TOPAZ RIP™ For WINDOWS

VALLOY Incorporation

Turning your Printers into Geese laying the Golden eggs.

White Paper

About Raster Image Processor

2003. 10. 15

Valloy Inc.

Turning your Printers
into Geese laying the Golden eggs.

TOPAZ RIP™ For WINDOWS

Overall

VALLOY Incorporation

Proofing/Printing Workflow

(proofing)

(printing)

Original	Digitalizing	Digital-editor	Reproducer	Printer	Output
Real Object	Digital Camera	Image Editor	Profiler (look-up table)	Small format pr.	Paper Banner Film and etc.
Painting art	Scanner		Calibrator	MFP LFP/GFP	
Proof reference	Graphic Art		(ICC profiles) (linearization)	copier / laser pr.	Thick material, Plastic, Stone, Glass, Wood, Textile, Metal and etc.
	Cad Drawing		**Rip Software**	Flat-bed plotter	
				Imagesetter	Separate Film
				Platesetter (CTP)	Separate Plate

Turning your Printers into Geese laying the Golden eggs.

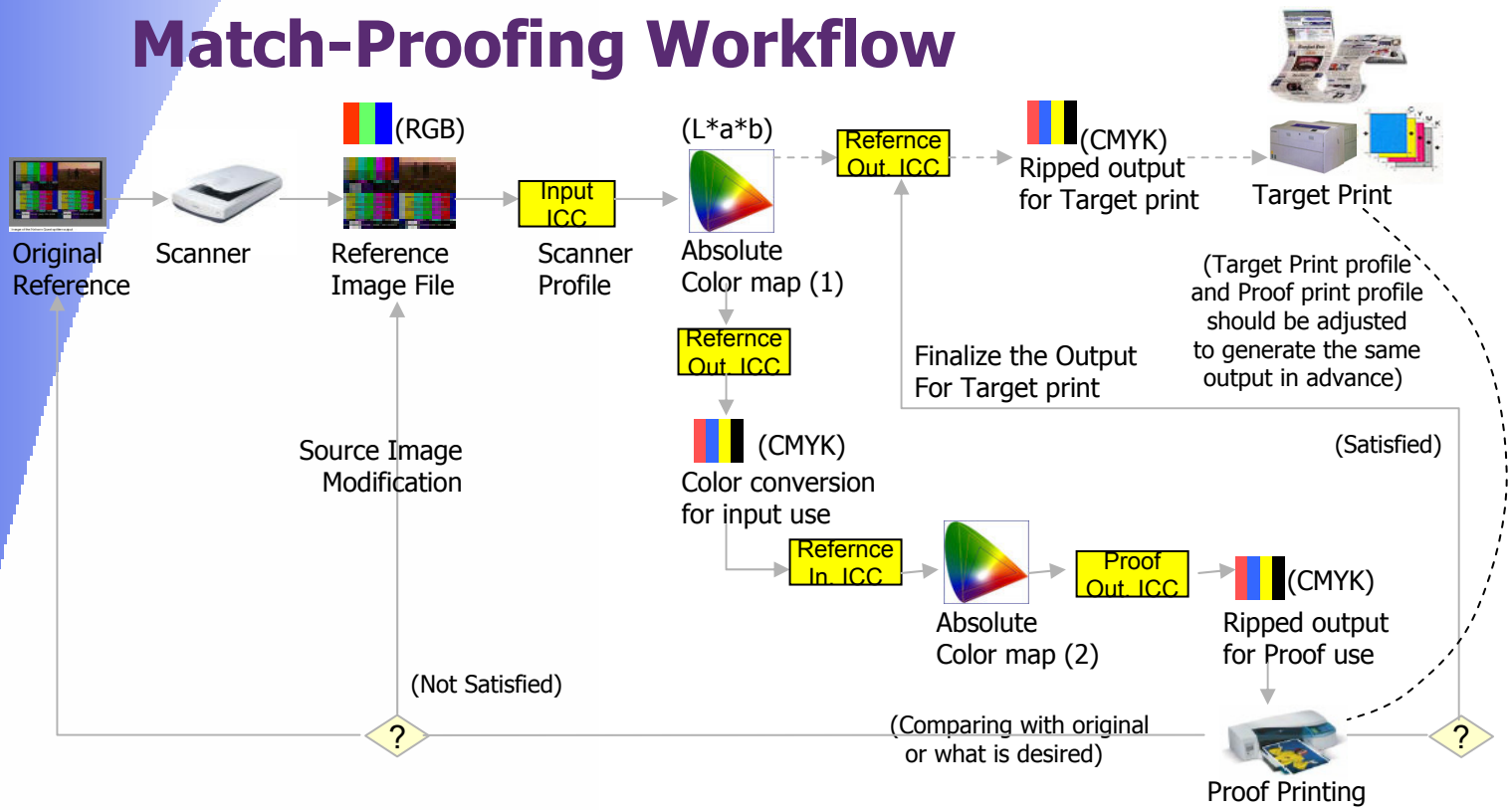
TOPAZ RIP™ For WINDOWS

Color Matching

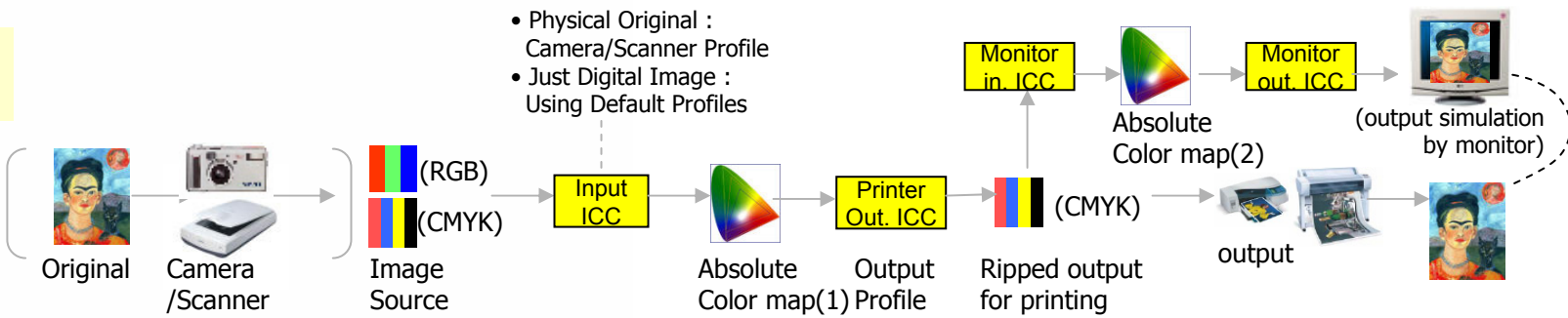
VALLOY Incorporation

Match-Proofing Workflow

Hard-Proofing Workflow



Soft-proofing Workflow



Turning your Printers
into Geese laying the Golden eggs.

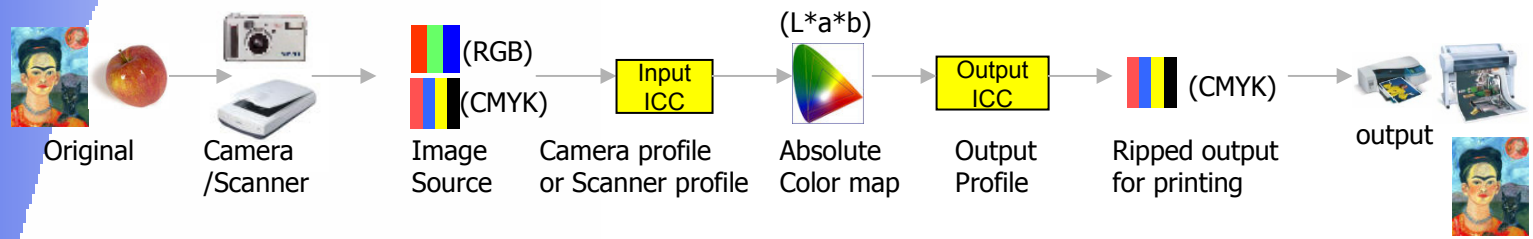
TOPAZ RIP™ For WINDOWS

Non-Color Matching

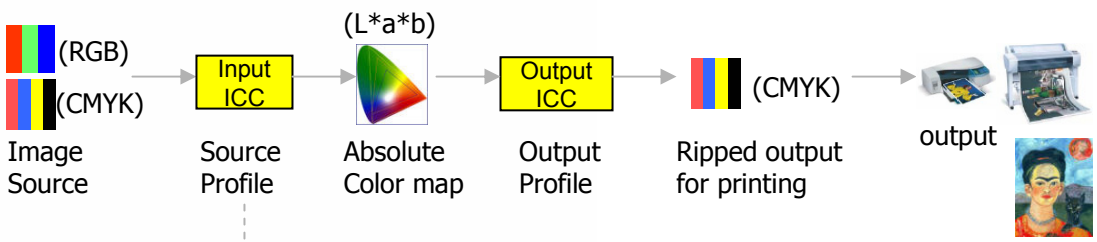
VALLOY Incorporation

Pleasant Color Printing Workflow

Color printing
from physical original source



Color printing
from Digital Image



CMYK Input Profile: US Web Coated SWOP, TOYO, DIC, Euro and etc

RGB Input Profile: AdobeRGB, AppleRGB, ColormatchRGB, sRGB, Digital Colorhub and etc.

