ColorSync 2.0: White Paper (2 of 2) (6/95)

Article Created: 30 June 1995

TOPIC ---

This article contains part 2 of the ColorSync 2.0 White Paper.

DISCUSSION ---

Framework for Color Matching
============================

A very important piece of any color-matching solution is a consistent method for users to gain access to the tools that are necessary to complete a task. ColorSync 2.0 provides an architecture that allows applications and drivers to request color-matching functions. This type of interface is commonly known as an applications programming interface (API). The ColorSync 2.0 API provides a powerful array of functions for color-matching needs. For example, the 2.0 API adds functions for features like device simulation, support for color separations using more than four colors, and PostScript driver support. In conjunction with the ICC profile format, ColorSync 2.0-supporting applications can actually store the color data for the device on which the file was created inside the file. For example, storing a scanner's color data in the file on disk ensures accuracy regardless of the system or platform the file is used on.

The ColorSync 2.0 API thus removes the need for application vendors to call specific APIs for color matching. With the release of ColorSync 2.0, most color management manufacturers will release new versions of their software that work within the ColorSync 2.0 architecture. This means much less work for application vendors–they need only call one API for all color management and matching functions. Now an avenue exists for popular tools to work together to ensure that color is communicated accurately, and consistent with the user's intent, across all applications and devices.

The API is only one piece of the solution, the framework for color matching. It is not capable of actual transformations of color data. The second piece of the system is the transformation engine that actually changes color data. This is known as a color matching method, or CMM. ColorSync 2.0 contains a default CMM provided by Apple. The default CMM was developed with the help of a leading manufacturer of prepress equipment, with many years of experience with color science. The result is a CMM that not only produces excellent results, but is extremely fast.

The default Apple CMM is a powerful engine capable of handling the most complex color jobs. However, some users may need a different engine. The ColorSync 2.0 architecture is designed not only to allow the use of CMMs from other developers, but to provide a mechanism for cohabitation and cooperation of CMMs. This allows ColorSync to be flexible enough to provide solutions that the default CMM may not offer. This adaptability protects users with existing color management products and those whose needs may change. It also allows VARs and developers to add value by developing new CMMs without having to create new APIs, system calls, and profile formats.

To accurately transform data between two devices, the CMM must have the necessary information about the devices in use. This information is provided by the profiles. ColorSync 2.0 recognizes profiles in conformance with the International Color Consortium (ICC) profile specification. ICC was founded in 1993 to create standards for the use of color on the desktop. Apple led the way for the foundation of this specification by offering the ColorSync profile specification as a starting point. The result was a broad, cross-platform implementation for color management profiles. The benefit for the user is clear: One profile is all that is needed for any color-matching functions on any popular platform. Apple supplies ColorSync 2.0 profiles for Apple's color-capable peripheral devices with ColorSync 2.0, and ColorSync 2.0 and ColorSync 2.0 profiles are ICC compatible.

Working with Color: Before and After ColorSync

To better explain the how ColorSync 2.0 works, let's look at an example of what it has been like to work with color before ColorSync 2.0.

Jill, a graphic designer, is hired to create an advertisement for a new product. The ad needs to include a picture of the product, the company logo, and an attractive design. The final piece will be printed on an offset printing press, using high-quality paper and the traditional CMYK inks. Jill begins the process by scanning an image of the product. Jill examines the scanned image on screen, judging and correcting the color of her scan based on what she sees on her screen. And what she sees is misleading because she has not compensated for the differences between her scanner and her display. When Jill feels that the color on screen matches the original, she moves on to the next step, assembling and laying out the page.

Next Jill inserts the color image and the company's logo into the page layout. The company logo uses spot colors from a swatch book, or colors that require special inks or special ink combinations. Often, spot colors are outside the gamut of a conventional process (CMYK) printing device, while they are in gamut for the display. However, Jill feels that the color logo she sees on her screen accurately represents the colors used in the company's logo.

Next, she places some text in front of a color box. Jill selects the color based on screen values that correspond to the colors in the image the company has provided. Again, she has selected the color based on what she saw on her screen, without compensation for the printing press. After Jill assembles the document, she produces a comprehensive, or "comp" print of the document on her desktop

printer. The comp allows her to check that all of the elements look as she intended. It also allows the client to examine the document.

As Jill examines the print, she notices that much of the color on the print is different from the colors on her screen. She must now go back several steps to correct the color. She will spend time repeating this process until the color from her desktop printer is what she wants. Because Jill is unable to preview what the color will look like, she is essentially guessing. And she must perform this process for each design comprehensive she produces for her client so that the client sees the most accurate representation possible.

Once the client views the comps, they may want to make several changes to the document, including changes to the colors that Jill has selected. Once a final comp is selected, Jill must prepare the document for the printing press. She will make the painful discovery that the press proof from the printing press does not match her desktop proof. At this point, she has spent many extra hours and dollars trying to match colors between her monitor, desktop printer, and printing press. She has three alternatives. The first is to have a trade shop or service bureau produce color proofs of her document. However, this would cost her a lot of money and reduce the control she has over the design process. Her second alternative is to simply guess how the colors will be reproduced. However, this may result in an unhappy client. Her third and most sensible alternative is to use a system that will automatically compensate for the differences in color between her devices, thus reducing the frustration, time, and money spent trying to get the results she wants. Jill wants to spend her talent and effort on creating the best possible design, not on trying to make colors match.

