

Integrating Virtual proofing into the Quality Color Workflow

Executive Summary

OVERVIEW – VIRTUAL PROOFING, FROM CONCEPT TO SOLUTION

The concept of virtual or virtual proofing was recognized over 20 years ago as a potential time and cost saver. At that time, a virtual proofing system consisted of a very expensive Barco monitor, a 9-track reel or hard copy proof for transporting the image and some form of courier service. Desktop publishing was in its infancy, color science had not yet been adapted to the desktop applications, standards were represented by digital libraries and high-speed data communications were still relegated to the lab. A Chromalin proof, even though not an exact facsimile of the eventual press output created a comfort zone for clients that continues to this day. Only in the past 10 years have progressive users and developers begun to stretch every bit of technology that exhibits any potential for viewing, communicating and printing high quality proofs to match and exceed these concepts from the past.

VIRTUAL PROOFING – BUILDING ON THE PAST

Along the way new technologies appeared and existing technologies evolved. Some of the seminal technologies include: press, proof, and display finger-printing and calibration; dedicated high-speed lines for communications; advances in software based RIP technology; and continuous improvements in desktop inkjet printers. Today, thanks to a convergence of technology, we have all of the pieces we need to build a complete virtual proofing system. The result is the end of the early adopter phase of this development and wider adoption. More users exercising the current systems lead to feedback that is more practical and push developers to create the next technology wave.

Clearly, the evolution of virtual proofing has been a slow one by high-technology standards. Numerous attempts along its development timeline have shown it to be a process in search of technology. The current crop of digital proofing solutions mirror many of the technological developments mentioned above. For example, the hard copy proof once represented by a press proof and Matchprint still exists but users are as likely to rely on a local calibrated inkjet since the color and texture of the intended output substrate can be modeled digitally. Device characterizations that were once done to remote, quirky CRT monitors and presses are now done to desktop displays and inkjet printers. High-speed communications have moved from expensive leased lines of the past to inexpensive, readily available internet providers to enable screen data and interactive group communications to move in real time.

INTEGRATED COLOR SOLUTIONS, INC.
60 MADISON AVENUE
NEW YORK, NEW YORK 10010
212-683-0585

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ALL DIGITAL – ALL THE TIME

In the highly competitive content creation business, where image quality and digital integrity are paramount, nothing can compare to a fully digitized process for accessing and managing data. But a pure digital workflow is only an advantage if the color can be counted on as accurate and consistent. In particular advertising agencies and prepress shops have the most riding on the quality and accuracy of the digital files because their reputation depends on it. Both players are responsible for preserving the brand through the way their creations are represented. Satisfying their high standards has taken a lot of research and development.

Today, most of the content creation workflow has been standardized and digitized. The adoption of digital asset management systems has brought some discipline to the routing of data. But even with all of these new technological advantages, much of the review and approval process is still done offline. Hard copies and mockups still rule and data is still shuttled around in e-mail and on disks. This will of course change with time. Today it exists as one of the last workflow segments to be streamlined.

VIRTUAL PROOFING MOVES BEYOND EARLY ADOPTERS

While most of the technological obstacles limiting the progress of virtual proofing development are history, a new set of issues have come under consideration that relate to virtual proofing's place in the larger supply chain. Content creation and printing are all part of a manufacturing process. As this process becomes completely digitized, it fits very nicely into what has been known as computer integrated manufacturing (CIM).

Today, a number of initiatives are afoot to move to a more efficient, controlled digital workflow further upstream at the content creation phase of the graphic arts process. This next step views virtual proofing as a component in a larger graphic arts workflow and regards interoperability with associated systems essential to fulfilling the eventual dream of end-to-end computer integrated manufacturing. To achieve that goal the architecture on which the systems are built must be done in a way to support interoperability and the integration of new standards.

