



## **Internet Printing Protocol (IPP) Defined**

### **Introduction**

This document defines IPP and provides examples of how it eases printer configuration and management. It also demonstrates how MultiNet and TCPware have a competitive advantage over HP's TCP/IP Services in printing because of its support for the IPP standard.

### **Printing Protocol Background**

There are many proprietary printers on the market today because there are limited protocol standards for printing (until the introduction of IPP). For example, LPR/LPD is based on a UNIX standard that was adopted by other operating systems, such as OpenVMS and Windows. The protocol supports simple printing functionality (it was developed for line printers). Printer vendors have developed proprietary extensions to handle more robust printing features, such as double-sided printing. Printer vendors also have developed proprietary printing protocols. HP printers running on OpenVMS operating system use the DCPS print symbiont.

### **Internet Printing Protocol (IPP) Overview**

The IPP is an IETF standard application-level protocol that can be used for distributed printing (RFC 2567). It allows an end user to print to a remote printer (including over the Internet), using the same methods and operations as if the printer was local. The primary goal of the Printer Working Group (under the IETF) is to deliver a standard off-the-shelf solution. The standard addresses more than just submitting a print job (like the LPD standard); it allows users to interact with printers in real-time in order to find out about target printer capabilities, inquire about the status of a job or cancel a job that has been submitted. IPP is independent of operating systems because it is based on web browser and HTTP technology.

Many major vendors have adopted this standard. In 1998, nineteen companies demonstrated interoperability using this protocol. Most notably Microsoft is supporting it in Windows 2000 and Hewlett Packard supports the protocol in their Laser Jet printer product line. To find out more about companies that are adopting the IPP standard, go to <http://www.pwg.org>.

Industry analysts have predicted that IPP will eventually replace LPD. IPP version 1 and 1.1 is being deployed today, but because the protocol is flexible and extendable, it has the

ability to easily evolve, as printing needs change. Since LPD will be in use for some time in the future, the IETF has provided some specifications on mapping LPD functionality to IPP so that a gateway can be used between the two protocols.

## **IPP v.1.0 Features**

Some examples of the standard printing features defined in the IPP RFC are:

### *Client Requests*

- View job status-how many jobs in the queue, defaults, assigned priorities, is the printer on-line?
- Cancel print job
- Find a printer by name, location or attributes (capabilities)
- Verify characteristics of printer-duplex, color, collating
- Submit printing-set parameters such as number of copies, two-sided, etc.
- Operator notification-Out of paper, out of ink alert, etc.

### *Server Response*

- Received the print job and queued it
- Received the print job and printing it
- Received the print job and it failed--includes why it failed, state of printer, and how much printed
- Received print job, but couldn't print--includes why it could not print and the state of the printer
- Did not receive the complete print job (e.g., communication error)

