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   Adina Levin ... August 28, 1997
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Internet Printing Protocol:
The Promise of Internet Printing

Yesterday Jim Hamilton, of the Print on Demand group of CAP Ventures, and I attended a briefing on the Internet Printing Protocol. The result of a year's worth of negotiations among industry powerhouses including Adobe, Hewlett-Packard, IBM, Microsoft, Netscape, Novell, Sun, and Xerox, the draft standard defines the method of sending a print job over the Internet.

This standard is going to be a key nexus over the next 5 years at the intersection between document software and hardcopy output, enabling and accelerating opportunities for document delivery and on-demand printing software and services.

WHAT IS THE INTERNET PRINTING PROTOCOL?

In the simplest terms, the Internet printing protocol is a protocol that enables printing over the Internet. It combines and supersedes early non-standard work on Internet printing by HP and Microsoft (Simple Web Printing), Novell (LDPA), IBM (HPPP) and probably Adobe (Web-Ready Printing).

Internet printing can work in one of three ways. 1) The user can print as usual through the operating system, but is able to access printers that are on Internet, not just on the local area network. 2) The user can send a print-formatted file (such as a PostScript or PDF file) to a printer. 3) The user can send a URL, and the printer will fetch the document and print it.

The IPP defines a list of printer capabilities, and print job submission and feedback commands. It uses a client-server architecture. The client, which can be a web browser or desktop client can submit, query, or cancel a print job, and query the status of a printer. The server can be implemented inside a network-connected printer, or at the print-server or network-server level. The server identifies the printer or printers with a unique URL, and a database of each printers capabilities (color, duplex). The server can then accept print requests from the Internet, perform simple negotiations (I cannot print that document since I am not a color printer), and provide feedback about status (I am processing a job, I have a paper jam.) The IPP uses HTTP 1.1 for the negotiation between client and server.

The standard was developed by the Printer Working Group (www.pwg.org), an alliance of printer, print networking, and infrastructure software vendors. It is not formally part of the IETF but is commissioned by the IETF to develop this standard.

WHAT IS IT GOOD FOR?

The Internet Printing Protocol adds an important level of infrastructure capability that makes some network printing tasks much easier to do. In the 8 years or so that I've been following this market, there have been numerous ill-fated schemes for managing printers on networks, starting with closed-system utopias from Digital Equipment, to LAN/WAN based solutions proposed by Novell, to international standards-based systems that tried to abstract and define every printer feature in the universe. These early solutions based on closed systems or international standards languished; one reason is that in order to develop working print management software, you needed to write low-level networking code that had little value to the printer vendor or infrastructure vendor. In reality, network print management solutions were based on a single printer vendor's products or a single network environment.

With IP as a universal network, enterprise-wide printer management becomes much easier. Printers become visible on the corporate intranet; users and administrators can see that the printers are working, measure usage, and conduct software upgrades. These capabilities will be quickly implemented by vendors of network printers, such as Hewlett-Packard, Lexmark, and Tektronix.

But if printer management were the whole story, this article would not be that interesting. Customers will appreciate enterprise-wide, network-independent, printer-independent network print management when it is available, but they will probably expect it for free.

Internet printing has some more interesting applications that will create or facilitate profitable business opportunities that builds on the IPP base.

1) Internet printing will be extremely useful for distributed on-demand production printing. It will become much easier to send printed documents to corporate branch offices in London, Tokyo, and Singapore. This kind of distributed printing has been slow to take off because of the work required to tie together the pieces of a heterogeneous network. With the Internet as a universal network, users will be able to print to the corners of far-flung organizations. Companies that make various types of print server products, such as TR Systems, NEPS, EFI, and Dazel, are likely to integrate this quickly.

Vendors and users wishing to implement distributed on-demand printing will still need to cope with complex device negotiation issues. IPP has built in a basic level of device specification - is the device color or monochrome, US letter-size or A4? IPP also

includes a basic level of negotiation - print it only the way that I want, or print the job as best you can. The real world is much more complicated, particularly in a production environment. IPP alone can't specify that yellow paper goes in paper tray 3. However, the IPP leaves the way open for vendor or user-level extensions to the standard. Successful distributed printing may also require a certain level of process co-ordination and discipline. Even if a site's IPP application states that the yellow paper goes in paper tray 3, humans must make sure that orange paper doesn't get put into paper tray 3 by mistake.