This paper will look at the virtual proofing system Remote Director from Integrated Color Solutions in the context of the key fast moving trends: collaboration, brand integrity and project management. These trends reflect important areas to advertising agencies that collaborate daily with freelancers, consumer product companies and prepress and print providers. Having the ability to discuss their work graphically is obvious and has led to years of reliance on proofs and mockups. All three of these trends overlap to some extent and each represents areas of development that are evolving independently. Brand integrity involves security in addition to some level of adherence to the accepted stages of content lifecycle: design, management, distribution and archiving. Workflow requires that systems talk to other systems as transparently as Remote Director's transaction server interoperates with Xinet's digital asset management system. Remote Director,



Remote Director pressroom installation

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through either built-in functionality or support for other systems and enhancements, has the architecture to evolve and adapt as new workflow control and integration opportunities arise.

VIRTUAL PROOFING TRENDS: TODAY AND TOMORROW

The following exposition describes the current state of the review and approval process in advertising agencies and the role virtual proofing plays. Of course the review and approval process is not limited to any one department. Stakeholders can include the executive, marketing, sales and any of the trades that feed content creation and output. It is our contention that we have moved beyond the early adopter stage and can now accept that the technology can provide a ROI and meets or exceeds the expectations of users. The simplest criteria for judging virtual proofing is on a color quality and ease-of-use basis. This is not unreasonable since for so many years achieving consistent color quality was so difficult and expensive. However, judging it in this way would disregard the reality that virtual proofing, after meeting user's color quality expectations, is now expected to meet a new set of collaboration, workflow and project management criteria. Applications, regardless of how comprehensive they are, can no longer exist in a vacuum, especially one where critical project decisions are made. In light of this new workflow reality, Remote Director is well positioned as an ideal integration component. The following will examine ICS's Remote Director as a collaborative tool, as a workflow component and as a project management enabler.

Collaboration

RISE OF THE VIRTUAL WORKGROUP

Over the past 10 years the reality of virtual workgroups has replaced the dream of telecommuting as the office of today and tomorrow. It was revolutionary ten years ago when Chiat Day in Los Angeles sent everyone home to work and only set aside limited office space for occasional project and customer meetings. Rather than a strict definition, telecommuting has become a fluid one with knowledge workers. Once again, we can thank the internet for expanding this new reality beyond the category of telephone bound sales, telemarketing and customer service workers.

The graphic arts workflow is a case of shifting collaborations. The hard copy proof is the token of this shifting collaboration. Whether it is used as part of an agency client pitch, a set of design variations or an example of the final output from film, customers and designers have come to expect far more precision and overall finish than in the past. Although some design operations may limit their use of virtual proofing to content creation, it truly is an end-to-end enabling tool. The opportunities for review and approvals of virtual proofs can begin at the first customer service contact and continue all the way to final press approvals. Pulling press proofs or creating Chromalin prints may never be eliminated but as the virtual proofing technology becomes more familiar, it will eventually lead to a shift in comfort zones from the hard copy to the screen proof.

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The whole purpose of virtual proofing is communication. This communication can take place between an ad agency and line managers at a consumer product company or between an art director and a prepress operator making film. Where Chromalins and mock-ups served in the past as the physical example for marking up the design with a grease pen, a view of it on the computer screen, modeled on a facsimile substrate and color model becomes the new screen “print” for adding digital notes and annotations. This is especially valuable for situations where a remote prepress shop or client is just too far to invite for a meeting.