## **IPP Examples**

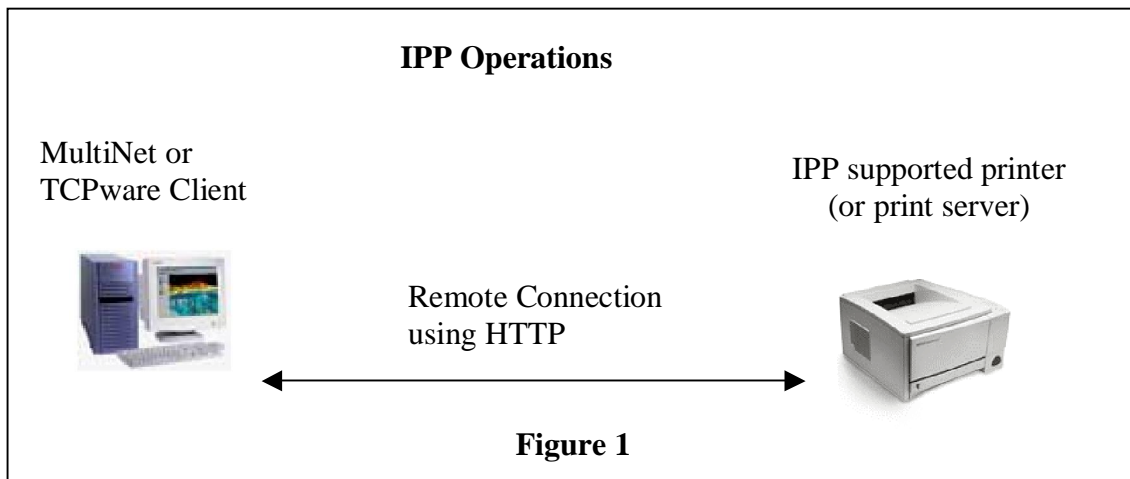
There are many ways IPP can be used that greatly extends the printing capabilities we know today. For example, a remote sales person staying at a hotel can send a report to his corporate office by simply logging onto the Internet, locating an available printer at the corporate office with his browser and send the file directly to that printer. Another example is that a student can print a report remotely via the Internet at a copy shop. He selects the appropriate copy shop based on price, location, and printer type (e.g., color). IPP is also a less costly alternative than faxing or mailing broadcast documents. For example, price lists or literature can be sent to the printers of partners, clients, or branch offices. These examples require directory services and address some security requirements as defined in the IPP RFC and will most likely be used in a user-interactive Windows NT environment.

## **How IPP Works**

IPP uses the client/server model, where the client resides in a PC or workstation and the server is embedded in a printer device or resides in a separate print server machine. MultiNet and TCPware support the IPP client (Figure 1). In IPP, the client always initiates the communication with the server. IPP transfers are made using HTTP v. 1.1 so

that once a connection is made, multiple commands (files) can be sent over a single TCP connection.

The server stores printer and job object attributes, which contain the status information a client can request, and the client's processing instructions. These printer and job objects are uniquely identified through the use of a Universal Resource Identifier (URI), a superset of a Universal Resource Locator (URL) used to identify web pages.



### MultiNet and TCPware IPP Implementation

The standard OpenVMS printing system is not interactive, but rather uses an automatic queuing subsystem. The automatic queuing subsystem makes use of symbionts that understand the details of the particular printers or print protocols. As a result, not all the real-time printer interaction that is possible with IPP can be implemented in the standard OpenVMS printing system.

Process Software's MultiNet and TCPware TCP/IP stacks for OpenVMS use an IPP print symbiont. A print symbiont is defined as an interface between the OpenVMS queue manager and the print device. It converts the commands from the queue manager (an OpenVMS printing method) so that the appropriate print device understands what to do. Because MultiNet and TCPware take advantage of the existing OpenVMS print queue management system, systems administrators are not required to learn a new interface or a web browser to use IPP. They will use the VMS commands they already know.

The print symbiont uses HTTP v. 1.1 as a transport to connect and interact with remote printers. Because an OpenVMS operator using the standard OpenVMS printing method may or may not be present when printing (e.g. for print batch jobs, no operator is present), the interactive IPP print features listed in the RFC are required.

The MultiNet and TCPware printer query utility lets systems administrators know if their printer supports IPP. In addition, the printer query utility will report on the printer's IPP

capabilities. For example, the utility program will report that a particular IPP printer supports landscape print jobs and not double-sided printing.

### **Benefits of the MultiNet and TCPware IPP Solution**

Systems administrators using the legacy print protocols such as the LPD print symbiont in MultiNet, TCPware and HP's TCP/IP Services for OpenVMS have had to spend a significant amount of time administering printing tasks with limited troubleshooting capabilities (Figure 2). For example, a system administrator receives no information on why a print job fails. The MultiNet and TCPware IPP print symbiont provides a reason for a print job failure. This saves a system administrator time in troubleshooting printing problems.

Today's LPD printing standard does not support advanced printer functionality such as double-sided printing. In order to implement advanced functionality such as double-sided printing, the printer manufacturer's proprietary extensions must be used. A system administrator would need to identify the printer type and language used by the printer and program escape sequences in the setup library for the queue. Each printer manufacturer has different programming requirements. As a result, the systems administrator would have to learn each vendor's printer model programming requirements.

