

Harlequin's Comeback: The "Have It Your Way" Approach

BY DAVID ZWANG

In the early days of desktop publishing, half a dozen developers marketed "clone" RIPs. Many fell by the wayside for lack of technical or financial acumen. Only Harlequin managed to maintain a strong position through all the changes to PostScript and, more recently, PDF.

Harlequin has always been an interesting company. As the "other" major player in RIP development, it always had to work hard to keep up with Adobe's evolving PostScript products. However, it always managed to step up to the challenge and, in many cases, even beat Adobe OEMs to market with new features or functionality stemming from the latest version of the PostScript language. The company's focus on RIP technology, without the distraction of many other products,¹ allowed it to be very responsive to technological changes and a changing market.

It wasn't only Harlequin's ability to react quickly that allowed it to give Adobe a run for the money. Taking a different approach from Adobe, Harlequin's offering was fairly complete, requiring significantly less OEM development to get it ready for product integration. In addition, as the scope of the RIP started to move from the basics (interpreting and rasterizing) to other workflow functions, the company added them to its offering, giving OEMs the option of licensing and accessing them as needed. By using a software lock, Harlequin created a single package that could be a simple RIP or an output workflow system that provided additional tools, such as trapping, screening and color management. OEMs or users could add features on a "pay as you grow" basis. This modular approach also gave many small output-device manufacturers an edge in competing with large companies that used Adobe components.

Unlike the early days of the clone RIPs, later Harlequin RIP technology was very reliable in production environments. Things seemed to be going well for Harlequin in the mid-1990s. At Print '97 in Chicago, it surprised the marketplace with an extensive map of exhibitors that were its OEM licensees—they seemed to be everywhere on the show floor.

Troubled waters. After the Chicago show, the company encountered some difficult times. Analysts observed that the original focus, to offer a solid competitive RIP solution, became less clear. Harlequin had also made some promises to its OEMs that it couldn't

keep, creating a crisis of confidence. Matters deteriorated, and the company filed for bankruptcy in June, 1999. Because a large number of OEM licensees had built their front-end solutions on Harlequin technology, many rumors circulated about which output-equipment vendor would ultimately take over the company.

Global Graphics

When the acquisition of Harlequin was announced, the industry's first reaction was "Global who?" Background on the company and its president and COO, Jim Freidah, will help readers understand the move.

Global Graphics' roots go back to 1978 with Photomeca, a French manufacturer of lighting equipment, cameras and exposure frames. It started to focus on flexo plate-processing equipment in 1980, and then moved into the development of litho equipment. Its business has been built on an OEM model, manufacturing product for such mainstream companies as DuPont, Agfa, Asahi, BASF, Fuji, Kodak Polychrome Graphics and Polyfibrion Technologies.

In 1996, investors of the Belgian Andlinger Group acquired the company. In 1997, they acquired Kelleigh in the U.S., Colomag in France and AZ in Italy, combining them into Global Graphics S.A. From that point on, they were in the business of developing a strong market presence through acquisition and further development. In 1998, they acquired Heights Design Production Limited, ICG Ltd, Technograph Ltd., and Harlequin Inc. (both in the U.K. and U.S.). As a result of this whirlwind of acquisitions, Global Graphics is now one of the graphic arts industry's largest OEM suppliers, with products that include flexo and litho film and plate processors, CTP platesetters, scanners (for CreoScitex and others), and now RIPs.

In 1999, Global Graphics' CEO Johan Volkaerts retained MIT graduate and industry veteran Jim Freidah as president and COO to help fulfill his strategy. Freidah will take on the leadership role of the new RIP development organization. While each of the RIP development groups are currently working on their own projects, at some point we may see some coordination and consolidation of their offerings, although the individual product branding might remain. **TSR**

¹ Actually, the company had two other divisions that offered some distraction, but perhaps also added strength. One group developed AI-based criminal-justice software. The other division, which was responsible for developing Dylan and Lisp (two programming languages), was spun off after the acquisition by Global.