REVIEW AND APPROVAL CYCLES

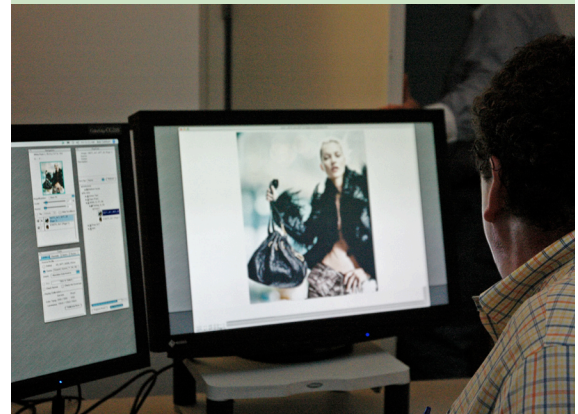
Pulling together a virtual meeting is at least as hard as pulling together a physical one. However, when a decision must be made it is important for there to be ways to notify members. For certain participants it may be important that they be notified immediately when significant milestones occur. As part of Remote Director’s file and project management function, the Email Notification parameter for an invited participant will set off an action requiring their response and involvement. The email includes the proof name, description, instructions, etc., and tells the recipient in what Customer and Job folder to find the Proof. Also a proof:// URL is sent in the email that automatically displays the proof when clicked. The digital options are similar to physical ones where: a new proof is created and seats invited; a new seat is invited to join an existing proof; and an image is signed off by all seats that have been designated with signoff requirement. For busy art directors having notification of an action they need to take pushed to their Blackberry is the only way to grab some of their bandwidth.

MANAGING THE GROUP AND THE PROCESS

Remote Director is a client server application. Using a server to feed software clients brings a level of security and reliability to the process. In this case a server routes the transactions between meeting members and holds permission data for such functions as digital signoffs and access to original data. For an ad agency or prepress shop this means that the setup and maintenance of the server is not their responsibility. Managing the proof files and the guests who view them is more basic and an extension to the ongoing management of the customer relationship.

MACHINE TO MACHINE COMMUNICATIONS

In order to make the color science work and meet the expectations of the participants, information about the participants, their equipment, the files being viewed and previous sessions must be communicated to the administrator or the members in the team. First of all there are color standards like SWOP and GRACoL that form the basis of color representation on screen and on press. These values must be transformed to dots and screen pixels depending on the output. The only way to transform color information to dots and pixels is by the use of a color engine. Remote Director uses a combination of an ICC engine such as ColorSync and their own spectral blending engine for spot colors and specialty coatings for this task. This combination has certain advantages in the types of output data it can print



Remote Director studio installation

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to screen giving Remote Director a full range of modeling from RGB, LAB, CMYK, spot colors and separations. It provides for the dynamic use of ICC profiles and N-channel technology in a 10-bit environment. Even the color and texture of the substrate can be modeled on screen. Advanced views are possible showing custom colors and spectral blending (colors over colors).

One of the most important considerations with virtual proofing is that the color stays consistent between and during the session. To maintain this consistency Remote Director continuously checks each participant's display and adjusts it if necessary. This is done using ICS Remote Verification patented technology. With supported displays, ICS uses high bit DDC/CI (display data channel/command interface) for automated display calibration.

A setup process must be used to prepare a system and a monitor for virtual proofing. With virtual proofing the gamma is critical. It is in this area that ICS has patented L*Calibration and Remote Verification for unsurpassed shadow detail.

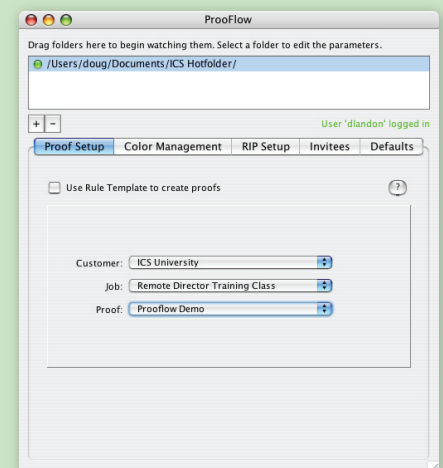
For ad agencies and prepress shops, virtual proofing provides an opportunity to supply a new service to clients. Training, system calibration support and new hard copy proof products are value added services that can strengthen a service provider relationship.

