

Hewlett-Packard Breaks the Print Barrier of Global Operations

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Global companies need an easy-to-manage, cost-effective, and reliable way to print documents from a central location to multiple countries in multiple languages. Now they have one.

Here's a problem many companies face when they make the transition from a regionally based organization to a global enterprise — how to print internationally. Globalization can offer many benefits including economies of scale and the ability to conduct activities in locations with a hometown advantage — such as where manufacturing costs are low or product design skills are high. But those benefits can be thwarted if enterprise applications can't easily print documents at distant locations—especially those on which production workflows rely. Those documents may be invoices, work orders, personnel policies, manufacturing specs, pharmaceutical formulations — or any of the hundreds of other document types companies need to operate both globally and efficiently.

The problem is that many printers only print in the script of the language spoken where they are located. If there are some Korean characters, for example, in a document printed in China, the probability is high that the Korean characters won't print. That means that all printers a company deploys (which may be tens of thousands) need to support the language of every country from where they are likely to receive documents for printing.

Until recently, companies faced with this problem had few good options. One has been to equip all printers with all the fonts needed to translate language-specific character encodings into rendered script. That would involve buying, installing, and keeping track of an inventory of language-specific SIMMS/DIMMS modules for each printer — at considerable labor and expense. Another option has been to send fonts, along with each document, to the printer — perhaps thousands of miles away — at a high cost in network bandwidth. Finally, applications could render characters as bitmaps before sending them to printers. Again, that would incur a high cost in bandwidth, but also in CPU resources by production applications that might have to render millions of characters to bit maps.

Now global companies have a better option: Hewlett Packard International Printing for Hewlett Packard Output Server. Released in fall 2006, this software module employs a paradigm that exploits HP Output Server's role as a central hub assigning print jobs to printers, fax machines, and email services on behalf of applications.¹ That includes setting up jobs based on a printer's configuration information preset at the server, which historically has included such data as available paper sizes. Now, with this enhancement, the server sends printers as much, and only as much, character data as needed to faithfully render the document — whether that's character encodings, fonts plus character encodings,

¹ Although most of this paper is about printers, the HP solution resolves many of the same internationalization issues when printing from fax machines and email services. See page 6.

or (as a last resort) bit maps. That decision is also based on preset configuration information — this time including which fonts are resident at the printer and whether the printer understands a standard encoding table — specifically Unicode.

This centralized server-centric approach avoids the complexity of how to manage any-to-any printing at its endpoints — the applications and the printers. It also saves resources — labor, bandwidth, CPU, font licenses, and hardware. HP Output Server is closer to the printer; it is task optimized; and it offloads production application servers. Finally, it sets companies free to truly exploit enterprise-centric strategies that combine economies of scale and location-based resource advantages.

International Printing Enterprise Style

To understand why international printing is so important to global operations, it helps to consider why printing in general is so important, whether companies operate globally or not. Even if a document is never actually printed on paper, the mere fact that it *can* be printed is significant. Printable documents let people identify and act on information in a way that just displaying information on a screen does not. As standardized forms, documents are particularly well suited for making information actionable. When people look at a form, they know where to find information; they know what information is missing; and they have a basis on which to take action within a workflow. Printable documents often have greater legal standing — printed or not. And in many environments, such as a factory, printed documents are the only practical way to distribute or handle information — as opposed to, say, having it displayed on a monitor.

What's different about global companies is the large scale of printing requirements. Another difference is the need to enable enterprise applications. These are applications that allow a global company to operate as a single entity rather than as a collection of entities. Enterprise applications, such as SAP and Oracle, generate hundreds of different kinds of forms — everything from bills of materials to customer bills. An Arabic speaker in Dubai might need to bill a Cantonese-speaking customer in Shanghai. Or a product designer in California might send purchase orders to factories in India and Vietnam.

Such scenarios are hard to enable on an enterprise scale without internationalization. The thousands of documents enterprise apps generate daily are based on hundreds of templates that management has carefully structured in both appearance and content. Ideally, managers would like to create only one template for each document type — no matter in how many languages or to how many destinations a document is printed. And — for each document — they would always like to invoke the same code page or table to translate the document's byte encodings into characters. In other words, they would like to *not* take any major cost or performance hits just because they print internationally.

But they will take those hits if printers can only render characters encoded according to local language code pages (if the printers understand code pages at all). Rather than just one template, companies may have to create a different template for each code page for each document type. Witness the experience of one HP customer — a large manufacturing

company with locations worldwide, including North America, Europe, the Middle East, and Asia-Pacific. Until recently, this firm employed nine different code pages to print its 900 different document types. That required 8,100 separate templates at an average investment of 20 labor hours per template — or about 18 man-years!

