RISC/UNIX Workstations in Desktop Color Prepress

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Prepress and RISC/UNIX

For many years, prepress specialists have the advantages of RISC UNIX at the back end of prepress, in performance-intensive systems for color separation, retouching, page assembly, page imposition, and PostScript interpretation (RIPping). Examples include systems from Scitex, UNDA, Kodak (Prophesy), Agfa and Island Graphics.

The performance levels required for these applications has traditionally required large, server-class machines. However, as the performance of desktop machines improves, these applications are moving to high-performance desktop workstations. The increased accessibility of these applications is causing traditional high-end, closed, specialized systems to be opened up: as the applications migrate from the back rooms out onto desktops, a wider class of users wants access to them.

Also, the shrink-wrap applications that are now available on low-cost desktop computers — illustration, retouching, page layout — are allowing designers to accomplish, at the front end of prepress, many of the tasks previously performed by production specialists at the back end.

The problem with most desktop machines at the moment is their inability to scale to the performance levels necessary for production work. The current generation of non-RISC, non-UNIX desktop computers has an uneasy partnership with some of the fundamental capabilities necessary to deal with prepress applications: 32-bit addressing, virtual memory, DMA, true multitasking, protection of the operating system and other applications from being crashed by errant programs, and built-in networking. Clearly, an evolution to RISC processor technology and the UNIX operating system will be necessary to integrate color publication applications from end to end.

Examples of compute-intensive operations that are a problem for the performance levels of current desktop computers are color editing, color separation, trapping and page imposition. In the short term, prepress users deal with these problems by performing the desktop design applications on Macintosh computers, and networking these front-end computers to Sun workstations to perform the compute-intensive tasks. In the long term, we can expect the desktop applications to become available on Sun SPARC platforms, eliminating the current integration difficulties.

Software RIPs and NeWSprint

For the past six or seven years, PostScript interpreters have been buried in imagesetters. Nowadays, there are advantages to having a software RIP running on a workstation, with a simple, bitmap interface to the marking engine. The workstation on which the interpreter is to run can be chosen for performance appropriate to the application. Upgrading the interpreter to take advantage of new features — such as PostScript level two — can be accomplished solely in software: there is no longer any need to retire a perfectly good marking engine just to obtain a new re-

vision of the PostScript interpreter. A RIP used for production imagesetting requires local disk (to store resources such as fonts), a large amount of RAM memory, a fast processor, and a high-throughput network connection. These are all standard components of a desktop workstation, where the economic advantages of high volume can be leveraged. Finally, a software RIP — with a single set of fonts — can be used across the whole spectrum of output devices, from CRT display, through low-cost printers such as 300 dpi laserprinters and color proofing printers, to high-quality imagesetters — all guaranteed to have exactly the same PostScript language interpretation. This assures that a job will print identically, without missing fonts or other PostScript problems, on any device.

Color Image File Interchange

Graphics arts, printing and publishing have historically exploited the CMYK color model in closed, monolithic, specialized systems. As the traditional prepress system vendors make their technology open and accessible at the mid-range and low-end, users will expect to exchange images among various systems and devices.

High-end prepress users have traditionally performed CMYK separation at the time of image scanning. Separation has been intimately coupled with the color reproduction characteristics of the intended printer, and this coupling has deterred the exchange of images to other devices. The high end prepress community has been discussing use of a RGB color space for the exchange of device-independent color images. Also, the ANSI IT8 committee has drafted a CMYK extension to the TIFF standard, to facilitate the exchange of CMYK images both among high-end prepress systems and between high-end systems and desktop software.

Color Management Software

High-end prepress system vendors have spent many years developing software to transform from one device color space to another. At the same time, users of inexpensive color peripherals have been frustrated by their inability to match color among their desktop color devices: flatbed and slide scanners, CRT displays, inexpensive color printers and slide recorders. Software to perform scanner calibration, and display calibrators, have had only limited success in dealing with these problems: these solutions deal with specific pairs of devices but cannot address the whole system. Certain application developers have dealt with color issues within their apps, but the majority of application developers have little expertise and no interest in dealing with the details of accurate color.

The next two years will see the emergence of color management systems that will offer a single, unified solution to color reproduction issues spanning the range from high-end to low-end. Color management systems will perform the color transformations necessary to exchange accurate color between diverse devices, in various color spaces including RGB, CMKY and CIELAB.

A color management system (CMS) is a layer of software resident on the platform that negotiates color reproduction between the application and color devices. It cooperates with the graphics library components of the platform software. The CMS makes available to the application a set of color facilities whereby the application can determine what color devices and what color spaces are available to it. When the application wishes to access a particular device, it requests that the color manager perform the mathematical *transform* from one space to another. The color

spaces involved can be device-independent *abstract* color spaces such as CIE XYZ, CIELAB or calibrated RGB. Alternatively the color space can be associated with a particular device. In the second case the color manager must have access to characterization data for the device, and perhaps also to *calibration* data that reflects the state of the particular instance of the device.

Color management systems have already been demonstrated by Kodak and Electronics for Imaging (EFI); others are sure to follow.

Color Device Characterization and Calibration

The format of the characterization and calibration data — sometimes called *device profiles* — is necessarily coupled with the CMS. Kodak have indicated that they will publish their device profile format. This is analagous to the publication of the Adobe Type 1 font format: publication of the format enables the adoption of the technology by multiple vendors. However, knowing the type-1 format is necessary but not sufficient to design a font or build a type-1 font rasterizer. Analogously, a particular device profile embodies art and craft that is not disclosed by publishing the format. It is likely that third parties will enter the device characterization business, and vendors of color peripherals will have to make, buy or rent characterization services.

It is likely that platform manufacturers will accommodate plug-in color management software that will be available from a number of third-party developers. Platform vendors may elect to provide basic color management capability with every platform: this may be adequate for office users, but is unlikely to satisfy prepress. Nonetheless, the existence of a standard plug-in interface is likely to create a large market for plug-in color transform packages.

Plug-In Color Spaces

It is likely that color management system interfaces will include the ability to accommodate commercial proprietary color specification systems, such as PANTONE and Colorcurve. It will probably be possible for these vendors to ship their color spaces in shrink-wrapped form to plug into color managers. Provision of these color spaces on a plug-in basis means that users will have guaranteed color accuracy among apps, and application vendors will no longer need to license these color systems individually.