Virtual proofing as a Workflow Component

In every graphic arts workflow there will be numerous review and approval cycles. It's critical to the flow of timely information to all of the stakeholders. The need for review can and will take place at different points in the content creation process. For the retouching artist it may take place progressively at each iteration. For use as a remote tool for pitching ideas it can happen even before the job is taken on. In each of these cases quality counts. One of the key motivating factors users cite for adopting virtual proofing is quality. In so many cases virtual proofs are not just for content and good enough color is not good enough. In magazine and advertising work, clients expect to see close to final output quality early in the design process. In designer to prepress communications it either represents the output or it doesn't – close enough doesn't matter.

The virtual proofing process should fit into the workflow seamlessly. In the best cases it should seem like an extension of whatever application the user is involved with. Remote Director is too comprehensive to act like a simple plug-in but through integration it can act as an extension of an application, digital asset management system and content management system.

Ease-of-use is also critical to the success of the process. We cannot expect all users to understand the technology and to be proficient by using it occasionally. The success of any project should not hinge on the lack of one approval. In the case of



Workflow automation with Proofflow and the Remote Director API

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sophisticated software like Remote Director, this means that the information must be available in different forms for different levels of users with automated ways to mitigate problems as they arise.

Control over how the system is used is done through an Admin function. Managing the output of displays is done with software that continuously checks to see that the displays used by the participants are still properly calibrated. Another automated feature utilizes “hot folders” with assigned trigger events to transform or route files. For example, after a proof has been created, a proof “hot folder” can be created as a way for image files to be automatically added to the proof. Alternatively, another set of rules could point to a RIP and output Tiffs as part of the overall workflow. Providing semi-automated functionality such as this further relieves creative departments of having to go outside their skill sets and add IT professionals to manage an infrastructure, assets and the overall process.

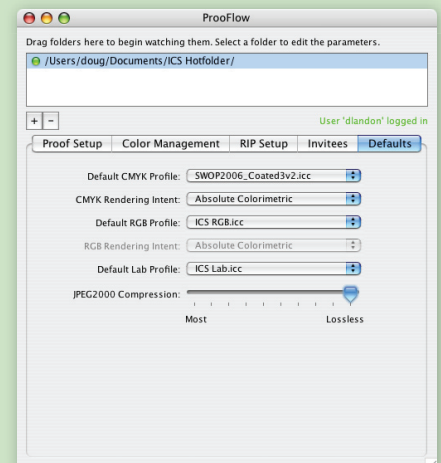
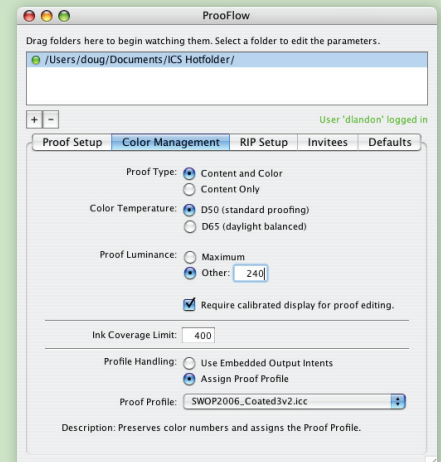
VIRTUAL PROOFING AS A GOOD WORKFLOW CITIZEN

Interoperability is a key to successful digital workflows today and that often requires that the application or solution provide either compliance with standards that enable interoperability or an application-programming interface (API) to allow hooking into a host application. ICS provides both and their customizable API has already been successfully integrated into Xinet’s WebNative Portal, Artworks Systems’ Nexus, Dalim’s Mistral and Wave’s Mediabank as well as several in-house custom solutions. Plug-in integration is also available into Gradual’s Powerswitch workflow automation systems. According to ICS, several other integrations to file transfer solutions and DAM’s are currently in development in addition to their OEM Partners, Vio, Adstream, Dev Zero G and CertiFyle.