Turning your Printers into Geese laying the Golden eggs.

TOPAZ RIP™ For WINDOWS

Raster Image Processor

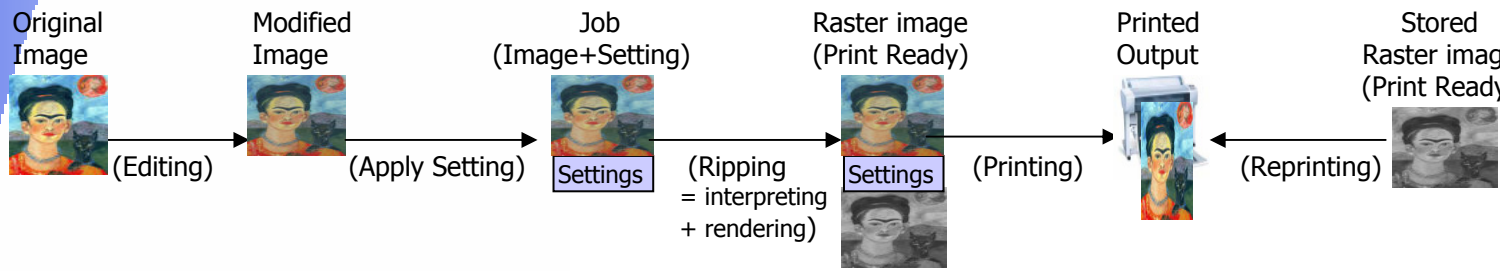
VALLOY Incorporation

Reproducer (Rip)

- PS interpreter
- Mechanical Adjustment
- Color Management
- Rasterizing
- Job Management

Rip Software

- Interpreting complex PS language for various manipulations on PS
- Controlling full features of specific printer / Enabling large printing
- Enhance color / maintain original color / predict output color (proof)
- Preserving Quality of Raster Image after manipulation like rescaling
- Speedy printing / Printing workflow management / Remote control



Layout / Mechanical	Scaling Cropping Rotating / Mirroring Tiling / Nesting	Media Maximum Printable Area Dot pattern Resolution / Image Size	Print Annotation Mark (Crop, tile, Registration,Overlap) Copy / Nesting	No. of Pass Uni/bi Direction Feeding speed	
Color Management	Color Correction	ICC profiles	Color Calibration Color Tweaking Spot color control Color Separation		
Rasterizing			PS options Processing options (Color / Gray / Separate)		
Job Management	Printer setting Hotfolder/Port setting	No. of copies		Queue / Hold setting Job monitoring / ordering Multi-professing	Coping / deleting Job Archiving Job / output

Turning your Printers
into Geese laying the Golden eggs.

TOPAZ RIP™ For WINDOWS

Features of Rip

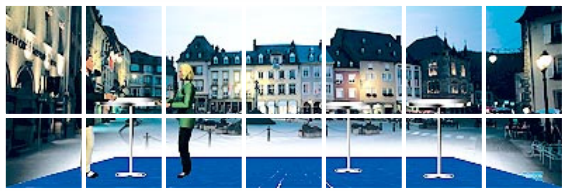
VALLOY Incorporation

Layout / Mechanical Features

Scaling : Image Editor cannot handle 'super-scale' images.
Rip can scale-up the image into super-scale for outdoor sign market
In this case, load management, printing speed, maintaining quality (resolution) are important

Cropping, Rotating, Mirroring : Basic layout options for efficient printing work.
In this case, stability and speed are important.

Tiling : This is used when output image size exceeds paper size. (manual sticking or sewing of tiles is required)



Nesting (media saving) : This is used when output image size is much smaller than paper size.
(People would like to save blank area of expensive media with printing various images at the same time)

Auto-nesting : Recent versions of Rips are supporting 'queue-oriented' to maximize printing productivity. Nesting page can be used as a 'job container' for this automatic process.
So, Auto-nesting requires arraying algorithms and criteria of starting rip&print.

