



Internet Printing Protocol

Requirements

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Our Customers want to

- ▶ Utilize the growing TCP/IP infrastructure for printing
 - servers
 - routers
 - firewalls
- ▶ Have consistent printing solutions for their growing heterogeneous enterprise environment
- ▶ Decrease the current client-side requirements for printing in a heterogeneous server environment
 - too many protocol stacks
 - too many redirectors
 - too many custom applications
- ▶ Use for inter-enterprise printing the same intra-enterprise printing tools
- ▶ Use the ubiquitous internet/intranet tools such as browsers and directory services for printing support

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My name is Don Wright and I am the manager of Strategic Alliances and Standards for Lexmark International. I am chairman of the Printer Working Group which in conjunction with the IETF is sponsoring the Internet Printing Protocol project.

This afternoon, I am going to review with you the requirements that the IPP group laid out before starting the work to create the IPP. I do not plan to discuss the actual IPP standards -- that comes later.

Just as a note -- in some minor areas, the requirements document and this presentation may differ slightly from the actual standards. These variations are simply in terminology and not in overall functionality.

At a high level, all of our customers have been searching for a better solution for printing.

(talk through the bullets)

Requirements for an Internet Printing Protocol

- ▶ Must enable use Internet tools, programs, servers and networks
- ▶ Must work for:
 - printers attached to servers locally or through networks
 - stand-alone printers with internal servers, with or without spooling
- ▶ Allow use of HTTP servers and browsers (perhaps with plug-ins or other modifications) to:
 - locate printers by attributes
 - ◆ capabilities
 - ◆ geography
 - ◆ name
 - launch a printer installation process on the client
 - print jobs
 - cancel jobs
 - monitor and manage
 - ◆ jobs
 - ◆ printers
 - configure printers
- ▶ Must be independent of client and server operating systems

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IPP Requirements - Roles and Tasks

- Who would use an Internet Printing Protocol?
 - ▶ End-users
 - ▶ Operators
 - ▶ Administrators

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If we take the high level wants and needs that our customers have ask for, we can turn them into a set of technical requirement for an Internet Printing Protocol.

Don't be confused by the terminology: in all aspects, the resulting protocol must work on both the internet and an intranet. We simply call it an Internet Printing Protocol for simplicity rather than a more cumbersome "Internet and Intranet Printing Protocol."

(talk through the bullets)

Let's break down the requirements into a little more detail by examining the tasks that need to be performed.

First, we broke down the roles that humans would play in using IPP. Three classes of users (in the generic sense) emerged from this process:

- 1) End-users
- 2) Operators
- 3) Administrators

IPP Requirements - Roles and Tasks

- End-user
 - ▶ Finding and Locating Printers using a WEB Browser or other application
 - ▶ Creating a local "instance" of a printer
 - ▶ Using a WEB Browser or other application to view:
 - Status of the printer
 - List of jobs
 - ▶ Submitting a print job
 - Using standard applications (word processor, spreadsheet, etc.)
 - Pushing a pre-formatted document
 - Using a reference to an existing document not located on the client
 - ▶ Viewing the status of a print job using a WEB Browser or other application
 - ▶ Being alerted due to printer errors, job errors and job complete
 - ▶ Canceling his own print job

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IPP Requirements - Roles and Tasks

- Operator
 - ▶ Alerting due to printer & job error conditions
 - ▶ Changing some printer and job attribute
- Administrator
 - ▶ Printer installation and configuration
 - ▶ Access control lists
 - ▶ Defaults, templates, views
 - ▶ Charge-back, accounting

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First, let's examine what an end-user might want to do?

(talk through the bullets)

Now, what about an Operator?

(talk through the operator bullets)

And finally, an Administrator?