Project Management

Remote Director includes its own built-in *project management* scheme that works in conjunction with and not instead of other third-party publishing servers, DAM or CMS systems or databases. The user is guided through the creation of file cabinet folders step-by-step with the help of a wizard. True workflow project management systems are not simple object storage any more. In the case of Remote Director the associated notes, revisions and sign-offs related to the proof are stored along with it. When it comes time to archive the proof Remote Director will make a compressed file for storage that includes profiles, color parameters and annotations.

Adding the Metadata that describes the proof viewing conditions is a new development in Remote Director. Metadata that is added to source PDF files are available to other applications or digital asset management systems that can read this data and add it to the digital record of the file. In project management terms, this is an extremely important development because files that are approved or transformed in some way can be noted as such with metadata and this metadata can be used for searching on the files or as triggers for downstream actions.



Proofflow dialogs create automated workflow templates

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FOCUS ON OUTPUT, SCREEN AND PRESS

Remote Director is designed for critical color evaluation of images on-screen. Beyond system calibration, one of the most important factors in displaying an image on a monitor so that it accurately represents printed output is the presence of paper white within the field of view. The human eye is extremely dynamic and will continually adjust to what it is looking at. By surrounding the image with a color and luminance corrected simulation of the actual paper white, your eye will keep the proper relative scale for accurate color perception.

Images are made up of at least three or 4 individual channels, Red, Green and Blue or Cyan, Magenta, Yellow and Black. In addition to these, spot color and mask channels can be part of the image file as well. It is often important to be able to isolate and view channel specific details. The Channels panel within the Remote Director Tools palette gives you the ability to view any combination of these channels at a time.

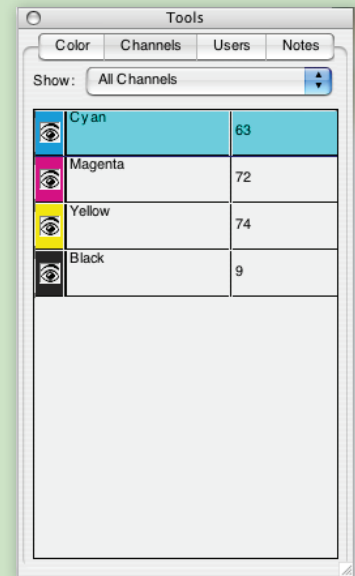
The *Rendering Intent* popup list changes the rendering intent associated with the selected source profile for the active Image. This list includes the three standards, Absolute Colorimetric, Relative Colorimetric and Perceptual. Remote Director is not only about the numbers. Rendering Intent provides for subjective evaluations as well as absolute numerical one. As further evidence of support for subjective evaluation, Remote Director allows for turning on anti-aliasing during the ripping process. The result is that fonts and image edges are artificially smoothed to give them a more pleasing appearance when ripping to lower resolutions.

Additional color information is available through views of the monitor's color gamut. Out-of-gamut image colors can be highlighted within the image for a quick visual check. Today's graphics cards all work in 8-bits. This means that only 256 shades of Red, Green or Blue that can be displayed on the monitor. The process of calibrating monitors can reduce this number further and this is where problems can be introduced. A standard non-DDC LCD monitor calibrated to D50 can potentially lose 10% or more of its Blue channel. The impact of this loss can manifest itself in banding within the fine color gradations. Remote Director has addressed this problem by making use of the high-speed computational capabilities in today's graphics card GPUs to virtually expand the bit depth of the graphics card. With Virtual 10-bit processing enabled, Remote Director's image rendering can display 1024 distinct shades of Red, Green or Blue.