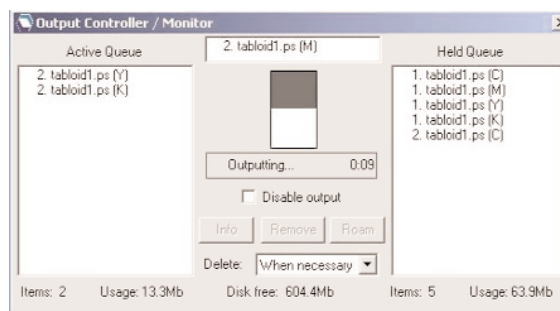
Surprisingly, less than two weeks after the bankruptcy filing, Global Graphics, a French company with holdings throughout the U.K. (and now in the U.S.), announced it would buy the company. The announcement was met with guarded skepticism. (See the sidebar, “Global Graphics,” on page 24.) However, at Seybold San Francisco 2000, not long after the initial announcement, Global Graphics took another step, announcing the acquisition of 5D and the Jaws family of products. Almost immediately thereafter, it acquired the MaxWorkflow product and development team, a division of Harris Publishing and a recent Harlequin partner. Initial skepticism has changed to interest, and even excitement, as the company comeback appears to promise some serious competition for Adobe, bringing some new workflow options to the marketplace.

RipFlow and ScriptWorks

With a fresh supply of capital to support new development, Harlequin hasn't spent much time gloating. It has been developing a new RIP strategy, with a foundation in the “have it your way” principles that originally made it successful. The current product offering, however, is much broader. This development process actually started prior to the acquisition; the ScriptWorks RipFlow product strategy was initially introduced at Drupa 2000. The RipFlow product line is broken into three base-level components: Editions, Extras and Enablers. Unlike the original ScriptWorks product, which offered all users the entire package, the new line was developed in multiple pieces to better suit the needs of a diverse market.

There are now four ScriptWorks Editions: ScriptWorks Classic, ScriptWorks Loadable Edition, ScriptWorks Enterprise Edition and ScriptProof. Each is targeted at a specific type of use and market segment. The goal is to offer an OEM licensee a RIP solution that will provide between 10% and 95% of the desired functionality, depending on individual needs. (When reading the following descriptions of Harlequin's offerings, end users need to understand that these packages are licensed to OEMs, who may supplement or omit much of the functionality listed. Prospective buyers should make sure that the specific features they need are supported by their chosen OEM.)

ScriptWorks Classic Edition. This is the same type of package that Harlequin has been offering since 1989. As with all of Harlequin's RIPs, it is fully PostScript 3-compatible. It comes with a comprehensive graphical user interface to enable OEMs to integrate their products with a minimal amount of additional development. The included workflow is based on pipeline processing, which will process multiple jobs simultaneously. It supports symmetric multiprocessing² and dynamic memory management to take best advantage of the available computing hardware.



Classic Edition provides standard input via TCP/IP, AppleTalk, Spool Folders, NT Print Manager and serial input plug-ins, in addition to other optional plug-ins. ScriptWorks supports most input formats including PostScript, PDF, JPEG, DCS2, EPS and TIFF 6. It has a preview feature that allows you to check the file in an approximated-colorimetric screen display prior to final output. Of course, it includes support for all PostScript fonts (including Types 0–4, 32 and 42), as well as TrueType and the composite font formats needed to handle Asian character sets. As was the case with the earlier versions of ScriptWorks, it also includes recombining of pre-separated CMYK and spot-color files, direct PDF printing and in-RIP OPI support.

Classic RIPs can output in several raster formats, including 8-bit grayscale, 8- and 10-bit run-length-encoded (RLE), and color contone CMYK and RGB formats in both single-page and reorderable-multipage mode, using the included FlatOut feature. They can also output screened and color-managed TIFF files to disk. Systems can also include Media Management to track and automatically choose the most appropriate cassette for output.

There are several “value-added” benefits for OEMs of ScriptWorks Classic Edition. One example is display-list access, which enables the licensees to manipulate the interpreted objects. Another is the Throughput Controller, which will compress and store rasterized jobs to disk before directing them to the output device. This uses a “late-binding” approach, which allows device-dependent decisions such as trapping and color management to be handled when the device is chosen, just prior to output. It also includes multiple-platform support for Apple Power Macintosh, Intel Pentium PCs (running Windows 98, 2000 or NT), as well as several Unix platforms including Sun Solaris and SGI IRIX.