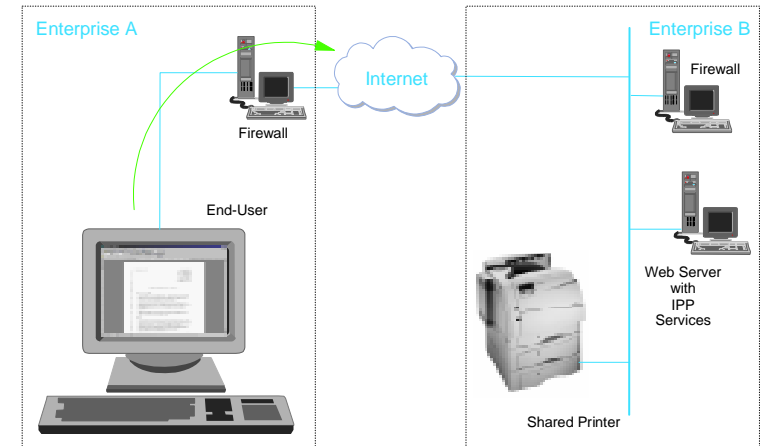
(talk through the administrator bullets)

End-user Requirements

- How are the three types of printing different?
 - ▶ From an Application
 - ▶ Pushing
 - ▶ By Reference
- What are some examples of how IPP could be used?
 - ▶ Document Library
 - ▶ Printing at a copy shop from another location
 - ▶ Inter-enterprise
- How can WEB browsers and other tools be used in this environment?
 - ▶ Finding and Selecting a Printer
 - ▶ Submitting a job

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Internet Printing - Application



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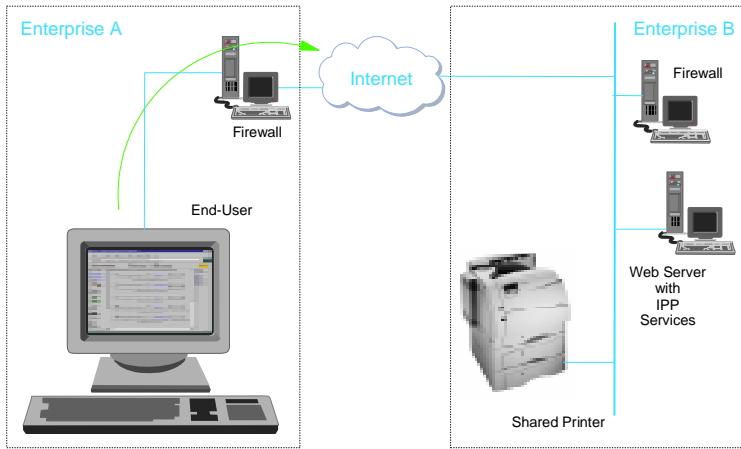
I mentioned earlier that end-users print in one of four basic ways:

- 1) Through an application
- 2) By pushing an existing file (whether locally created or retrieved from another system) from the client's system to the printer
- 3) By delivering to the printing system a reference to an existing file which is to be retrieved by the printing system and then printed.

Additionally, what are some examples of how existing tools such as browsers can be used as part of a complete internet printing system?

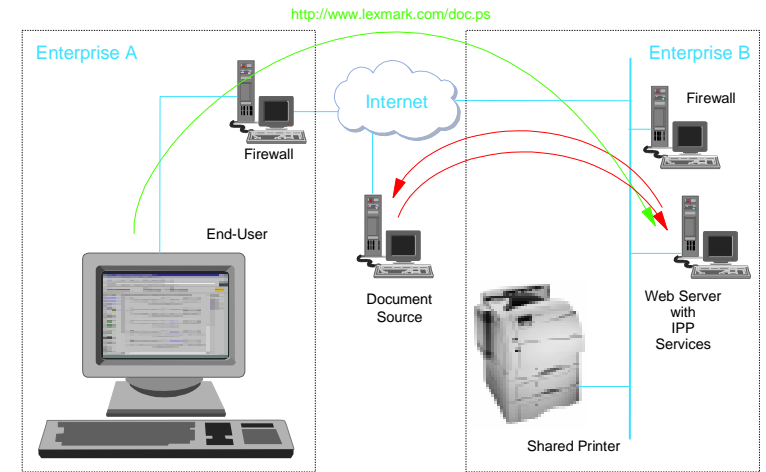
In this example, an user has created a printer object on his desktop (for the Windows environment) or some other means in another environment. The client is now able to use the standard applications and its printing process to submit the job through the Internet or an Intranet to a printer.

Internet Printing - Pushing



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Internet Printing - By Reference



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In this example, an user has created a print file on his system and then is able to use an IPP printing application (either a custom application, an operating system tool or command or perhaps a browser-based tool) to submit the job through the network to a remote printer.

