ISSUES IN GRAPHIC ARTS AND OFFICE SYSTEMS INTERCONNECTIVITY

A PANEL DISCUSSION

Moderator: David McDowell *

Panelists: Mr. Frank Scott **
Mr. Gary Starkweather ***
Mr. Ken Cloud ****

ABSTRACT

The panelists represent a graphic arts prepress organization actively using a combination of desktop and traditional techniques; a developer of desktop equipment; and a consultant involved in both desktop and traditional graphic arts.

The primary theme of these discussions center around the increasing use of "desktop" systems to facilitate the capture and initial manipulation of text and pictures for eventual printing by traditional graphic arts processes. It was pointed out that desktop PC's are also finding increasing use in the creation of "informational" graphics and in page layout operations.

While the current activities are best described as experimentation in the working environment, they are producing positive results and are changing the prepress arena. Some of the problems described (that still need a great deal of work) include: the difficulty of handling large picture files on desktop computers; RGB to CMYK color conversions, the use of PostScript and other output drivers to feed both film writers and desktop proofers; color fidelity issues from screen to desktop proof to film proof; font issues where desktop systems are used to directly drive output devices using PostScript.

PRESENTATIONS

Frank C. Scott, Director of Technology
Applied Graphics Technologies
Washington Division

Applied Graphics Technologies is a prepress service bureau located in Washington, D.C. It's a full service operation providing composition, typesetting, color separations, electronic pagination, desktop production,

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conventional graphic, ad management, facilities management and telecommunications for over 20 publications.

In the production of these publications we use a variety of systems, which can be classified as either "High End" or "Low End" production systems. The High End systems are typically dedicated systems, Atex or Penta for composition, Autologic or Videocomp for typesetting, and Crosfield or Scitex for color systems. The Low End systems are typically desktop systems, which use IBM PCs or Macintoshes as the computer and PostScript for output. Hybrid systems are now appearing -- systems like Scitex Visionary which combine the quality of the dedicated system with the flexibility of the desktop systems.

The dedicated systems like Atex certainly changed the offices in the publishing field in the 70's and 80's. With this system, publishers could close their magazines later and have more control over the production process then ever before. But the issue of connecting office systems into the graphic arts production wasn't really addressed until recently. The first area that was addressed (at least for us at Applied Graphics) was the editorial, text entry function. IBM PCs or clones are being used, either as stand alone systems or networked together as a complete editorial front end. These systems will transmit the textual data to a high end system like Atex for composition or H&J. And now with software like Bestinfo, Magna & Architype, the whole editorial process can be done on PCs, including composition pagination and output. Almost all of our customers are using these PC based systems for text entry and transmission to our Atex systems and a few are doing their own composition.

Another area where PCs are being used is in the proofing of pages. There are several systems we're using that will emulate phototypesetters, like the APS 202 or Videocomp, outputting on plain paper at 300 to 600 dpi.

We are also using a PC based system that performs the layout function. This system captures the page geometry and transfers this information to Atex and Scitex. We have found that this is a very cost effective, interactive system which takes care of the problems of different measuring systems and the origin of the elements on a page. This system creates an indent file so the composition system can compose the text file and a "spec" file or X-Y road map to paginate the page. It also creates a Scitex page instruction file that will build the graphic page on the Scitex system. This page can be displayed on the Scitex system with "dummy pictures". These dummy pictures hold the name, place and size for the real high resolution pictures. At this point, we can output the page on the Scitex Raystar output device, merging the text and graphics on output. The Raystar is a

laser based, flat bed recorder which has a resolution in excess of 2,500 lines per inch. It can produce the separations for a 4-Color page in about 4 minutes. We are currently using this system to produce the majority of our color pages and "Federal Computer Week", is produced totally on the Raystar.

We are using Macintosh for high quality graphics. Last June, we began to install Macs in the Art Department of U.S. News & World Report. The first page that they produced was the "Vital Statistic" page, in the July 25th issue--just 3 weeks after we installed the first two Macs! The complete page was created on the Mac, including the text for the graphics. The file was sent to a Linotronic 300, with a PostScript RIP, for final separation films which made the color proof.