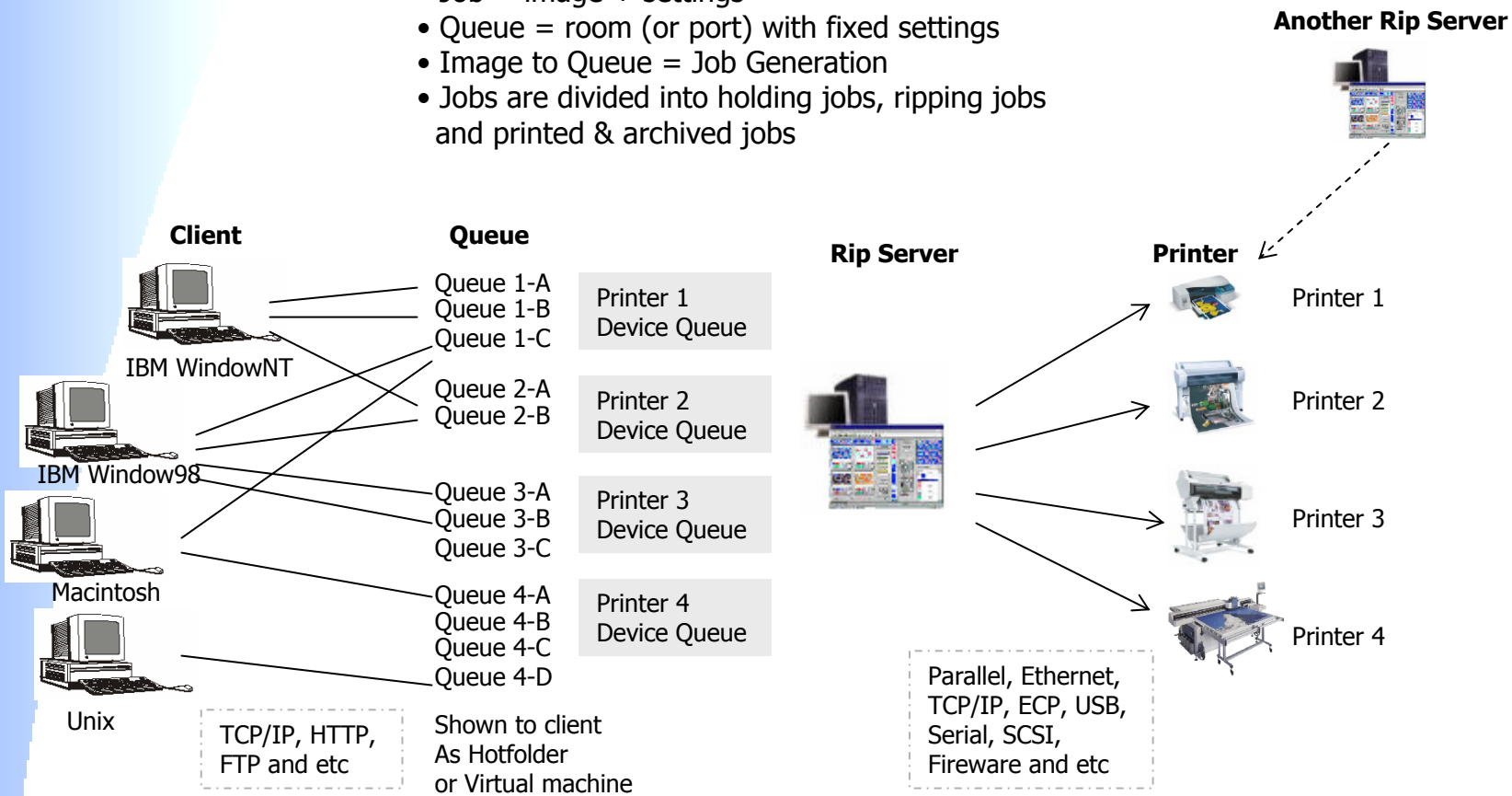
Mechanical adjustment : Real-word printing meets various outer noise factors.
So exact printer/media ICC profiles and calibration are not sufficient to produce expected quality of output.
People us different Ink, Media and mechanical properties of machine can change. Even atmospheric conditions can change output quality slightly. This factors are;

- Media Calibration DATA : Media size and thickness, Media type (hard or soft), media color and etc
- Machine mechanical properties : Feeding speed (LPI), Uni/Bi direction, Number of Passes, Vacum, Printer Head height and etc
- Ambient temperature and humidifies

Features of Rip

Job Management

- Job = image + settings
- Queue = room (or port) with fixed settings
- Image to Queue = Job Generation
- Jobs are divided into holding jobs, ripping jobs and printed & archived jobs