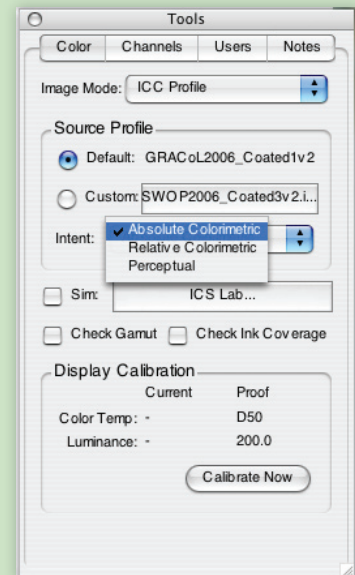
OUTPUT FOR PROOF

When Print permission is granted, the Print and Export Active Image to TIFF option under the File menu will be enabled. Selecting Export Active Image to TIFF will download a high-resolution copy of the currently active image and store it to disk. The downloaded .tif file will be an exact copy, with all channels and color data kept unchanged. It's an ideal product for local proofing.

The PressOK profile is used in conjunction with the Remote Director's PressOK press-side scanner option. This profile is used to accurately display the scanned



Remote Director Channels palette and on-screen densitometer



Rendering Intent selection in Remote Director

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press sheet on screen. Selecting the Pressroom Mode checkbox puts Remote Director into press mode. Press mode optimizes the Remote Director GUI for the special needs of press-side proofing.

A prerequisite for Finishing a proof is that all required participant signatures must first be entered. If any of the Participant signatures are missing, the Finish Proof selection is grayed out and disabled. The Signoff tab opens up a panel where you can see the signoff status for all of the participants of a proof on an image-by-image basis.

The Science Supporting Virtual Proofing

STANDARDS: SWOP® AND GRACOL®

For many years the unsung and tireless activities of industry trade groups acting ad hoc or organized formally have assumed the mission to bring best practices and standards to the graphic arts, prepress and printing industry. Beginning in 1996 with a group called the Graphic Communications Association (now IDEAlliance), the mission to document general guidelines and recommendations that could be used as a quality color printing reference source has morphed into the GRACoL Committee. They developed, maintained and published printing guidelines that have since become de facto standards at many pressrooms. The mission of GRACoL is to improve communications and education in the graphic arts by developing best practices that reflect the influence and impact of new technologies in the workflow of commercial offset lithography. GRACoL is a registered trademark of IDEAlliance. Learn more at <http://www.gracol.org>.

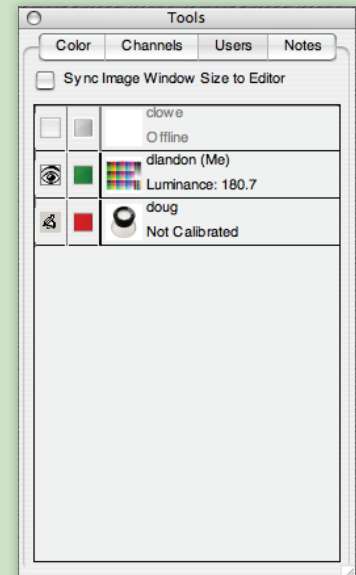
Specifications for Web Offset Publications (SWOP®) is another program currently managed by IDEAlliance. Begun in 1975 to determine uniform specifications and tolerances that would result in consistency and quality output, in 2005, SWOP merged with IDEAlliance who now coordinate development of standardized specifications and guidelines, certification programs, software tools, educational seminars and peer support networks. Remote Director is SWOP certified. Learn more at <http://www.swop.org>.

METADATA

ICS is a member of the Ghent Working Group for developing a metadata standard for upstream content creation. This essentially is an extension to the Job Definition Format (JDF) that in practice begins at preflighting and extends to post-press processing.

PANTONE MATCHING SYSTEM AND GOE™

Pantone color libraries can be licensed and added to Remote Director by the end user. Once installed these libraries are displayed when encountered in proofs.



Remote Director displays participant color calibration status in real time.