In this example, an user has found a file on a remote system which he would like to print. Using an IPP printing application and a IPP server which supports "print-by-reference" he is able to point to the file and submit the job through the network to a remote printer. The remote IPP print server retrieves the file (which must be publicly available) and then prints it.

How can IPP be used?



Corporate Document Library

- On-line manuals created by the company
- Search using web search engine
- Print by reference
- or-
- Fill in a form and print on a remote printer (e.g. in purchasing)

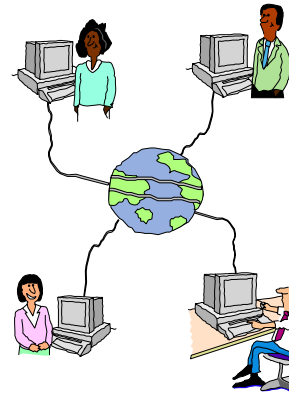
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Printing thesis at "Copy Shop"

- Create thesis or school work at home
- Proof in pieces and in B&W
- Send finished work to "Copy Shop" for final copies and binding

How can IPP be used?



Inter-Enterprise Document Exchange

- Exchange electronically hardcopy rather than editable documents among companies
- Brings "distribute then print" model to the Internet
- Distribution initiated by author
- Utilize Internet rather than point-to-point or dial-up connections
- Take advantage of higher quality and other options available for printers

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I have talked about the technical aspects of delivering a job to the printer from an application, pushing, pulling and by reference. Let's look at a couple of examples of how this turns into real-world applications of IPP.

In the first example (on the left) we can easily envision in a corporate environment we might have a documentation library. This library could contain corporate procedures, personnel manuals, insurance forms, purchase orders, etc. The corporate client could then go search for the document he or she is looking for and view it on line. The client could then submit the URI of the document to the IPP print server which would retrieve the document and print it for the client.

Using this same example, the client could fill in the form on line and submit the print job to a remote IPP printer at the destination location; for example submit a PO to the purchasing department.

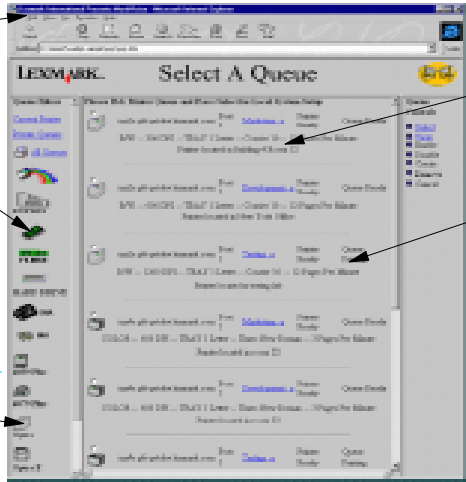
In the example on the right, a student has prepared a paper. While the paper has been proofed in pieces and perhaps on in black and white, the final version is submitted to a copy shop (something like

In this third example of how IPP can be used, we can envision sharing documents among enterprises with Internet connections.

Today it is very difficult for an author to distribute a document electronically to remote readers. Many times, the source or editable form of the document is sent via e-mail or posted on some ftp or WEB server. When the source is distribute, edits or changes can be made at the remote location causing a loss of control by the author. Additionally, in today's model, the intended readers must then be notified of the new document's availability and they must then go and retrieve it. Wouldn't it be easier if the author could distribute a document using the Internet just like FAX does today?

Using IPP, the author can print directly on the IPP enabled printers at each reader's location. The document is then available to the reader quickly, simply and with the high quality expected in today's business environment and if available on the remote printer, even finishing (stapling, punching, etc.) could be performed making the document ready for consumption almost instantly.