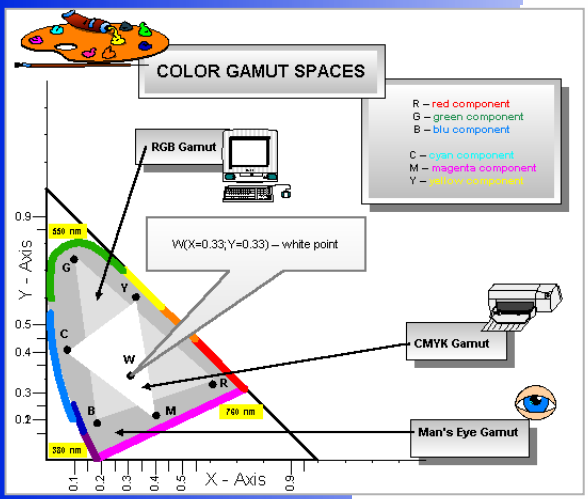
Turning your Printers
into Geese laying the Golden eggs.

TOPAZ RIP™ For WINDOWS

Features of Rip

VALLOY Incorporation

Color management (1) : "ICC Profile ?"



Color : Set of numbers (eg. RGB=200, 100, 15 or CMYK=100, 100, 0, 0)

Device-dependent color : The same number shows different color depending on Devices

Device-independent color : we need absolute number of Color Representation, "PCS"
** PCS : Profile Connection Space*

RGB ↔ CMYK

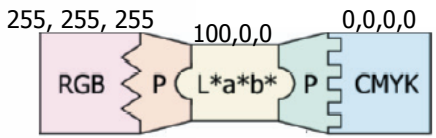
Absolute color can be converted to device-dependent color numbers and vise versa

↔ This mapping algorithm (or table) is called "**ICC Profile**", as a properties of device (or media)

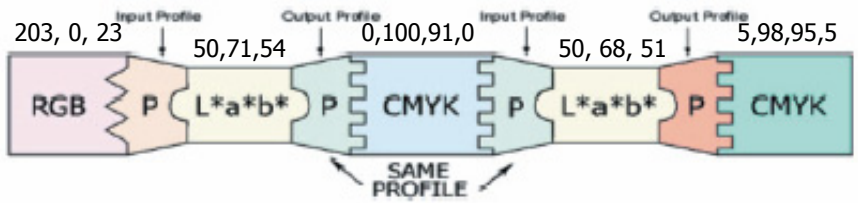
So, in ideal case, we can maintain all the same color view with all different devices.
But in reality, there's a limitation of different color gamut (any device cannot show any specific color).

[Color Conversion in ideal and real cases]

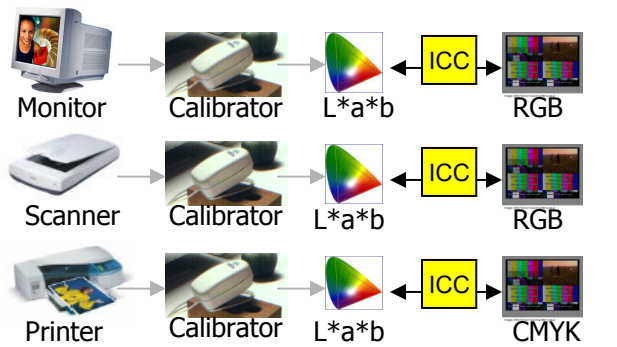
(a) Ideal Case : Pure White



(b) Practical Case : Different Red



[ICC profile creation by ICC Profiler with calibrator]

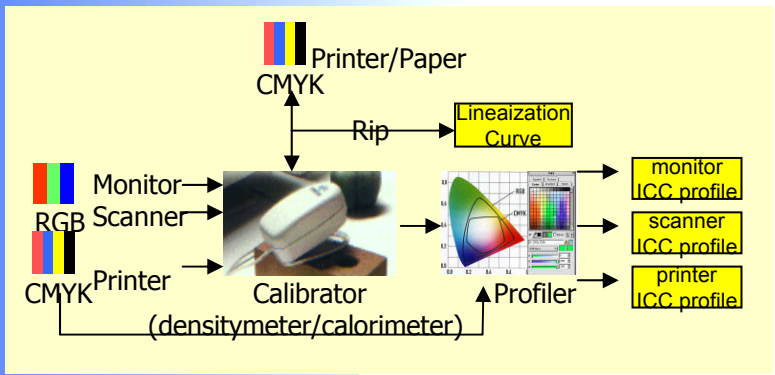


TOPAZ RIP™ For WINDOWS

Features of Rip

VALLOY Incorporation

Color management (2)