Today there are 16 Macs in the U.S. News Art Department. They are creating all of their maps, charts and diagrams on these systems, some of them are quite involved and can take as long as an hour, and sometimes 2 hours, to output on the L300. But even with this amount of time we have cut the production cost and time in half, compared to the conventional process.

U.S. News has also used the Macintosh to create their covers. This cover for the February 6th issue was created by an artist in Seattle, Washington and transmitted to U.S. News in Washington, D.C. The U.S. News logo and cover type was added. It was proofed on a QMS ColorScript thermal printer. Once the cover was approved, we made the printing plants using high resolution facsimile systems and printed. As you can see, there is quite a close match to the thermal proof, prepress proof and final printed page.

In conclusion, there are several critical issues that have to be addressed as we move into office systems. This is by no means a complete list, nor is it in any particular order.

Today PostScript is one of the most popular desktop "page description languages". It has a lot of capabilities, but it has a lot of potential problems. At this point in time, it is quite slow. There is no way to calibrate and control halftone dots. And PostScript's ability to control screen angles and frequencies is inadequate.

Only Adobe fonts can be used on Adobe PostScript printers even though your customer might want to use other non-Adobe typefaces. Other typeface vendors claim to have overcome these problems, but it is too soon to know if these claims are completely accurate.

Desktop systems were not designed to handle the amount of data color images contain. A low resolution "FPO" color image might contain a megabyte of data, to store and transfer and design a page with this much data causes all sorts of problems. Larger storage

devices, faster networks and more memory will be required to use these systems effectively.

Again, there are other issues, but there is not sufficient time to address all of them now.

Gary Starkweather, Project Manager
Apple Computer Company

We can do an overview to get you thinking about some issues that I consider important. First of all, I think that any of the systems that we have dealt with at Apple, you have dealt with as well. They are generally from three areas. While we can consider them as probably somewhat irrelevant, they generally fall into the three categories.

How are pictures acquired? We will talk a little bit about that. They are manipulated, usually. I've almost never seen an image that went straight from the acquisition phase up to the printers, and I'm not sure if that is because it is always a necessity or if the user can not resist doing something to it. But, never the less, something always seems to happen between the acquisition and the printing process. Then you go through the manipulation and the printing. Now, there are some very important system issues, especially if you are going to come to the printing press eventually with some of these images. We will talk just a little bit about that.

You can, of course, go from acquisition to printing directly, I guess that is an electronic copier. But nevertheless, the triad of acquisition, manipulation, and printing tends to support most of the things that we do.

Let's look briefly at some of the ways of getting images, perhaps with a Sharp Color Input Scanner--that is one of the standards now--so is the Howtek and so forth, 24 bits per pixel, 300 pixels per inch. So, if you have 24 bits per pixel and 300 pixels per inch, an 8 1/2 x 11 page is 25 megabytes of data. Now, of course, with the original Macintosh, you have 128 K bytes of memory. Eventually, this became the standard 512. That gets exhausted very quickly on this particular 25 MB file. If you were to transfer the image over AppleTalk, it could take a long time. So FDDI is a very important issue for transferring images of this size rapidly. Input scanners, for example, like the Fuji slide scanner, also generate terrific amounts of data.

Video capture/illustrators also help generate this sort of image. Then you might use some image processing on it, and I have a list of what all of those things are, programs like Digital Darkroom and Photomac for example. There are all kinds of little programs

available that can do all kinds of these things for you. They will separate the colors and permit sophisticated editing, e.g. Digital darkrooms, so to speak, will permit you to do all the sorts of things you used to have to do chemically. Color correction and matching. --I'll come back to that. In printing, here is for example a list of printers one might think about. You have an HP Paintjet, you might have a Xerox 4020 ink Jet, ACT marketed for Polaroid (I don't know if that still exists). You have Tektronix and QMS, which are thermal transfer printers, and oh, by the way, you can achieve grey scale with thermal dye.