2) The second, related example in the production printing environment is remote job submission to for-profit printers. There are networks of for-profit printers that have begun to do this already, including networks of for-profit print chains: Kinkos and Sir Speedy; networks of independent printers: PagePath, WEPN, IPN; and networks of large, multi-location commercial printers: Uarco Impressions, Standard Register StanFast.

These networks provide software that allows an end user to find the printer in the desired geographical area with the desired capabilities, to fill out the requirements of the job and payment information, and to submit the print file. The Internet printing protocol will not replace the services and networks that exist. The Internet printing protocol does not include all of the features you would need in a job ticketing system - it just includes a basic method of identifying a printer and sending a print job. Moreover, networks of printers will provide a variety of value-added services and customer service capabilities that distinguish them, above and beyond basic job ticketing. The Internet printing protocol is likely to make remote job submission easier, and will popularize the process of remote printing in general.

3) The previous two examples involved "push" printing. The customer has the document in hand, and would like to print it at a location far away. Another potentially valuable application is just-in-time printing from a database of print files. This is "pull" printing, and it would work in the following manner: an organization would create a database of print files - sales collateral, or brochures, or CAP Ventures published reports. A sales person or customer would be able to locate the file, or the URL of the file, and send that to a local printer. The user would be able to order and print the documents where and when they were needed.

4) The previous three examples dealt with production printing - the printing of documents designed to be distributed to multiple people in some formal way. Internet printing will also be useful in the day-to-day business world. Ordinary users will be able to use Internet printing to print a document to some printer someplace else.

The big challenges here are discovery and security. How can I find one small printer in the great wide world? And how can I make sure random people aren't sending me junk prints, in addition to junk faxes and spam e-mails? The IPP standard does not specify any

particular security method. Instead, it allows infrastructure software developers and user organizations to use the security methods they have in place. Solving the discovery problem will require additional development at the network infrastructure level, using LDAP and other standards, to build software for resource discovery. In the mean time, people will have to give out their printer's URL deliberately, in the same way that they give out their fax number. Another problem is print drivers. IPP can generate a feedback message about the driver needed to print to a distant printer. This process sounds awkward and is likely to give MIS staff headaches.

Companies in the fax business should be afraid, since remote printing avoids telephone charges and creates a clean, original document rather than a fuzzy bitmapped fax. However, it will take some time before IPP printing capability is anywhere near as common as faxing.

5) The promise of remote printing adds hardcopy output into the matrix of electronic document delivery solutions. After all, it will enable users to deliver formatted electronic documents to a remote location. Electronic document delivery can be tied into specific horizontal or vertical applications, in extranet electronic commerce, financial publishing, health care, and so on. Providers of electronic delivery products and services, from Tumbleweed to Diffusion to Adobe, are likely to add support for remote printing to the capabilities of their products.

WHAT IT WILL TAKE TO MAKE THIS A REALITY

None of these scenarios will happen overnight. A number of steps need to happen first, starting with finalization and adoption of the IPP standard. The draft standard is expected to be finalized over the next few months and submitted to IETF by the end of the year, and approved by IETF, probably early next year.

Next, IPP capability needs to be added to infrastructure software (Microsoft, Novell, Sun, Netscape). Depending on the decisions of infrastructure software providers, IPP will be included as a free add-on, or part of a next-generation revision of network software. The infrastructure software upgrade cycle will add another six months to several years to reach a critical mass of deployment, depending on how aggressive the software vendors are and how popular the feature is among users.

IPP can also be built into a network printer itself, and it probably will be, starting as early as late `98. Many network printers, and most printers in the production environment, are software-upgradable, so upgrades can happen fairly quickly. It is important to note that it won't be necessary to upgrade the installed base of printers to take advantage of IPP. The IPP intelligence can live at the level of the print server or network print service. This is very important for the potential speed of proliferation. If you needed to replace existing printers, it would take many years to make a small

dent in the installed base of existing LaserJets.

CONCLUSION

IPP won't happen overnight, and there are many problems that the
Internet printing protocol won't solve by itself. That said, we
believe that IPP will serve as a critical enabling technology that
will make many kinds of network printing applications easier to
build, will create or facilitate opportunities for network printing
and document delivery systems, and will set the stage for more rapid
adoption of useful network printing applications.

-- Adina Levin