ScriptWorks Enterprise Edition. This GUI-less RIP is designed for OEM developers that are looking for a conventional RIP to integrate as part of a broader process, without the overhead or complexity of the ScriptWorks GUI. It includes the RIP core, some built-in services and the ability to integrate the optional RipFlow Extras and Enabler technology. Developers can administer any RIP configuration changes through an extensive PostScript API.³

² Symmetric multiprocessing (SMP) allows computing tasks to be distributed over multiple CPUs. However, it is available only on certain platforms, such as Unix.

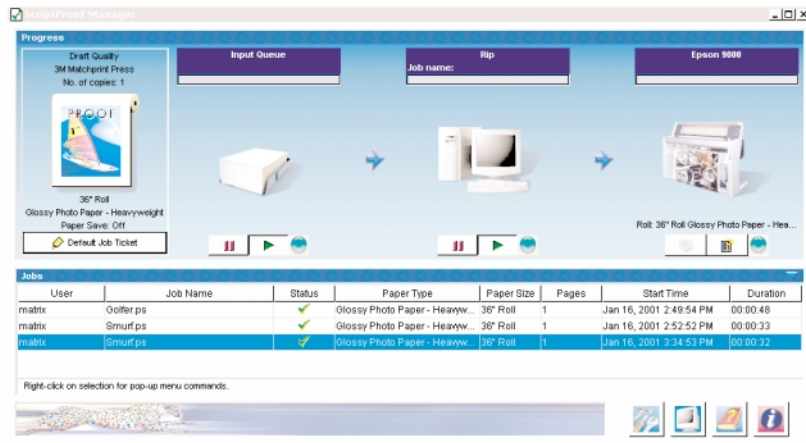
³ Later this summer, Harlequin expects to offer a more extensive API than the current PostScript one.

ScriptWorks Throughput Controller. This is perhaps the most recognizable and widely used component of a Harlequin system. PostScript separations may be held and previewed (using the “room” feature) prior to output.

The Enterprise Edition is based on the same RIP core as Classic and supports the same input formats, including PostScript 3 and native PDF. It is supported on the same hardware platforms as Classic.

Recently Mail.com, the fax-mailing ASP (and the developer of the FaxMailer and Production Fax services), has licensed this technology to provide its customers an automatic way to fax thousands of computer-generated invoices, orders, statements and other business-critical documents on demand. Another type of use would be Rampage, which uses the Enterprise Edition in its RIP output solution.

ScriptProof Edition. Based on the Enterprise Edition, the ScriptProof Edition sports a new easy-to-use Java-based GUI. A subset of Classic, it was developed with a focus on color proofing. The concept is to provide a single RIP driving a single proofing device, with job submission and output control from multiple users on the same network. The Java GUI includes a full HTML help system that is accessible from a standard browser. The Java client on the operator's workstation (Mac or PC) provides output controls and detailed feedback to each user about the printer state, including what media is loaded, and printer calibration. Installation, configuration and administration of the RIP are done at the RIP workstation.



ScriptProof RIP. The client user interface may be run on multiple workstations. The status display and detailed jobs queue give individual operators full control over their jobs.

ScriptProof uses hot folders for file input and a job ticket to specify the settings and to communicate these settings to the RIP workstation, which acts as a front-end processor for the connected output device. Each printer requires a ProofReady plug-in. Plug-ins are currently available for a selection of Epson and HP printers. Other plug-ins will be developed as needed, or could be developed by OEMs using the output plug-in specification. HIPP-based color management is included with all ProofReady Plug-ins. The OEM predefines settings for proof quality as a combination of resolution and screening. Harlequin Dispersed Screening (HDS) is included with the RIP, and Error Diffusion Screening (EDS) is supported if included in the ProofReady plug-ins.

ScriptWorks Loadable Edition. This kernel RIP is designed for use by OEMs that want to embed a RIP in their own application or develop a product around a PostScript interpreter. It uses the same core RIP as Classic and Enterprise, but provides an extensible low-level API. OEMs can use this API to instruct the kernel to receive PostScript or PDF data and output raster data. The rasterized bitmaps are then delivered back to the API's service layer one band at a time. OEMs can extend the service layer by writing translators for additional data formats or can send the data directly to an output device. Unlike Classic and Enterprise, the Loadable Edition does not support any of the RipFlow plug-ins; rather, developers are able to write their own code for any additional functionality they require.

Some of the possible solutions for this product include embedded RIPs in software applications, advanced proprietary printer systems, or a simple rasterizer to view PostScript or PDF as pixels from within an application. One of the licensees of this technology is Scitex Digital, which uses it as the core of its high-speed digital-press front end.