Besides labor, the company also incurred costs to install language-specific DIMM/SIMM font modules so that local printers could render the encoded characters — at \$149-\$349 per module per printer. Where the appropriate fonts were not installed, applications would send the entire Unicode 4.0 character set (all font files for 64,000 Unicode 4.0 supported characters) along with each document — resulting in megabytes of extra bandwidth overhead. And for printers that lacked the functionality to employ font files, the alternative was even worse — sending a bitmap of each character.

Rather than suffer these pains, companies may cut back on international printing— which means they also undercut their ability to operate as global companies. Applications may then have to be replicated in multiple locations, hard copies faxed or couriered, and resulting workflows partitioned instead of seamless.

Three Key Success Factors

This particular global company, however, chose not to cut back. By adding the HP International Printing for HP Output Server module to its HP Output Management Solution it was able to reduce development time of its SAP form templates by 90%, or 18,000 man-days. One SAP template can now be used to print into all regions and to print multiple languages in a single document. In addition, a single document can contain text in multiple character sets — so that printer in Korea, for example, can print Korean and Chinese characters in the same data stream.

Rather than render documents from bit maps, in this example all documents are rendered from a Unicode compliant font (Monotype Andalé) — without the need to deploy additional DIMM/SIMMs. Any font modules already deployed to remote printers, however, can still be utilized, thus saving bandwidth. Where a particular character is not available locally, only that specific character is downloaded to the printer, not the entire font — saving both bandwidth and printer resources. HP Output Server supports all printers from leading makers. So the customer is not restricted to only HP printers to achieve these benefits. HP Output Server itself runs on both HP and non-HP systems, including HP-UX, IBM AIX, Microsoft Windows, Red Hat Linux, and SUN Solaris.

What makes these benefits possible are three key factors:

A Universal Character Encoding Table

In April 2006, SAP announced that new versions of its products would *only* support the Unicode standard starting in 2007 — further evidence that Unicode is now the world's text encoding standard. Unicode support includes most leading computer industry vendors, including Apple, HP, IBM, Microsoft, Oracle, SAP, Sun, Sybase, and Unisys. It includes most operating systems, web browsers, and databases as well as most enterprise

applications such as enterprise resource planning (ERP), customer relationship management (CRM), and sales force automation (SFA). And it is a requirement of most other modern computing standards such as CORBA, Java, JavaScript, LDAP, XML and WML.

With origins that date back to the late 1980s, Unicode's success reflects the simple but compelling idea that every character in every script be represented by a unique number — no matter what the platform, no matter what the program, and no matter what the language. Multiple languages may use the same script (most European languages use Latin script); however, Unicode assigns one and only one number to each character for virtually all of the world's scripts. In addition to letters, Unicode also assigns unique numbers for each script's punctuation marks, diacritics (accent marks), mathematical symbols, arrows, technical symbols, dingbats, and other symbols.

In addition to characters, Unicode also specifies algorithms that standardize properties for character layout. Those properties include:

- Whether characters read left-to-right or right-to-left
- Where lines can break between adjoining characters
- Character shaping in the case of complex scripts
- Normalization — so text is consistently rendered in the most accepted form
- Positioning rules such as for non-spacing characters and combined characters

A universal code set means that companies can avoid the problems they would encounter when using different language-specific code sets to print in different locations. No two characters can use the same code. And no two codes can represent the same character. That means Unicode offers important advantages to the global enterprise. As stated on the homepage of the Unicode Consortium's website (www.unicode.org):

Unicode enables a single software product or a single website to be targeted across multiple platforms, languages and countries without re-engineering. It allows data to be transported through many different systems without corruption.

Server-Centric Printer Management

A universal standard for character encoding doesn't necessarily help, however, if most printers in the field don't support Unicode even when most enterprise applications do. Replacing all these non-Unicode printers is not a practical option for most companies. What is also not practical is buying, installing, and managing an inventory of Unicode-compliant DIMM/SIMM font modules across a widely dispersed inventory of printers. Unicode specifies a character encoding table and a set of algorithms for layout — it does not specify glyphs — i.e., the design of character rendering. That's the role of the font — which the printer maps to a particular Unicode value at print time — provided the printer has the Unicode-compliant font.

Decoding Unicode characters, however, does not have to be done at the printer. Nor do fonts have to be pre-positioned in the printer for them to be used by the printer. An upstream process could interpret Unicode and/or supply fonts. If the printer knew Unicode,

it could print the downloaded character. If it did not know Unicode, then that process could send the printer a bit map.

But asking enterprise applications to perform this upstream work can cause problems:

- If applications are far away from printers then sending fonts and bitmaps in high volumes can severely impact network performance
- Production applications are typically not optimized to serve printers, plus they wouldn't be doing their production jobs while they were serving printers
- Applications don't have knowledge of printer configurations, so they're not in a position to make decisions such as whether to supply a font or create a bitmap to enable a specific print job
- Even if they had specific knowledge of thousands of printer configurations, applications don't typically have the built-in rules processing capability needed to make these decisions

Fortunately, a centralized printer management solution exists that is already well positioned in many companies to address these issues — the HP Output Server. It is geographically closer to the printers than are the applications it serves (conserving network resources); it has the rules processing capability needed to set up print jobs based on a printer's configuration; and it offloads printing from applications. All that's been missing (until recently) is a third factor.