Let's examine her work flow using ColorSync 2.0:

Jill begins the process by scanning an image of the product, and then examines the scanned image on screen. She judges the color of her scan based on what she sees on her screen, confident that ColorSync 2.0 has compensated for the differences between her scanner and monitor, as well as alerting her to any colors that are out of gamut for her target printing device. She can now move ahead with the color correction process with confidence that the colors she sees on her screen will be very similar to those produced by her desktop printer.

Next Jill inserts the color image and the company's logo into the page layout. She doesn't worry about the spot colors used in the company logo because the logo file has the source device's color data attached to it, in this case, the display of the machine on which the logo was created. This means that ColorSync 2.0 will automatically adjust the colors between the logo file and her display to ensure accurate viewing of the logo.

Jill then places some text in front of a color box. She selects the color based on screen values that correspond to colors in the image the company has provided. Again, she has selected the color based on what she saw on her screen, but this time she is confident that the color she has selected will reproduce accurately on the printing press. This is because ColorSync 2.0 knows which output device she will be using, and can adjust on-screen colors for that device. Now that the designer has the document assembled, she produces a comp of the document on her desktop printer. Before she prints, she tells ColorSync 2.0

that her current printing device is a desktop printer, such as an ink-jet or dye-sublimation printer, and that she wants her printer to simulate the printing press on which she'll print the final piece.

ColorSync 2.0 automatically maps the colors from her display to her printer, while keeping her intent of simulating a printing press. The result is a comp that very closely matches her display. She can now show her comps to the client with confidence in the color. Once the client has approved a design, Jill prepares the document for the printing press, where thousands of copies will be printed. Because she's using ColorSync 2.0, she easily creates color separations for the printing press. ColorSync 2.0 ensures that her digital proof closely matches her press output. ColorSync 2.0 has saved Jill enormous time, money, and frustration compared with her previous process. She now has more time to focus on design.

In our example, all steps are performed on a single workstation by a single user. However, in creating color documents, it is common for elements of that document to be created by different people, using different applications running on different computers. These factors can significantly affect the color fidelity between steps. However, ColorSync 2.0 is versatile enough to handle any color job, from a business graph in a presentation to the most difficult prepress task.

Developer and User Benefits

ColorSync 2.0 offers a wide array of benefits for different types of users. Depending on the implementation of a particular application making calls to ColorSync 2.0, different levels of functionality and control become available. The result ranges from automatic color matching to high-end prepress functionality.

Business and desktop graphics users don't need to spend valuable time trying to get colors to look right. ColorSync 2.0 eliminates the guesswork involved in using color by putting the color science in the operating system. Colors that are defined on the screen in presentation or spreadsheet programs are automatically adjusted so that the colors from the printer match those on the screen. It is critical to have this type of solution implemented in the operating system so that color fidelity is consistent across all applications. To do otherwise would produce inconsistent, unacceptable results. Only one operating system currently offers this comprehensive solution: MacOS.

Commercial publishing and prepress users require the highest level of accuracy and performance from their tools. High-end users will appreciate the open approach Apple has taken to implementing ColorSync 2.0. Whether they use a drum scanner, a digital camera, or the hi-fi color process, they'll find that ColorSync 2.0 can handle the wide range of data they need.

A Labor-Saving Framework for Developers

The key to the success of any color management system is that it be a complete

solution. This requires the widespread adoption of ColorSync 2.0 by the manufacturers of products used in working with color, including application and device manufacturers, the operating system, and other third-party tools. ColorSync 2.0's expansive architecture provides developers with the plumbing needed to access system-level functionality for color management. With one framework for these functions, application vendors need only write one common set of calls, greatly reducing the development workload.

Before ColorSync 2.0, a manufacturer would have to decide which color management system to support, and then develop to that proprietary system. Application developers can now include color management in their applications without the burden of selecting a single system. Because ColorSync 2.0 has an open architecture, products from other companies can easily work with ColorSync. Developers' color management systems and their supporting products, which were previously proprietary, can plug into Apple's architecture to offer additional functionality to supporting products. Minimal work is required to ensure compatibility with ColorSync 2.0 and supporting applications.

To ensure that peripheral manufacturers benefit from a common framework, Apple led the way in developing the ICC standard-profile format. This format offers many benefits to both end-users and developers. Now peripheral manufacturers need only create one ICC-compatible profile for a device, eliminating the need for several profiles for each CMS and platform.

Together, ColorSync 2.0 and ICC-compatible profiles offer the ability to store the data about an element's original color space in the disk file. This ensures that any user who has ColorSync 2.0 installed can accurately reproduce that element, thus eliminating the possibility of a user not having the necessary profile. ColorSync will read this source data, and provide the necessary information to the CMM for proper display or printing. A variety of different tools are available to developers through the ColorSync 2.0 architecture.

An Open Solution

ColorSync 2.0 alone does not provide a color management solution. Together with Apple's developers, ColorSync 2.0 provides a powerful solution for the needs of users working with color. This solution generates consistent, predictable results as color information is scanned, manipulated on the display, and then printed.

This solution levels many of the roadblocks to users of color, making color accessible to those who previously were intimidated by the daunting challenges of working with color.

Users of all Macintosh applications will be able to take advantage of the capabilities ColorSync 2.0 brings to the Macintosh. All in all, ColorSync 2.0 allows Macintosh to be the computer of choice for anyone who wants to communicate effectively and powerfully with graphics, type, and color.

Support Information Services

Keywords: <None>

==========

This information is from the Apple Technical Information Library.

19960215 11:05:19.00

Tech Info Library Article Number: 18021