ScriptWorks Extras

While the RIP Editions include most of the core technology, including process control, basic input and output functionality, and the necessary APIs, there are many functions and features that are not included. That's where RipFlow Extras come in. These include some of the more robust input and output functions, such as trapping and color management. However, because these can vary from one vendor's requirements to another, Harlequin has chosen to classify these outside the basic RIP license.

Screening library. Because each OEM has different screening needs—some prefer their own proprietary screening, while others need none at all—Harlequin has always treated screening as an option. It now offers three types of screening: HPS (Harlequin Precision Screening), a standard AM screening algorithm; HDS (Harlequin Dispersed Screening), an FM or stochastic screening routine; and EDS (Error Diffusion Screening), which supports desktop and large-format color printers via the ProofReady plug-in. It also offers special screen sets developed specifically to support new n-color applications such as HiFi and photo inks. However, OEMs may also incorporate their own screening, using the available SDK Enabler.

Color production solutions. Harlequin has been supporting color management since 1995, when it introduced HFCS (Harlequin Full Color System). In 1997, it added ICC color management support with HIPP (Harlequin ICC Profile Processor), which now includes support for device-link profiles, which are an important way to handle CMYK-to-CMYK color transforms without destroying the black-plate infor-

P1 and PDF. New formats can be added either by contracting with Harlequin or by developing custom code using the OEM Plug-in Kit.

As MaxWorkFlow has been around for a while, Harlequin now has an extensive group of task modules. There is a lot of redundancy among the available task modules; many include functions that are also available in the ScriptWorks or RipFlow arsenal. For example, there are currently four imposition modules—Enhanced Imposition, Newspaper Imposition, Page Pairing and Preps—that offer both pre- and post-RIP imposition. While it might seem prudent to pare down the list, the company has found that many of its existing customers are happy with the solutions they currently use, so it has elected to continue to support them all.

Plug-ins. Except for the Loadable Edition, Harlequin has developed each of its Editions to support ScriptWorks Plug-ins. These can be developed by Harlequin or by the individual OEMs using the ScriptWorks Plug-in Kit. Plug-ins can be developed to support alternative input or output formats, as well as individual printer drivers. There is also a plug-in to support CIP3 ink-key setting. It accepts data in a PPF v2 file, which can be read by any CIP3-compliant reader (usually supplied by the press manufacturer). Harlequin is an active member of the CIP4 committee and will likely support JDF once the standard is finalized.

ScriptWorks Enablers. Enablers are supplemental tools for developers. They include the OEM Plug-in Development Kit (used to create output-device interfaces), a localization kit for language translation of the GUI, a migration utility for software upgrades, and FlatOut, an OEM tool for developing customized imposition applications.

One interesting Enabler is SetGold, a tool that automates the color calibration of devices. SetGold adjusts the CMYK color scales to reduce over-inking and to set the gray-balance of CMY color combinations throughout the tonal scale. The end product of the SetGold procedure is a fully functional Golden State profile that contains default calibration data as well as Status-T aim values.

5D Jaws products

With the acquisition of 5D late last year, Global Graphics picked up 10 talented developers (bringing the combined development group to 45) as well as an extensive and popular line of products.

(It is not often discussed nowadays, but the Jaws name was originally a reference to 5D's status as a clone-RIP developer. In the mid-1980s, JAWS stood for "just another workstation," a phrase analysts used to dismiss a boring Unix-clone product announcement. The 5D programmers adopted the name as a form of self-deprecating humor.)

Jaws PDF Creator. Adobe initially introduced Acrobat as a suite of products, including Acrobat (the extensible PDF viewer application), Distiller (the PDF creator), and Acrobat Catalog (a PDF-cataloging utility). Although it was a very comprehensive product, some users found they needed only certain parts of the package. Subsequently, Adobe introduced repackaged combinations that aligned features with targeted usage. However, as PDF became more widely accepted, a need arose for a good, inexpensive tool to create PDF files; 5D, with its Jaws PDF Creator application, attempted to fill the gap. The sole purpose of this product was to offer simple, efficient and cost-effective PDF creation.

