and overall costs. Axis addressed these issues by developing a UPnP implementation specifically designed to accommodate embedded networked devices.

Axis is also providing solutions that will allow third-party developers to include UPnP support in small embedded devices. To shorten time-to-market, Axis offers a developer board for rapidly prototyping new product concepts, reducing the overall design effort for developing network peripherals and emerging mobile devices.

Based on Axis' ETRAX 100 processor with embedded Linux, this small but versatile developer board makes it possible to connect up to

ports directly to an Ethernet network. To ease design efforts for developers, Axis will also supply source code, tools and drivers for embedded Linux and a detailed reference design with no association, royalties, or licensing costs. Other applications are also available, such as Bluetooth wireless technology.

The developer kit, including hardware and software, is available and shipping now, with a free upgrade of the UPnP extensions targeted to be available in the fourth quarter 2000. Third-party developers interested in more information should contact: in Europe, Niklas Morberg (+46 46 272 1800, niklas.morberg@axis.com) and in North America, Bengt Christensson, (650-903-2221, bengt.christensson@axis.com). Axis also posts information on its developer kits at

Intel UPnP Software Development Kit for Linux

Andrew Liu, Intel Corp., Steven Conner, Intel Corp., Forum members

At the June 2000 Summit of the UPnP Forum in Seattle, Intel introduced the Intel UPnP Software Development Kit version 1.0 for Linux. This kit (SDK) provides developers with a cost-effective way to speed time-to-market for UPnP-compliant Linux-based devices such as Internet appliances, residential gateways, and home networking products.

Intel UPnP Software Developer Kit (SDK)

The Intel UPnP SDK provides a comprehensive API and Linux source code for the implementation of UPnP-compliant control points and devices. The SDK will be deployed and tested on the Linux operating system. The UPnP SDK is interoperable with Windows operating system software. The SDK, which is compliant with version 1.0 of the UPnP specification, includes header files, commented source code, documentation, and an open source software license. The SDK provides a complete UPnP reference implementation, and supports both controlled devices and control points.

Architecture overview

Figure 1 illustrates the Intel Linux UPnP SDK, open source with no restrictions, with its three main components for effective implementation. At the top of the stack is the UPnP client or service application, provided by the customer, shown in purple. In the next layer, the seven grey boxes comprise the Intel SDK and the orange box is the XML parser. The bottom layer of the stack, shown in dark grey, is the TCP/IP stack provided in the Linux operating system.

Conclusion

The Intel UPnP Software Development Kit version 1.0 for Linux enables immediate developer support of UPnP and will dramatically simplify use of Linux-based web appliances and e-Home devices. The SDK will be available beginning summer 2000.

Figure 1. Intel Linux UPnP SDK architecture
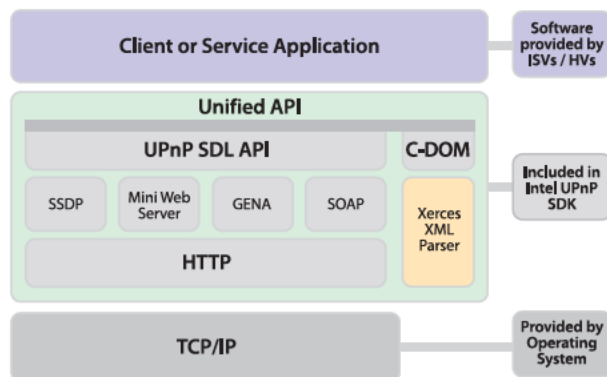
An expanded version of this article, and additional information about how to obtain the Intel UPnP Software Developer Kit for Linux are available at the UPnP area of the Intel Architecture Labs web site at http://www.intel.com/ial/upnp. Additionally, Intel will present demonstrations of this new technology at the Fall Intel Developer Forum (IDF) and the First UPnP Plug Fest.

Microsoft UPnP Development Kit

Steve Judkins, Microsoft Corp., Forum member

UPnP is gaining momentum as the next generation standard for home networking. The completion of the UPnP 1.0 architecture is a significant milestone for the technology. Another significant milestone will be the arrival of device implementations that are fully compliant with the UPnP standard, expected by the 2001 end-of-year holiday season.

In support of this momentum and in response to multiple requests for test devices and tools for debugging, Microsoft recently announced the availability of a beta UPnP development kit. The kit was introduced at the UPnP Forum Summit in June 2000. An early beta has been made available for download at the Microsoft web site at http://www.microsoft.com/hwdev/upnp/.

This first beta of the Microsoft kit includes an early release of source code demonstrating how to build a UPnP controlled device. This sample code is designed to run on Windows 2000 using the IIS web server. Once compiled and configured, the device will appear in any

Windows Millennium Edition (Me) control point with UPnP installed. Using the device with Windows Me, the developer can observe and step through the interaction between a device and a control point. The default device includes support for bridging an X10 light, and can be easily extended to support other device functionality by listing a new action and implementing the function in C code. (X10.com has a great offer on the wireless firecracker package that was used for the device demonstration at the June 2000 UPnP Summit.)

The Microsoft kit also includes Simple Service Discovery Protocol (SSDP) and Simple Object Access Protocol (SOAP) parsers for the Netmon network-monitoring tool. When using Netmon, the developer can drop the parsers into a "Netmon Parsers" directory to easily filter and display these packets. The kit includes text file captures of the packets sent during discovery, description and control sequences between the device and a control point. These file captures have proven to be a handy reference

when debugging.

In-depth presentations and documentation are included in the kit. The presentations, first made available to Forum members, provide technical insights into implementing discovery, control, and eventing. Documentation of the Windows Me API and device sample code is provided for reference.

A beta update will be available in early August that will include a number of important changes to the UPnP device sample. First, the new device code can be compiled on both Windows 2000 and Windows CE. The code will no longer use the XML Document Object Model (DOM), relying instead on a mini XML parser. Source code for the mini-parser will be included in the kit. The device sample will also contain source code illustrating how to implement SSDP and UPnP eventing.

To comment or receive future announcements and updates about the kit, email Microsoft at upnpfb@microsoft.com and ask to be added to the kit mailing list.

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