If all of these are accessible to the system, a very major point (from my perspective) is how one talks to those printers in an intelligent way, and what are the issues that are most important. If you think about all these, I believe an intelligent printer would install itself. The user should not have to have a laundry list of printer drivers to to pull through and decide to pick up Model 609 or 4690 screen, before you can load the proper driver. One should be able to transfer an image standard across into that peripheral and that peripheral vendor would design it to be that way. The reason I think that this is an important issue to raise is the issue of, for example, new ribbon or new ink being available on an Ink Jet printer. You have two in the building, one loaded with new and one loaded with old. Which driver do you use? You need to know. I think it is important that the peripheral has some intelligence knowing what it is doing, and therefore, in this particular case as we go back to our little triangle, we think that in the printing stage, the user should not have to worry about that. You should only say this is a printer that I know will bring me some quality level that is adequate for the project I have in mind, and not have to worry about the fact of "I hope they put the color correction software in, or do I have to do that?" I certainly don't want to transmit the bits over the net to do that.

Let us look at the manipulation process. If you have a 25 megabyte file to print, what are you going to do with it? You surely don't want to recreate the entire image necessarily on your Mac or on your PC. You don't need to do that. The screen should only put out 750 kilobytes or something for the most part. But, why don't you keep a smaller level representation around and then transfer that representation out in the final image in the form of a script or some sort of description of what you want to do. There is no need to completely modify 25 megabytes worth of data except when printing. So, I think the concept of having standards is crucial. The whole concept of PC's, and the Macintosh especially, is convenience, quickness, rapid turn around and ease of use. To have the user wonder why the wrist watch runs for two hours to completely modify for display, the 25 megabyte color image is not something I would prefer to explain to them. It is fine to let the printer take care of that

because that is the only time that you care about doing it unless you want to do it for the representation on the screen.

Lastly, we talk about color matching. An exact spectroradiometric match is inappropriate, since a perceptual match is more desirable. What are the viewing and lighting conditions for the user? Is it sunlight, morning, afternoon, artificial, etc.? To properly match, these factors must be known. The application will also dictate the closeness of the required match.

Kennard S. Cloud, President
Cloud Information Services

Noting the wide variety of backgrounds represented by the panel members, I can't help but be struck by the similarity of the messages from the three of us. My message is twofold. First, despite the noise and hullabaloo surrounding desktop color today, PC based color systems will not replace traditional graphic arts color electronic prepress systems. However, the second message is that building links and bridges from traditional graphic arts systems to the newly evolving desktop color design and/or production systems is critical for the healthy survival of the graphic arts industry.

If we look at the universe of color page creation and production, there are three converging worlds. The first is traditional graphic arts systems, including color scanners, CEPS, color retouching systems, stripping systems, mask cutting systems, and dedicated design workstations. This world has been growing by over 15% per year for the past fifteen years, fueled by an almost insatiable demand for color pages. This is the world of color trade shops, commercial printers, advertising agencies, etc. Unfortunately, the fuel is about to run out. Advertising driven graphic arts color page production has reached a saturation point. The number of pages produced in black and white that can be converted to color have almost disappeared. This is not to say that color page production won't continue to grow, but it does mean the rate of growth will decline significantly.

There are two other worlds that are growing in size and magnitude that stand to eclipse our traditional world. The first is desktop publishing, which has already created some profound changes in the black and white sector of the graphic arts. The second is desktop color (design and/or production), which is in its infancy. These two worlds represent less than 10% of all color pages produced today. However, while traditional graphic arts color page production growth is slowing, desktop color page growth is increasing at an ever expanding rate to meet the insatiable appetite for data created by the information age. By 1995, desktop color pages should equal almost one-third of all color pages produced.

Based on these premises, the message is clear. While we can sit back complacently confident WE can't be replaced, if we want to continue the healthy growth we have been experiencing, we better figure out how to join the band wagon. Frank Scott described a working marriage of desktop and traditional. However, Frank has a fully integrated environment where he made this work. Our challenge is to develop the ability to accomplish the same flexibility, turnaround time, and user control Applied Graphics offers in a non-integrated environment.