Jaws PDF Creator, now in version 2, produces PDF 1.3-compliant files, as published in the Adobe specification. It operates in two modes: as an installed printer in the Windows or Macintosh printing system, or as an icon on the desktop allowing drag-and-drop conversion of PS and EPS files. Much like the Adobe Distiller, it comes with three predefined configurations: high-resolution production printing, printing to desktop devices, and publishing on the Web. In addition, users can also define and save custom configurations that fit their own process needs.

Single copies of the software can be purchased, of course, but there is also a Jaws corporate-licensing program. Among the companies taking advantage of this new program are Ctrlp.com, Europe's first fully integrated Internet print service, which has licensed more than 75,000 seats to date, and Union Bank of Switzerland, which has acquired 30,000 licenses.

Jaws PostScript interpreter. This configurable PostScript 3-and PDF 1.3-compatible interpreter has been the crown jewel of 5D for years. Since the interpreter is hidden below the surface of an output solution, observers often have difficulty judging its acceptance in the market, but we have found that, moving very quietly, 5D has been making significant inroads over the last few years.

The reason it has been gaining acceptance is that it was developed to offer the OEMs a relatively simple and inexpensive way to integrate a RIP into their individual products. It provides a very flexible API. OEMs get full access to the graphics pipeline via the unique Jaws "device class interface," which allows them to implement such features as custom screening, image enhancement and color management. 5D has also started to offer its OEMs a more tailored solution that could include a GUI, workflow automation and other value-added technologies, thus reducing even further the development burden.

5D has wider platform support than Adobe or Harlequin, supporting Intel, PowerPC, Sparc and SGI, along with multiple operating systems for each hardware vendor. It fully supports Adobe PostScript 3, including all of the Display PostScript operators. It

also interprets PDF 1.3 files directly (as opposed to converting the PDF to PostScript for interpretation). PCL-5c, -5e and -XL languages have recently been added as an option. Standard font support includes Types 0–4, multiple master fonts, TrueType and CID. Optional support includes Morisawa OEM-encrypted Kanji, Agfa MicroType II and, in the future, OpenType.

Color page descriptions can be rendered either in full composite color or as color separations. (Separations can be produced either serially or in parallel.) The RIP also includes native support for DeviceN color. There is kernel support for parsing OPI 1.3 and 2.0 comments, as well as for replacing the low-resolution images with high-resolution images. In addition, baseline TIFF files are supported directly, without the need for a PostScript wrapper. Standard color-management support is through PostScript CRD's, but 5D also has optional support for the Agfa color-management module.

The interpreter supports 1, 4, 8, 16, 24 or 32 bits-per-pixel output. The 32-bit color can be either CMYK or RGB. Antialiased 24- or 32-bit color is also available via a standard device driver. There are optional modules that can support vector output for both composite and separated PostScript (level 1–3), EPS and PDF. The standard screening is a proprietary version of Accurate Screening, an FM-screening method, but 5D also offers the option of Agfa's Balanced Screening, CristalRaster or Error Diffusion algorithms.

Jaws Digital Courier. This new client-server product was developed to support centralized production of encrypted PDF files. Digital Courier is aimed at publishers that need to minimize the cost of PDF creation and control the use of the resultant PDF files. It comprises two components: a Client Builder application and a decryption-and-licensing server.

The Client Builder allows customers to define the essential parameters of the software that they will distribute to their clients. These parameters include various PDF output options, the print driver name and the look of the splash screen, which allows them to brand their products. Once configured, the client software is compiled and then can be sent out on disk or distributed on the Web. When a client is installed, it exchanges handshake messages with the server to ensure that all the encrypted files that are created by the client can be read and decrypted by the server. The handshake also lets the server debit one user license from the system.

The server can be configured to work with hot folders on a LAN but, nowadays, the preferred approach is to integrate it into a Web-based delivery system. The server is shipped with a sample Web site, which can be customized to reflect the requirements of the customer's job-submission and file-handling procedures. When an encrypted PDF file is uploaded to the

server, the file is decrypted automatically and preflight information is extracted; the client is warned if there is a problem with the file. The job-ticket information, which includes the job-processing options as well as a reference to the file, is stored in an SQL-compatible database.

Platform support for the client will include both Windows and Macintosh. The first release of the server will run only on Windows NT4 and Windows 2000, but 5D intends to make it available on Sun and Linux-Intel in upcoming releases. We were told an OS X version will be beta-tested this summer.