Printing Transformations

HP International Printing for HP Output Server builds both on Unicode's widespread acceptance and on the server's position as a central print manager. Specifically, it compares each print request it receives from applications against the configuration information it has on file for the requested printer. It then determines what, if any, additional resources a printer needs to fulfill the request based on two factors:

- Is the printer Unicode enabled?
- Does the printer have all the needed fonts (or at least the characters from those fonts)?

If the printer is ...	The server sends ...
Not Unicode enabled	Bitmaps
Unicode enabled but lacks needed fonts (or characters from a needed font)	Unicode encodings plus whatever characters the printer needs from the font
Unicode enabled and has the needed font information	Unicode encodings

Table 1: Decision Rules for Sending Fonts, Characters, or Bit Maps to Printers

It then sends the required resources, as described in Table 1. In addition to printers, HP Output Server also serves to fax and email. And in addition to character encoding, HP Output Server also deals with *document* encoding. Specifically, it makes sure documents are appropriately encoded for output on the devices selected, as described in Table 2.

Incoming Formats	Output Formats		
	Printer	Fax	Email
UTF-8* PostScript UTF-8 PCL UTF-8 text *UTF-8 = 8-bit Unicode	Non-UTF-8 PostScript Non-UTF-8 PCL Non-UTF-8 text UTF-8 PostScript UTF-8 PCL UTF-8 text	G3 TIFF	UTF-8 PDF UTF-8 text

Table 2: Document Formats Incoming from Applications Versus Output

This means that any printer can now print any PostScript, PCL, or text document produced by any Unicode-compliant application in any language, whether the printer is Unicode enabled and (if it is) whether it has the needed characters. Any fax will also print these documents (via G3 TIFF). And so will any email service. The key differences for email are that a Unicode-enabled email service is assumed and that PostScript and PCL documents are converted to PDF prior to sending to the email service.

Why We Like the HP Solution

As a company specializing in internationalization, Basis Technology is often asked to help companies resolve a conflict inherent in global operations — how to perform like a single organization everywhere (to gain scale-based economies), yet communicate like a native in each region (to gain location-based resources). HP International Printing for HP Output Server is a significant step forward to resolving that conflict through automation. It frees companies from having to make a choice between giving up on international printing (and the borderless workflows that go with it) or printing across borders the hard way. Often the hard way means writing language-specific templates for each document type and buying, installing, and managing inventories of font-specific DIMM/SIMM modules across an international inventory of printers.

Such issues cause concern by themselves. But the real danger can be to isolate ERP from the very purchase orders, inventory reports, invoices, bills of material, and other business tools it is supposed to manage.

What gives the HP special traction is how it leverages robust technologies already widely deployed — like Unicode as a universal encoding standard and HP Output Server as a solution for managing diverse printer populations on behalf of enterprise apps. HP also has licenses with developers of the key transformation and font technologies. It has the

integrations with key enterprise vendors like SAP, Oracle and others. And it has world-class — and worldwide — training, service, and support. We believe the total combination is what's required — and unique.

Bottom line: HP essentially reduces international printing to an incremental management issue. Customers save money in terms of templates and font modules they no longer need. But they also save money and time versus competitive solutions that have weaker Unicode support, require forklift investments, or make companies focus on internationalization outside their normal output management process.

As the experience of HP customers demonstrates, these savings — especially when combined with the more productive enterprise-wide workflows that result — makes HP's international output solution worth strong consideration by global companies.

About HP

HP focuses on simplifying technology experiences for all of its customers - from individual consumers to the largest businesses. With a portfolio that spans printing, personal computing, software, services and IT infrastructure, HP is among the world's largest IT companies, with revenue totaling \$91.7 billion for the four fiscal quarters ended Oct. 31, 2006. More information about HP (NYSE: HPQ) is available at <http://www.hp.com>.

About Basis Technology Corp.

Basis Technology is the leading provider of products and services for software globalization and multilingual information processing. The company provides high-performance, highly reliable software components through its Rosette Linguistics Platform, a suite of interoperable products designed for applications that analyze and process all the world's languages. The company also provides rapid deployment engineering services covering all aspects of globalization, including source code audits, project management, software re-engineering, and global quality assurance.

Company headquarters are located in Cambridge, Massachusetts, with branch offices in San Francisco, California; Washington, D.C.; and Tokyo, Japan. For more information, visit www.basistech.com or call 800-697-2062.

For more information please contact the HP Output Management solution team at outputmanagement@hp.com or visit their website at <http://www.hp.com/go/outputmanagement>