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OPERATING SYSTEM MANAGEMENT AND OPTIMIZATION

Remote Director utilizes the graphics processing unit (GPU) of the built-in hardware to compute the complex 3-dimensional color modeling. The application maps up to 128 regions on the display for uniformity and considers this when using the high-bit DDC/CI automated calibration. In use, switching between different ICC profiles and N-channel views is dynamic and based on a 10-bit virtual display. ICS patented L*Calibration is based on the luminance level on the screen.

HARDWARE CALIBRATION

Remote Director supports the GretagMacbeth™ EyeOne monitor calibration sensor or the X-Rite DTP94 (also known as the Monaco™ Optix XR) for the measurement of the display necessary to calibrate and profile the display. Both can be used to accurately measure both CRT and LCD displays. The following displays can support SWOP® certification conditions: Apple® 20", 23", 30" Cinema Display, Apple G5 iMac, Eizo® CG21, CG210/211, CG220/221, LaCie 321, and Quato IntelliProof 213.

Use Cases

The following cases illustrate how virtual proofing is being used; the issues encountered adopting this new technology and the returns resulting from the investment. In each case, the users experienced significant time and material savings to satisfy their ROI expectations.

CASE #1

THE LAB NYC



The LAB NYC is a high-end retouching and prepress firm based in New York City. Their clientele includes Jaguar, GlaxoSmithKline, Levis and British Airways.

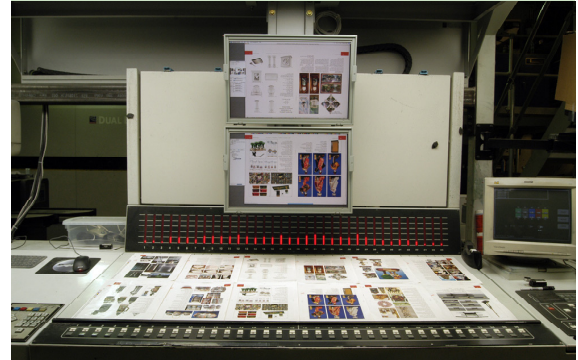
GOALS

1. Save money on proofing costs with virtual proofing
2. Develop better internal color management procedures including monitor calibration
3. Reduce the turnaround time on client projects

TEST

A team consisting of senior management, operations staff and color retouching experts spent three months evaluating systems from Kodak, ICS and CGS. Their criteria were features, functionality, color accuracy, ease of use and price.

The evaluation also included what the potential impact on their business as a whole would be. What would be the disruption to their workflow or their revenue production? How would their clients be affected?



A typical Remote Director press-side installation

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The LAB chose Remote Director because:

- It achieved an excellent color match to their existing hard copy proofing systems
- The setup process and ease of use were superior to other solutions
- It delivered significant cost savings
- The initial investment was less than for alternative monitor proofing solutions

IMPLEMENTATION

Remote Director was initially installed in the retouching department on a purpose-built GTI viewing booth and duplicated at customer locations. After successful testing, it was installed on other retouching workstations.

THE BOTTOM LINE

Six months after the installation of Remote Director:

- Consumable costs have been reduced. The LAB expects to see savings up to \$100,000 per year
- Color management procedures and skills have been elevated to a higher level
- Viewing conditions at client locations have improved to the betterment of all
- Job turnaround is much faster leading to increased studio revenue
- The LAB plan a big push to the rest of their clients

CASE #2

DIGITAL COLOR CONCEPTS



Digital Color Concepts, DCC, is a highly regarded prepress and printer. For 20 years, they have operated as a company where customer satisfaction is paramount. They operate offices in New York City and a state-of-the-art printing facility in Mountainside, New

Jersey. ICS Remote Director joins state of the art proofing solutions from most major manufacturers.

“We are using 75% fewer hard proofs internally and the system paid for itself in two months.”