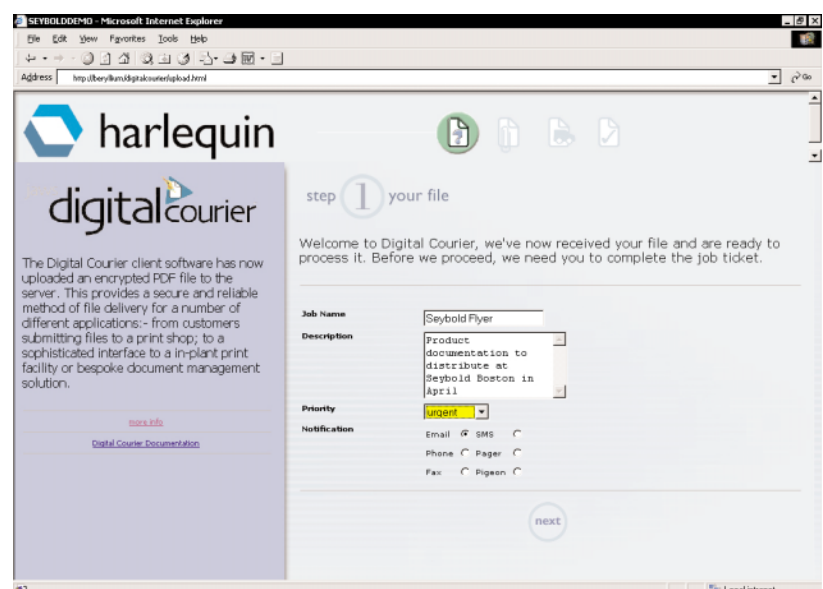
Jaws PDF library. This is fully configurable software library designed to provide PostScript-to-PDF and PDF-to-PostScript translations within a licensee's broader production solution. It is supplied as a Win32 DLL. The resource definitions and PostScript code, along with the basic 35 fonts, are built into the DLL as a ROM file system. Other fonts can be added using the font functions or stored as references on the hard disk.

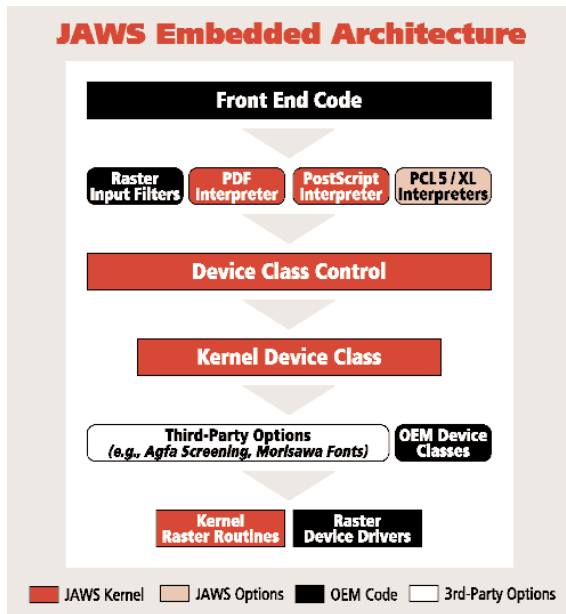
Jaws-embedded RIP

This is a new area for Harlequin and 5D. Prior to the acquisitions, both companies were independently working on embedded-RIP technologies, which became an obvious duplication of effort after they were under the same roof. Reviewing both companies' progress, Global Graphics decided to take the Jaws product to market. It is targeted at mid-range and high-end multi-function peripherals: copiers, departmental printers, large-format printers, digital printing systems and servers.

Motorola was chosen as 5D's production partner because it is the world's leading supplier of embedded computing platforms for OEMs. The Jaws-embedded RIP will initially be provided on Motorola's PowerPC processor boards running VxWorks. The

Digital Courier. The client software allows users to upload encrypted PDF files and related job-ticket information via a Web interface.