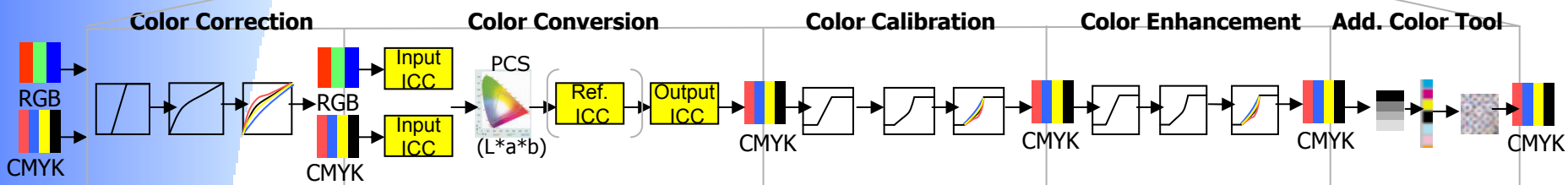
Rip Software

Profiler

- Screen LabProof
- ColorBlind ColorMatric
- Kodak MatchPrint
- ORIS ColorTuner
- Monaco MonacoPROFILER
- EFI Color Profiler
- ColorVision ProfilerPlus
- PraxiSoft CompassPro

Calibrator

- ColorSavvy
  CM2S, CMsC, CMsD
- X-Rite
  DTP41, DTP41/T, DTP32, DTP22
- Gretag Macbeth
  Eye-one, Spectrolino, SpectroScan
- Color Partner
  Color Scout A and S
- Spectrostar Spectrocam



1. Primary correction (Bright, contrast, Hue…)
2. Color Correction (all channels)
3. Color Correction (single channel)
4. Input ICC profile
5. Reference ICC profile (For proofing only)
6. Output ICC profile
7. Rendering Intent
8. White/Black point control (Total Ink Limit, Color Separation, Light Ink Control)
9. All channel calibration (Ink Reduction)
10. Single channel calibration (Linearization)
9. White/Black point enhance (Total Ink Limit)
10. All channel enhance (Ink Reduction)
11. Single channel enhance (Curve Tweaking)
12. GCR (Black Generation) and Gray Balance
13. Spot Color Replacement
14. Printing mode and Screens

* *RIP : Raster Image Processing*
PCS : Profile Connection Space
ICC : International Color Consortium

Color management (3)

- Beyond the 4 color (CMYK) system -

" These are some of the toughest colors to match in any four-color proofing and printing systems."

GRAYS

When adjustments are made to CMY inks to optimize tone reproduction or desired colors, gray balance will shift. For example, if magenta is added to print warmer flesh tones, gray balance will shift noticeably.

ORANGES AND GREENS

Some pure shades of orange and green are also a challenge for process color reproduction.
If these colors are critical to your image, talk to your printer, who may advise you to use spot colors, 6-color Pantone Hexachrome, or 7-color hi-fi printing.

PURPLES / VIOLETS

Rich, vibrant purples are notoriously tough to match and, in some cases, they may be outside the gamut of colors achievable using CMYK. Purples are reddish-blues. A slight shift toward either red or blue has a strong effect on final color. colors cannot be matched using CMYK.

PASTELS AND LIGHT SCREEN TINTS

Color shifts are more apparent in near-neutrals than in saturated colors. The human eye is more sensitive to color changes in light areas. The effect of paper base is so important that it can be considered a fifth color. In addition, a 4% highlight dot doubles in size if it grows by 4% due to process variability, which has greater visual impact than a 4% change in a 70% dot.

METALLIC AND FLUORESCENT COLORS

Some metallic colors, especially gold (jewelry, gold lamé fabric), are simply impossible to match using CMYK. Some gemstones, such as emeralds and garnets, also fall outside the gamut of 4-color process printing. Special metallic or fluorescent inks should be used.

Color management (4)

- Beyond the 4 color (CMYK) system -

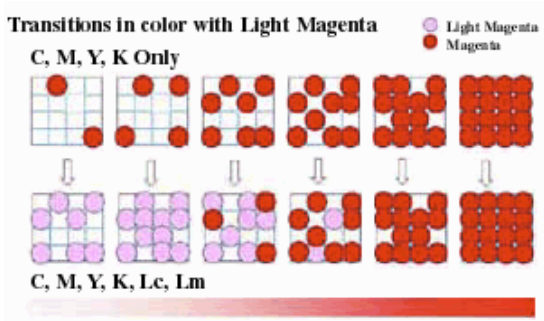
HI-FI COLOR (High-fidelity color)
processes that involve printing in more than four colors. It is not a single technology, but a whole series of attempts to discover a way to print a larger gamut of colors than is possible using the traditional four process colors (C, M, Y and K).