Currently, we are in the infant or early adoption phase of desktop color technology. This is the experimentation period when the market consists of what I like to call the lunatic fringe. A lot of people are playing with desktop color and liking some aspects of their experiments but not others. What they like is the affect of adding color to their documents. What they don't like is the pain they need to go through to get there. Mechanical color works, but scanned process color images only work with a tremendous amount of effort, even starting from a perfect original.

The results of the experiments will be that the end-users will go out and find someone who knows how to produce quality color right. Unfortunately, traditional graphic arts firms don't know how to deal with corporate document originators. As a result, we will move into Phase II which will see a new class of color provider spring up -- the color service bureau. The color service bureau is the color equivalent to the PostScript Service Bureau. This phase will find a healthy period of growth from 1990 through 1995.

These color service bureaus will be made up of PostScript Service Bureaus who learn color, and color establishments that learn to deal with the new breed of customer by offering fast turnaround, no load services. During this growth period, a lot of people are going to learn a lot about color, but producing color, even on the desktop, will still be the province of the professional. Mechanical color will be produced hands-off, as a pass through operation to the output device, but process color images (scanned color) will be handled by special personnel using special tools and software the general public doesn't want to be troubled with. Having service bureaus to produce desktop color pages will help fuel the growth, but at the same time it will inhibit explosive growth because of the skilled personnel and/or equipment investment still required.

Before we move from Phase II to Phase III, a couple of technical problems need to be solved. Phase III, moves color page production from the service bureau to the office. To do that, we need intelligent scanners and effective color printers - all at low cost. Today's desktop color scanners are "dumb" devices. They lack the sophisticated color control of a graphic arts color scanner with a highly evolved

color computer to convert scanned images to half-tone dots. Technical quality issues such as dynamic range and bits of color precision aside, its the color operator that is missing. In fact, much of the software involved in desktop color systems today does little more than mimic the basic capabilities of the color computer in a graphic arts scanner.

The problem, however, is SMP (a Small Matter of Programming). Some of the packages available today already show excellent promise, and within two years they will evolve to the point where they do at least 85% of what is being done professionally today, and they will be more than good enough. The greater problem is to replace the skills of the color scanner operator. Most of what the scanner operator does to manipulate the forty or fifty analog dials (or parameters in a digital scanner) is a black art. Its CRAFTSMANSHIP. This is going to be much harder to solve with SMP. The corporate document originator doesn't want to know anything about color craft. He wants to put a picture in one end and get a color page out the other end without any fooling around. I predict it will be at best 1991, but more likely 1995 before we see color scanners that solve this problem.

The second problem in moving to Phase III is the color printer. It is likely that a number of solutions will spring up to allow service bureaus to solve the problem of generating color page masters (CMYK separations) for the printing process based on PostScript (more on this later). Again, however what solves the service bureaus problem doesn't solve the Phase III problem. New printing techniques, which I tend to think of as a "digital color press", need to be invented before we get to Phase III. When we do, it will have been worth the wait. We will likely see a boom in the growth of color pages that will feed our appetite for information that will last well into the 21st century. And, the ability produce casual documents with images in full color will dramatical improve our ability to communicate and learn.

As I mentioned early, one of the keys to this scenario is PostScript. PostScript is, in my opinion, likely to be the catalyst that makes Phase II happen just like it was the catalyst for desktop publishing. However, PostScript is not without problems, and these problems must be solved before we can proceed. For those of you unfamiliar with it, PostScript is the defacto standard page description language developed by Adobe Systems to drive laser printers and other text and graphic image setters from different systems. PostScript became the glue that tied desktop page composition and layout packages together with output engines such as the Apple LaserWriter and allowed the desktop publishing revolution to happen.

A couple of points to remember are that PostScript is a computer language, not a file interchange specification, despite the fact we try and use it that way. It is also a defacto standard, and not an industry standard. Both points create a situation where there are numerous different versions, nuances, implementation interpretations, and just plain bugs that prevent PostScript from being all things to all people. As to be expected, some implementations are better than others. Aside from the language specification itself, there are significant issues with font compatibility and interchangeability, and with PostScript's device independence as modified by "Encapsulated " PostScript files which take "standard" PostScript and include considerable non-standard additions to make the target device work properly.