The MultiNet and TCPware IPP print symbiont provide standard commands for advanced printer functionality regardless of what printer is being used. A system administrator requires no special programming or training. In addition, with MultiNet and TCPware IPP print symbiont, a user will not need to inquire about the functionality of a particular printer with a system administrator because this information is automatically provided.

Finally, the Printer Working Group of the IETF is making enhancements to the IPP protocol. Limited investment in legacy protocols is being made because IPP is the standard that is being developed for the printers of today and the future.

## Legacy Print Solution vs. IPP

### Today's TCP/IP for OpenVMS legacy print solution

- Limited troubleshooting capabilities
- Administration overhead for advanced functionality
- Difficult to use - training is required for users and administrators
- Limited future development by the Printer Working Group of the IETF

### Process Software's MultiNet and TCPware OpenVMS IPP solution

- Ease of administration
- Ease of use
- Supported in new network aware printers from major vendors
- Future development by Printer Working Group of the IETF

Figure 2

## MultiNet and TCPware Print Glossary

*Access Control* – MultiNet and TCPware allow specific hosts or users access to specific printers. The host name and IP address of the printer must be specified.

*Accept Batch Queue* – When the system is booting and the stack is automatically starting, a batch queue is created in the background.

*Auto-Start* – When a system boots, the queue manager automatically starts the queue.

*Automatic Batch Queue* – When a system is booting, TCPware submits the print queue in batch and processes the queue in the background allowing the system to boot quicker.

*Configurable Connect Timeout Value* – The length of time a printer would try to connect to that printer before it stops trying.

*Configuration Utility* – A feature of MultiNet and TCPware to manage the server; for example, it can modify a print queue.

*Configuration Utility Support* – Allows configuration using a menu instead of command line interface.

*Default Remote Printer for LPR Command* – A system administrator can set up an LPR command that directs printing to a specific LPR server. For example, if everyone prints to one printer, it can be set as the default printer.

*Internet Printing Protocol (IPP)* - is an IETF standard application level protocol that can be used for distributed printing using Internet tools and technologies (RFC 2567)

*LPD* - Line Printing Daemon is a printing protocol adopted from UNIX, and involves both a client, for printing to remote systems, and a server, for accepting print jobs from remote systems.

*LPRM* – This is a command that can be used to manage the queue; for example, it can allow a client to delete a print job.

*LPR Command Interface* – Instead of setting up a print queue, an LPR command can be used to print directly to an LPD server. This involves less work for a system administrator than setting up print queues, yet there can also be less functionality.

*LPD/LPR Queue Information Stored in Printcap File* – This is a UNIX command. UNIX uses a printcap file to configure printers, such as setting-up print queues.

*Optional Tab* – Typically one tab equals eight spaces. Some printers do not accept tabs, so MultiNet replaces the tabs with eight spaces.

*Option Form Feed at Connection Open* – The ability to print a blank page when the connection is open. (form feed =go to top of next page)

*Option Form Feed at Queue Start-up* – This feature provides the ability to print a blank page at queue start-up.

*Option Form Feed at Job End* – This feature provides the ability to print a blank page at the end of a print job.

*Supports LPQ Queries* – A client can query the LPD server to determine the status of the queue.

*TELNET*– a terminal emulation protocol commonly used on the Internet and TCP/IP-based networks. It allows a user at a terminal or computer to log onto a remote device and run a program.

#### **MultiNet 4.4 IPP Documentation References**

- MultiNet TCP/IP for OpenVMS v4.4 Installation & Administrator's Guide (Chapter 16)
- MultiNet TCP/IP for OpenVMS v4.4 Administrator's Reference Guide (Chapter 1)

#### **TCPware 5.6 IPP Documentation References**

- TCPware for OpenVMS 5.6 Management Guide (Chapter 15)
- TCPware for OpenVMS 5.6 User's Guide (Chapter 5)