Color Space	Feature	Application
High Fidelity CMYKLcLm (Pigment or dye)	• Smoother transitions between colors • Improved pastel representation Excellent skin tones	• Portrait photographs • Complex gradient reproduction Fine Art applications
Hexachrome© CMYK+OG Pigment only	• Expanded gamut printing • Eliminates spot color printing • Hexachrome* proofing	• Bright color reproductions • Off-press proofing PMS* solid color matching

* PMS : Pantone Matching System

SPOT COLOR
Spot colors are specially mixed inks that come in a rainbow of colors, including some specialty inks such as metallic and fluorescent. Unlike CMYK or process color which creates colors by laying down layer of cyan, magenta, yellow, and black in varying amounts on the printed page, spot colors are pre-mixed and applied individually to the printed page.

CMYK + light cyan & light magenta



CMYK + Orange & Green

For example : PANTONE © **Hexachrome©** (patented)

Others : CMYK + Orange&Blue
CMYK + Orange&Blue&Purple
CMYK + light cyan & light magenta & Orange & Green
and etc.

WHAT RIP SHOULD DO FOR THIS ?
Light Cyan & Light Magenta : Diluted inks do not change the color gamut. Rip should to linearization for diluted inks and set criteria of ink change. Furthermore, Rip can set simple mixing rule in the intermediate range of light and full colors.
Orange&Green or Orange&Blue : Different full colors can change the color gamut itself. In this case, Rip need to control colors with totally different color mixing and mapping algorithm. Different ICC profiles and linearization are required.
Spot Colors : When spot colors are used to mix with other CMY colors, different ICC profiles and linearization should exist.
However, Spot colors are often used to keep specific color printed with pre-mixed ink independently, so simple color adoption library and linearization is required for this kind of color replacement.

Color management (5)

- Screen Technology -

Screen (Dithering Patterns)

A pattern of dots used to reproduce color or grayscale continuous-tone images. Screens are produced by photographing the original artwork through an actual screen of fine lines. The fineness of the screen can vary from 65 lines to 150 or more lines per inch. Sixty-five- to eighty-five-line screens are used for printing on newsprint. Better paper can accommodate finer line screens.

Halftone Screening

The representation of a continuous-tone image as a series of dots that look like gray tones when printed. Also called a screened halftone because traditionally the original image is photographed through a finely ruled screen, the density of which varies depending on the printer's capabilities.

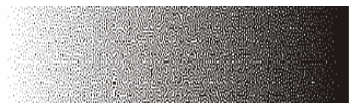
AM Screening (Traditional Halftone Screening)

Amplitude-modulated screening. Traditional or conventional halftone dots that are aligned along nice, neat (and visible) screen angles. uses varying dot sizes, varying dots shapes and equal line spacing (the screen ruling).
[Setting angle, shape, lpi and varying dot size for presenting tone]

FM Screening (Stochastic screening)

Frequency-modulated screening. Stochastic uses random dot placement, hence varying spacing between dots. Dots are the same size and shape in most versions. Dot size is measured in microns. This process differs from traditional halftoning in which the distance between CMYK dots remains constant while dot size varies to create the desired hue and intensity.
The concept of stochastic screening is… that dots placed randomly will not cause moiré patterns but it can cause graininess and other visual artifacts.
Stochastic helps achieve "Hi-Fi Colour". With stochastic, almost any combination of colours can be used to create either subtle or dramatic effects. The usual problem of stacking conventional screen angles is eliminated.
[Setting dot,random function and varying frequency/density for presenting tone]

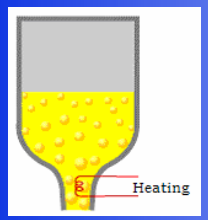
AM Screen (traditional halftone)

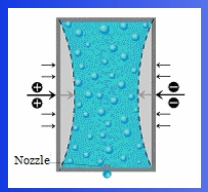


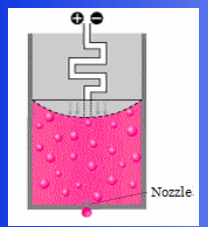
FM Screen (Stochastic screen)

