

# The Future of Plug and Play

by Stephen Turbek



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Visions of the future show people intensively using computers, but never complaining about not having the right cable or not being able to print. Today, computers can make life easier but making all the parts – PCs, PDAs, printers, modems work together can be a job in itself.

Several new technologies are being developed to make connecting and configuring happen automatically between the devices as much as possible. 'Plug and Play' automatic configuration of devices frees us from calling tech support and allows the average person to take advantage of equipment that currently only the gadgeteer can make work. Though currently focused on personal computers and their peripherals, Plug and Play will become increasingly important as intelligent devices become more common.

## How Do Things Work Together Now?

Because computers cannot deal with unfamiliar situations by themselves, programmers must try to deal with every possible combination of situations, an extremely difficult task. With the wide variety of products, manufacturers and competing standards, it is amazing that things work together at all.



Stephen Turbek

<stephen@razorfish.com> is in the razorfish science department.

## Drivers

When two pieces of hardware are connected they can interact if they "know" each other and "speak" the same language. As each device is different, they each have different standards for formatting and communicating. Perhaps you've added a printer to your computer and had to select a file describing that exact printer. That file is called a "driver", a small program that manages communication with the device and provides info about it.

## To make our devices really useful, they must learn how to work together.

Drivers are the first solution to the communication problem, but they have several obvious flaws. If you don't have the driver, you often cannot use the device. Drivers are always being rewritten and can have incompatible versions. All of the thousands of drivers are written independently, wasting effort, causing software conflicts, and crashing computers. The invisibility of drivers confuses users, making it difficult for them to fix problems on their own. If computers are going to fulfill their promise, they need to be made simpler.

## Apple's Improvements

Apple, by controlling the basic hardware of the computer and its operating system, was able to define standards for drivers and encourage other manufacturers to reuse them. This simplified the system, allowing users to trouble-shoot their own computer. The Windows/Intel platform, being manufactured by many companies from the beginning, is only now standardizing its drivers.

The hardware was also designed differently. Because Apple defined how peripherals could interact with the central computer and had predefined standards for basic components like mice and keyboards, it could deal with an unknown device that followed the standards. Its networking protocol had the computers constantly looking for new devices on the network, keeping abreast with what was on the network.

## USB

The next step was to develop an open standard to simplify computer communication. The Universal Serial Bus (USB) is not simply a new type of cable, but a new architecture for computers to sense that devices have been plugged in and deal with them in a limited fashion. However, just knowing that the device is there is not enough, you want to know what it is, what it can do, and be able to use it. This is the goal of automatic configuration.



Prototype Plug & Play devices

## What is Automatic Configuration?

Automatic configuration is the idea that computer devices can figure out how to communicate with each other on their own. The reduction in the cost of computer chips means that they can be cost-effectively put inside devices. This allows them to be more than dumb hardware, to think and communicate a bit more. As devices are being networked and people are becoming more mobile, it becomes necessary for the

devices to work out the configuration themselves.

## A Scene in Automatic Configuration

A presenter walks into a hotel conference room, plugs in her computer to the phone line and can instantly access her files from her office. Her computer realized it had been plugged into a network, learned where it was, logged onto the Internet and connected with her office's computer. She plugs the computer into a projector, which identifies its capabilities, and the computer chooses the best screen resolution. Before the presentation, she borrows a new wireless mouse from a guest, plugging the antenna into her computer. The antenna identifies itself to the computer and explains how to talk to it. She gives a presentation with the new mouse. Afterwards, she chooses the closest printer in the hotel to print out the presentation.

## Plug and Play Functionality

Several groups (Sun's Jini, Microsoft's UPnP, and Salutation) have competing Plug and Play proposals, but they all have roughly similar functionality. In all of them, Plug and Play devices will:

### Introduce Themselves

When a device gets plugged into the network, it sends out a short message to the devices on the network announcing that it exists and what its address is.

### Discover Other Devices

A device can find out what other devices are on the network.

### Describe Themselves

A device can provide an in-depth description containing what it is, what it can do, and how to communicate with it.

### Notify Others About Changes

If the device has trouble, or changes

its abilities, it informs its neighbors. Running out of paper can be handled instead of stopping the whole process.

### Self-Configure

Devices on the network can work out minor configuration issues between themselves.

### Use Each Other

Once they can communicate, they can use each other, such as printing or playing audio through another device's speaker.

When a device is plugged into the network or turned on, it sends out a message to the whole network announcing its presence and giving a short description of itself. In some proposals, the device registers with a directory on the network. Afterwards, another device can request more detailed information to format their communications with the device.

The beauty of this system is that a little organization can make the whole system very orderly. By adding a little intelligence to each device, it reduces the need for the central processor to do all the figuring out. Like ready-to-assemble furniture that comes with its own tools, the Plug and Play devices provide the instructions necessary to use them. Two of the standards, Jini and Salutation are also designed to be used as communications protocols between software on a network, not limiting communication just to devices.

## But Whose Standards?

A future of automatic configuration is by no means assured. The three largest proposed standards are incompatible, and are still being developed. Though generally similar, they vary in the amount they standardize the communication between devices and have other tradeoffs. Another competing technology, Bluetooth, uses a wireless chip to do

some simple communications with other local devices. Including the emerging wireless networking technologies, there are dozens of competing communication standards. Each of these is trying to solve a different problem, but they overlap, with differing strengths and weaknesses. Unless they can be made to work together or one becomes dominant, Plug and Play will not catch on. Unfortunately, the winner of the standards war may be defined by market-share, not technical superiority.

## Where Is All This Going?

The exciting thing about automatic configuration is that it is a step towards a time when computers rarely need maintenance. This is required if computers are going to be ubiquitous and improve all aspects of our lives, not just in the office environments. Automatic configuration is one of the key elements to making computing as ordinary as the telephone, the television, and the automobile.

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### for more information

**A comparison of Jini, UPnP, Salutation**  
<http://www.cswl.com/whiteppr/tech/upnp.html>

**CNET Plug and Play Overview**  
<http://news.cnet.com/news/0-1003-201-1559726-0.html?tag=st.ne.1002.srchres.ni>

<http://www.jini.org>

<http://www.upnp.org>

<http://www.salutation.org>

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