Color is also a significant issue with PostScript. (The previous issues apply to black and white applications as well as color.) PostScript was originally designed as a black and white imaging specification, not a color specification. Certain features of PostScript have been used to generate color, and Adobe has developed an appendix to PostScript for color applications. However, specific implementations have resulted in questionable results for a variety of reasons, which are all outside PostScript as a language specification. The PostScript color addendum itself is outside standard PostScript.

The PostScript issues are all solvable. It is encouraging to see organizations such as ANSI IT8, the SPS Association, and Adobe itself willing to try and address the issues, I believe that while solving all these issues is not necessarily a prerequisite, if we don't solve them, progress will be greatly delayed. PostScript may not be the ultimate solution for all we want to do when we get to Phase III, but it is the best intermediate solution to use for Phase II now.

ADDITIONAL PANELIST COMMENTS:

Prior to opening the floor to questions the pannelists were given an opportunity to comment on each others presentations.

Frank: We've taken a pragmatic approach to desktop color. It may not be perfect, and there are a lot of things we'd like to see, but its producing a lot of pages for us right now. For us, mechanical color works well, but process color (scanned images) are not up to the quality we need.

Gary: PostScript has a poor color model. There is a danger in fixing it in that we may bust the major advantage of PostScript. It is a universal tool today --change it and it may loose its universality. For example, the MAC imaging model permits blends --when you add green over red, you

get yellow. With PostScript you wipe out the underlying layer and get green. If we changed the way PostScript works, existing programs would not work properly. The transition from our current processes to generate color to new desktop processes to generate color must be painless. It will be impossible to train all the users. If the users felt they had to learn all about color, they would stay in black and white. The challenge is to build systems that generate the necessary quality levels without pain.

QUESTION AND ANSWER PERIOD

The audience was then invited to direct questions and or comments to the panel. A partial transciption of this discussion follows.

QUESTION: (To Frank) Would the PPI experiment have worked as well in a non-dedicated environment as it has in your dedicated environment?

ANSWER: (Frank) The integrated Applied Graphics environment made it much easier, but we are steadily moving beyond our starting point. Each step has been a learning process that built a foundation for the next step.

QUESTION: (To Frank) How did you solve the problem of reconciling what the end user sees on screen (in the way of color), and what appears in print?

ANSWER: (Frank) We haven't. Again, its been an education process. We've provided color calibration patches so users can try and predict what will print, but we don't pretend to work in a calibrated color space.

QUESTION: (To Panel) How are the issues of transferring files amongst all these systems being addressed?

ANSWER: (Gary) We need to do a lot of work in defining color spaces and color models. The end user doesn't know or care what color space he is in, and unfortunately that is what todays software prompts him for. The software and peripherals need to develop the sophistication to keep track of the color space issues for the user.

QUESTION: (To Panel) Can we convert CMYK to some other color model and back again?

ANSWER: (Dave) Scanners currently go from RGB to CMYK, but going back is difficult.

(Gary) Hard to say. Maybe if CMY converted to RGB and back again as red minus one, but that's not the case.

(Ken) This is a significant problem that needs to be addressed. The field testing of DDES has proved we can't even go from CMYK to CMYK without a lot of additional information, so there are still lots of open issues to be solved with color space conversion.

(Frank) The basic printing process demands more information be included with the files than we are now transferring. I think we are still a few years away from using desktop systems for (scanned) image color.

QUESTION: (To Panel) How about Crosfield, Hell, and Scitex? Are they likely to cooperate and provide the knowledge (Electronic Dot Generation) necessary to move forward?

ANSWER: (Ken) The technology necessary to print color, i.e., electronic dot generation, is the family jewels of the color printing industry. It is to color what font technology is to black and white text generation. Hell is in a significant position to tie things up due to the intellectual property rights (patents) on EDG. This has been a key to their economic life and they won't quickly let go. However, the mood in the industry is changing dramatically. It started with the DDES process, where all the CEPS vendors sat down together and started to share their secrets. Not too long ago Hell opened up their patents via cross licensing agreements, starting with Scitex, and recently Hell and Adobe announced a cooperative agreement. The industry is looking to move forward.