* **screen angle**
  The degree of rotation at which a halftone screen is printed. Each element in a four-color separation must be reproduced with a screen that has been placed at a specific angle to eliminate moir patterns when the colors are superimposed. Black is normally 45 degrees, magenta at 75 degrees, cyan at 105 degrees, and yellow at 90 degrees. Precise alignment is required.
* **Moir pattern**
  An undesirable pattern in color printing resulting from incorrect screen angles of overprinting halftones.
* **Microdot Technology (Supercell)**
  Microdot technology handles the complex algorithms that place the dots "randomly", while electronic image processors and image setters at Focus Press capture the image and transfer it to the plate with very fine dots. For ink-jet printing, this is not a screen technology but a piezo head technology (to simulate fine-dot screens). Epson's Ultra MicroDot, the very smallest size of ink droplets are available today. An Ultra MicroDot is only 2~6 picolitres in size resulting in 4 times smaller than the diameter of a human hair.
* **Variable Dot Technology**
  This is not a screen technology but a piezo head technology, based on Ultra Microdot technology. Variable Dot Technology incorporates two new developments - Ultra-Microdots and the ability to print with different sized droplets.
  Smaller dots are not in themselves the final answer - the increased number of dots required to cover the page can reduce print speed. And so, EPSON have introduced Variable-sized Droplet functionality.

Head and Ink







Technology in Wide-format Printer

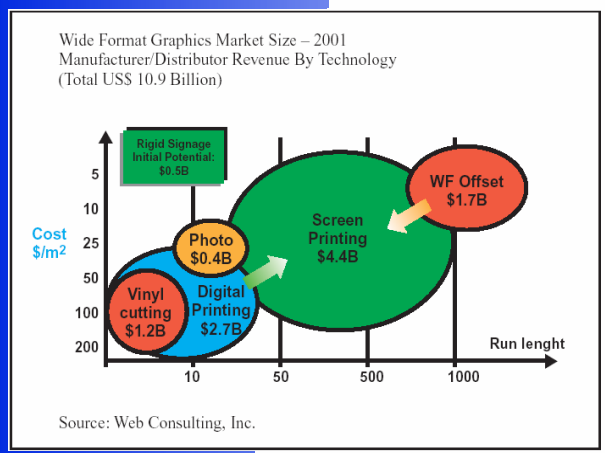
Inkjet Print Head

- **Thermal (Drop-on-demand)** : Canon(Bubble Jet), Hewlett-Packard, Lexmark
- **Piezo - Drop-on-demand Piezo** : Aprion Digital, Epson, Hitachi Koki Imaging Solutions, Kodak, Seiko Instruments, Spectra, Xaar
  - Continuous Piezo : Imaje for super-wide printers like IRIS printers, Scitex's Wideboard or Nur Macroprinters' Blueboard

- **Comparison**
  Thermal inkjet heads : Cheaper, Shorter lifetime, Aqueous Ink Only
  Piezo inkjet heads : Expensive, Reliable and have a longer lifetime, The flexibility in using and developing inks (Aqueous, Solvent, Oil, UV)
- **Major Manufacturers of Piezo Head for Solvent Ink**
  Epson piezo heads > Roland HiFi, Mimaki, and Mutoh. // Mutoh printers are resold by Kodak, Agfa, and several other places.
  Xaar piezo head (lower in resolution than those of Epson) > Raster Graphics, CreoScitex GrandJet, Xerox XPress, and Salsa.
  Spectra piezo head > Mutoh Lamiless, Vutek, Agfa challenger

Inkjet Print Ink

INK is [Base carrier : Water or Solvent] + [Colorant : Dye or Pigment] + [Chemical additives]



- **Water-based dye ink [Indoor Graphic Market]** : exceptional color gamut and quick fading.
  A new breed of enduring-dye inks is extending the life span of prints created with dye-based inks, but these inks produce a smaller range of colors.
- **Water-based pigmented ink [Indoor & Outdoor sign(banner) market]** :
  High resistance to fading and typically producing less vivid colors than dye inks.
  The pigment particles remain suspended in the water or solvent, they can clog the nozzles of some print-heads.
- **Solvent-based pigmented ink [Outdoor wide-color sign market]** :
  High resistance to fading in outdoor environment.
  Relatively cheaper price than that of Water-based inks. However Environmental problem is big issue.
- **UV ink [Outdoor market using various media]** :
  Very speedy drying. It's possible to printing on various materials.
  High resistance to fading in outdoor environment and no environmental problem.
  Cost is higher than Solvent ink, however, useful when printing on flat-bed materials.