Paul Codi, Operations Manager

GOALS

1. Save money on early and internal rounds of correction. Before implementing virtual proofing they were generating over 1,000 hard copy proofs per month using Fuji FinalProofs, Kodak Approval and Dupont Chromapro Inkjets
2. Reduce cycle time between customer corrections

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3. Create a tighter line of communication with clients and streamline their workflow system

TEST

In February 2007, DCC began testing Remote Director against another of the leading SWOP certified monitor-proofing solutions. The four week evaluation took place with the following criteria:

- How well the systems matched their reference hard copy proofing system
- How well they simulated different printing stocks and printing conditions
- How well the system integrated with DCC's existing workflow

DCC chose Remote Director from ICS for the following reasons:

- Better user interface
- Superior color management capabilities
- Impressive ICS support

IMPLEMENTATION

Initially Remote Director was installed in a central color viewing area but within a few weeks it was rolled out to each of their retouching workstations. They now rely on the system to proof color corrections and photographic retouching.

THE BOTTOM LINE

Within three months, DCC was using 75% fewer internal hard copy proofs and the system had paid for itself. Turnaround time for projects has been shortened for projects with multiple rounds of corrections.

DCC is now integrating Remote Director into their Xinet workflow and demonstrating to more of their clients the benefits of virtual proofing. A side benefit of the success of Remote Director is that DCC can control the client's proof viewing environment. DCC's long-term strategy is to install Remote Director in every major client location as well as in their new sheet fed pressroom in New Jersey.

Conclusions

Virtual proofing is here to stay. Virtual proofing is built on mature technology and is gaining new believers even amongst the most conservative pressmen. Technologically speaking, it is now possible to configure a digital end-to-end, creation to output, virtual proofing workflow that will at the minimum replicate the analog process. When you add to that the many possibilities color modeling adds for emulating substrates and viewing conditions the comparison ends.

This is good news for ad agencies and prepress shops where relationships are maintained with customers based on quality and accuracy. Replacing a hard copy with a virtual proof is a cultural shock and there has been resistance that has

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delayed widespread adoption. The implied value of the hard copy proof and the personal interaction provided by passing around and marking up a proof has been the standard for a long time. The advantages provided by a virtual proof are easy to define and demonstrate. For example, viewing separations and dots is so much easier with a RIPped file onscreen than it is with a hard copy and loupe.

The comparison that this transformation represents is similar to the revolution that was desktop typesetting. Twenty years ago we were introduced to WYSIWYG, *what you see is what you get* with type. Today layout programs have built-in color management engines so that users can see an approximation of the finished piece while designing and laying it out. The same is true with virtual proofs but since we are asking a virtual proof to act as a contract proof, the stakes are much higher. The science under the hood that defines and manages the onscreen view is considerable and represents a huge investment for companies that specialize in it. ICS brings many years of expertise and practical field experience to enable quality onscreen color to happen.

Comprehensive solutions such as ICS Remote Director are so deep in functionality that some companies seem to have to grow into them incrementally. As we learned from case studies with customers, it's important to allocate some time to training so that enough of the functionality is understood to take advantage of the features of the system. The good news is that even using a scaled down proofing workflow companies are achieving their ROI in a year or less. It's relative and is directly proportional to the number of hard copy proofs generated day-to-day that are being replaced by virtual proofing.

The eventual goal of virtual proofing is seamless integration in computer-integrated manufacturing. On the one hand, we have some movement towards the development of inter-application automation via the instructions carried out through Job Definition Format metadata. This satisfies the machine-to-machine communications. But with virtual proofing, we have digitization of the most subjective part of the manufacturing process.

With virtual proofing we achieve the following review and approval criteria:

- Ability to reach consensus of the current status of an asset graphically
- Documented history of the evolution of the asset available as recourse should it be needed
- Elimination, to the extent it is possible, of time lag in the review process and quicker time to market for the product
- Better communications between project members resulting in an overall increase in productivity

Adding these advantages to the accepted decrease in hard copy proofing costs is a compelling argument for adding virtual proofing to any ad agency or prepress workflow.

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60 MADISON AVENUE
NEW YORK, NEW YORK 10010
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