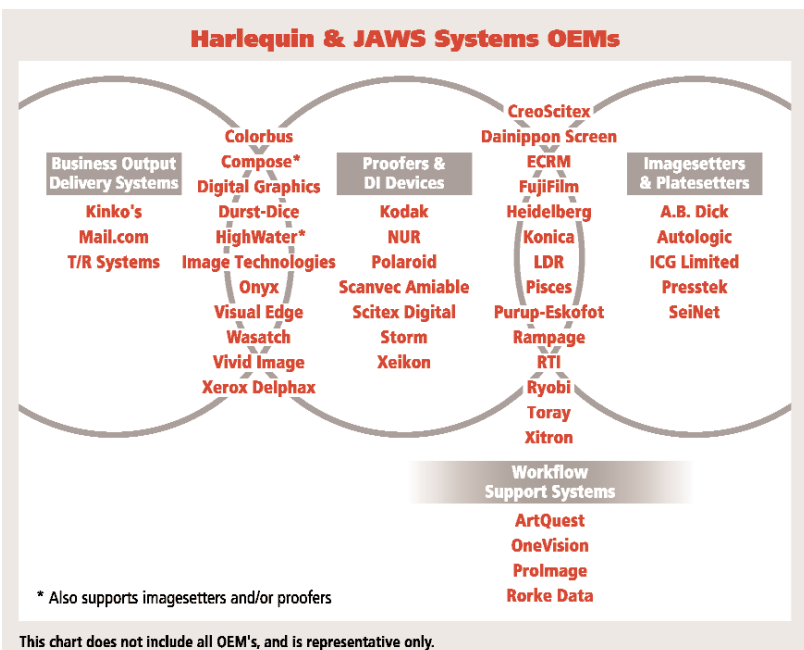


Jaws architecture. This diagram shows the software components of the Jaws embedded RIP.

first version, running on Motorola's MTX, a PowerPC-based ATX-form-factor motherboard, is currently in beta testing. It does not rely on access to a hard disk—all software resources can be loaded into the on-board ROM—but it can make use of a RAM-based file system. Release is expected this summer. As we went to press, there were plans to show a prototype driving an HP printer at Seybold Seminars Boston.

The embedded RIP is based on the Jaws PostScript 3-compatible interpreter. Thus, all of the key features of the software interpreter are available in the embedded version as well. These include all of the input formats, fonts, screening and color management. Jaws device drivers provide the interface between the rasterizer and the output device, which might be a printer controller, interface card or disk

OEMs. A sampling of OEMs for Harlequin and Jaws systems.



file. The source code for the various rendering architectures is provided so that OEMs can modify it for a particular device.

Conclusion

The list of OEMs for the combined product line of Harlequin and 5D reads like a *Who's Who* for the graphic arts industry. In addition to the companies mentioned earlier, it includes Agfa, Barco, Colorbus, Heidelberg, Kinko's, Polaroid, Shira, Xerox and Xitron, to mention only a small sampling.

Later this year, Global Graphics and Motorola expect to release additional products. These will continue the strategy of including Harlequin software technology, both inside and outside of the Motorola board, and will provide workstation solutions that work hand-in-hand with embedded technology. In addition to their historic print-publishing base, Harlequin and 5D are pursuing new product development in the broader market of networked enterprise publishing where, so far, they seem to be on the right track.

Now that some time has passed since the acquisitions, we are starting to see signs that Global Graphics has a new and comprehensive product strategy, one that combines the strengths from each of the individual companies. One of the first indications is a new product-naming structure. In addition to all of the Harlequin RIP Editions, the Jaws Interpreter and the Embedded RIP will all become RipFlow Editions. The combined Extra and Enabler offerings will also be covered under the RipFlow family of products. The job of taking a huge mass of products and developing a single strategy is not easy, and it is one that many companies have failed to accomplish. The true test, of course, will not be in the new names, but in the way Global Graphics' managers combine the separate strengths it acquired to form a company that is more than the sum of its parts.

Not long ago, many in the industry had written off Harlequin as another casualty of the ever-changing world of digital prepress technology. It now seems the rumors of its death may have been exaggerated. If the company continues on its present path, Harlequin could easily become the leading supplier of RIP technology in the publishing industry. **TSR**

About the Author

David Zwang (david@zwang.com) began his career as a commercial photographer and eventually founded ProColor, a color printing and separation company. He began consulting in computer technology, focusing on the creative industries and, in 1988, cofounded Colortec Graphic Production, a state-of-the-art color separation facility. He has wide experience in offset, flexo and gravure printing along with electronic publishing. He has developed courses in process benchmarking, color reproduction, PostScript troubleshooting and service-bureau management. His firm specializes in process analysis and strategic development for electronic publishing, design, prepress and printing companies.