Printer Locating & Selecting - a WEB Browser example

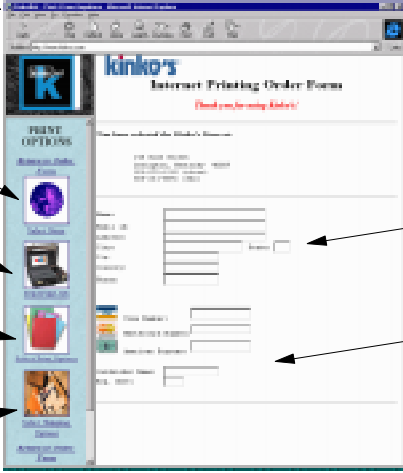


The screenshot shows a web browser window displaying a printer selection interface. The interface is titled "Select A Queue" and lists several printer models and their corresponding queues. Annotations with arrows point to various parts of the interface:

- "Off the Shelf" Web Browser (top left)
- Select Printer by Capability (left side)
- Select Printer by Model (bottom left)
- Details (top right)
- Printer & Queue Status (middle right)

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"Job Ticket" Creation - WEB Browser Front-End to IPP



The screenshot shows a web browser window displaying a job ticket creation form. The form is titled "Internet Printing Order Form" and includes various fields for customer information, billing/payment information, and shipping options. Annotations with arrows point to various parts of the form:

- "Off the Shelf" Web Browser (top left)
- Select the Store (left side)
- Submit the Print Job (left side)
- Select Print and Finishing Options (left side)
- Shipping Options (left side)
- Customer Information (right side)
- Billing/Payment Information (right side)

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Now let's examine how WEB browsers can be used to enhance Internet/Intranet Printing. While this is not strictly a part of IPP, it demonstrates how IPP is envisioned to be a part of a complete printing system.

This example is one where a WEB administrator has installed a unique application or perhaps a custom WEB page to provide access to the printers installed in an enterprise. Alternatively, the administrator could create a directory of printers that could be queried by users looking for a specific device or a device with a specific set of capabilities.

While the IPP protocol does not need to define the appearance of these WEB pages or any other application that would provide this function, it does need to provide the capability to dynamically query an IPP printer and learn about its characteristics and capabilities.

Similar to the WEB Browser example of searching and locating a printer we just talked about, this is an example of a WEB browser front-end that could be created and used to create a job ticket for a commercial printing environment for example in the thesis printing example I mentioned earlier. Again, this could be implemented as a stand-alone application but it could also be done with a browser on the client and appropriate CGI script, JAVA applets, etc. running to create this application.

The actual submission of the job would most likely occur outside of the browser but the creation of the job ticket, payments, etc. could be done through the browser.

It is not necessary for the IPP protocol to specify how this is done but to simply enable this functionality by specifying appropriate security means, etc.

Resulting IPP 1.0 Goals and Objectives

- ▶ First version will address the end-user requirements only
- ▶ Independent of
 - Client operating systems
 - Server operating systems
- ▶ Security
 - Authentication, Authorization, Privacy, Commercial Transactions are required
 - New security protocols, etc. will not be created, rather IPP will use existing ones
- ▶ Interaction with LPD
 - Use of LPD very common today but is functionally deficient and inconsistently implemented
 - Mapping between IPP and basic LPD will be provided as Informational RFC
- ▶ Firewalls
 - Protocol must pass through firewalls where enabled by the firewall administrator
- ▶ Internationalization
 - Must be enabled

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What does the Customer Gain from IPP?

- A robust, widely implemented protocol that provides the foundation for a broad set of consistent printing applications.
- Reduces costs, including both installation and training, in a heterogeneous printing environment because platform specific drivers and redirectors are not required.
- Improves end user performance and lowers costs through the use of familiar and ubiquitous end user tools such as WEB browsers.
- Protects sensitive customer print data from unauthorized leakage or tampering even across public networks.
- Increases a company's ability to interact with other companies and customers across public networks using the same tools and interfaces used for intra-enterprise printing.
- Promotes global business with a fully internationalized protocol.

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As a result of the explicit customer wants and needs and the implicit ones we understand as implementors, the following became the goals and objectives of an Internet Printing Protocol.

(talk through the bullets)

(Note: Be care on the firewall issue. We are not attempting to go around the security that many companies need but rather we want to give companies a choice of whether or not they enable internet printing from or to their companies.)

So, what does the customer gain from IPP?

(talk through the bullets...)

1. If it is robust and widely implemented then many printers and operating system will support it and it will have the basic functions needed to be able to build upon it providing directory support, searching, etc.
- 2) In many environments, user's have to have multiple redirectors installed because of the variety of networks in use there.
- 3) If the users already know how to use the tools then training costs are lowered.
- 4) Security
- 5) ... back to the inter-entrise example
- 6) Internationalization