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Best practice PDF Color Management

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Why do we have to do Color management in a PDF?

- RGB content in layout (Office-RGB, Digicam)
- Not designed for **this** printing process
 - total ink coverage to high
 - inconsistent black generation
- Spot Colors not correct
 - inconsistent alternate color definition
 - inconsistent spot color names for **one** spot color
- Use of device independent colors (CIELAB, ICCbased)
- Softproof of PDF pages

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Available color space definitions in a PDF file

- **Device dependent colors**
 - DeviceGray, DeviceRGB, DeviceCMYK
 - Separation (single Colors, All, None)
 - DeviceN (up to 32 color channels, additions defined as NChannel)
- **Device independent colors (calibrated)**
 - ICC-based Gray, RGB, CMYK
 - CIELAB
 - CalGray and CalRGB (basic color management functionality)
- **Default color spaces - used for mapping of color spaces**

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Color properties needed for color conversion

- **Correct Color Management maintains and in the case of color conversions honors the following color properties per object:**
 - Color space (Graycale, RGB, CMYK, CIELAB, spot color)
 - Color value
 - Color characterization (ICC profile, PostScript CSA/CRD)
 - Rendering Intent
 - Destination Color space or Output Intent profile (PDF/X)

 - Alternate Color Definition of Spot Colors (e.g. CMYK)

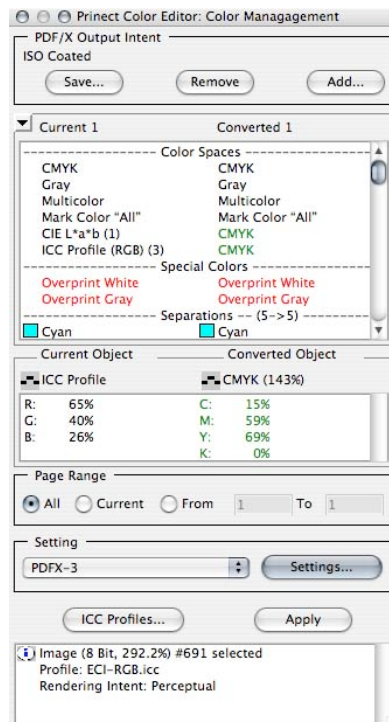
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Prinect Color Editor

- Information about the PDF (page)
 - PDF/X Output Intent
 - Color Spaces
 - Special Colors
 - Separations

- Color values per object
 - expected conversion values (only in licensed copy)

- Additional information per object
 - ICC profile
 - Rendering Intent



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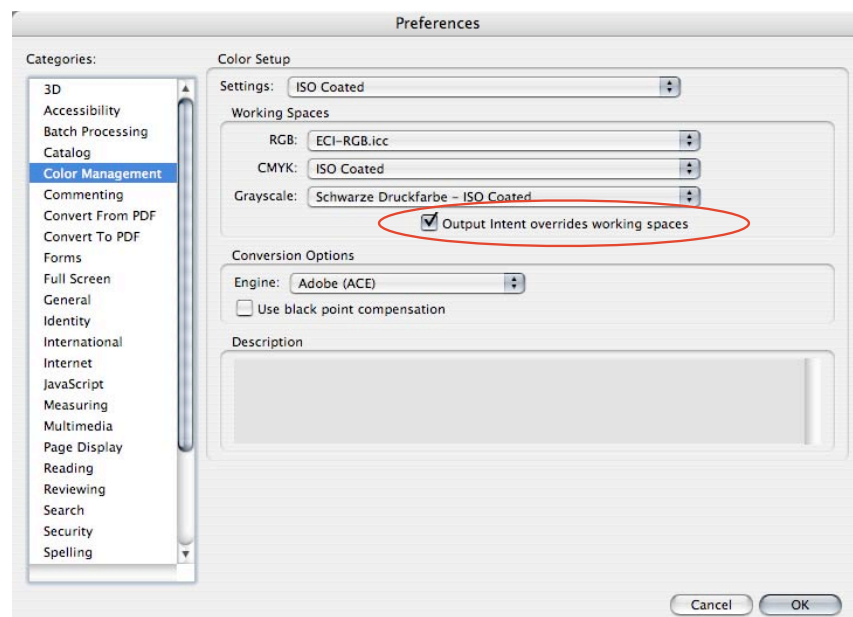
Acrobat Professional – Color Management Setup

- Color Setup

- Working Spaces

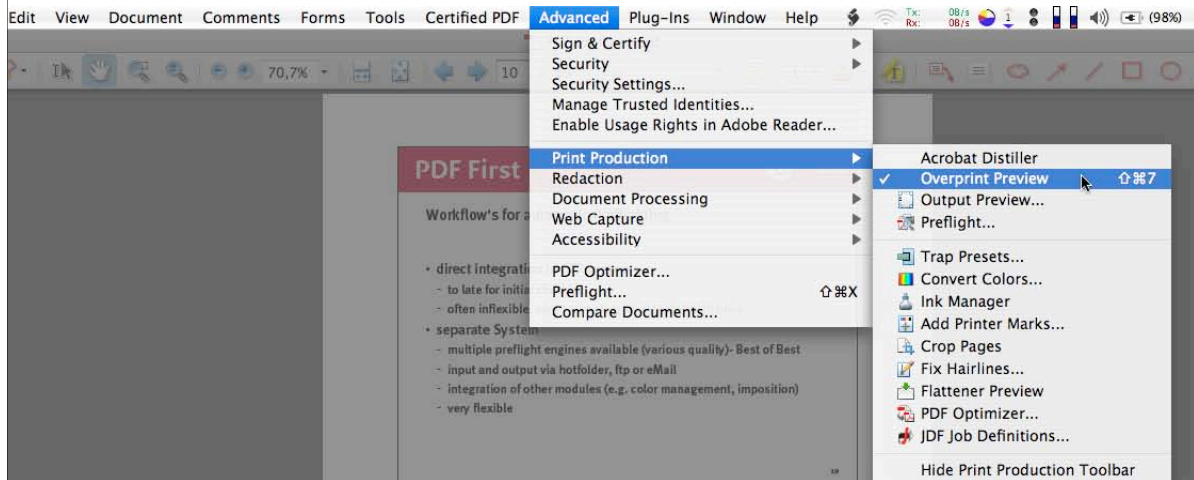
- Output Intent (PDF/X)

- Conversion Option



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Acrobat Professional – Important viewing options ...

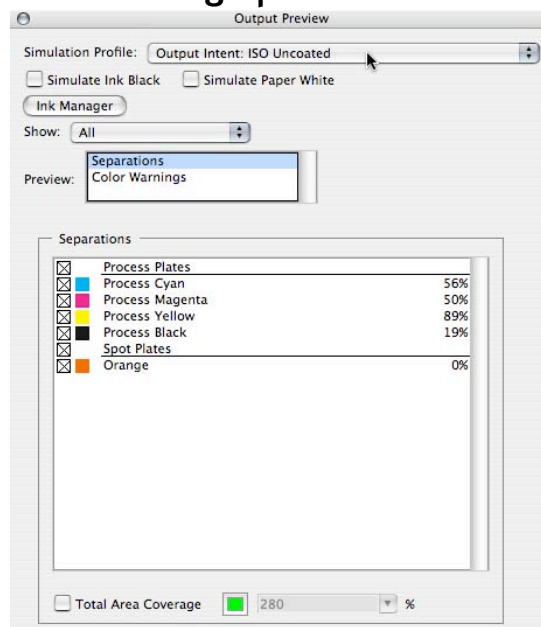


- Overprint Preview ON
- Output Preview ON and setup according to the intended output condition...

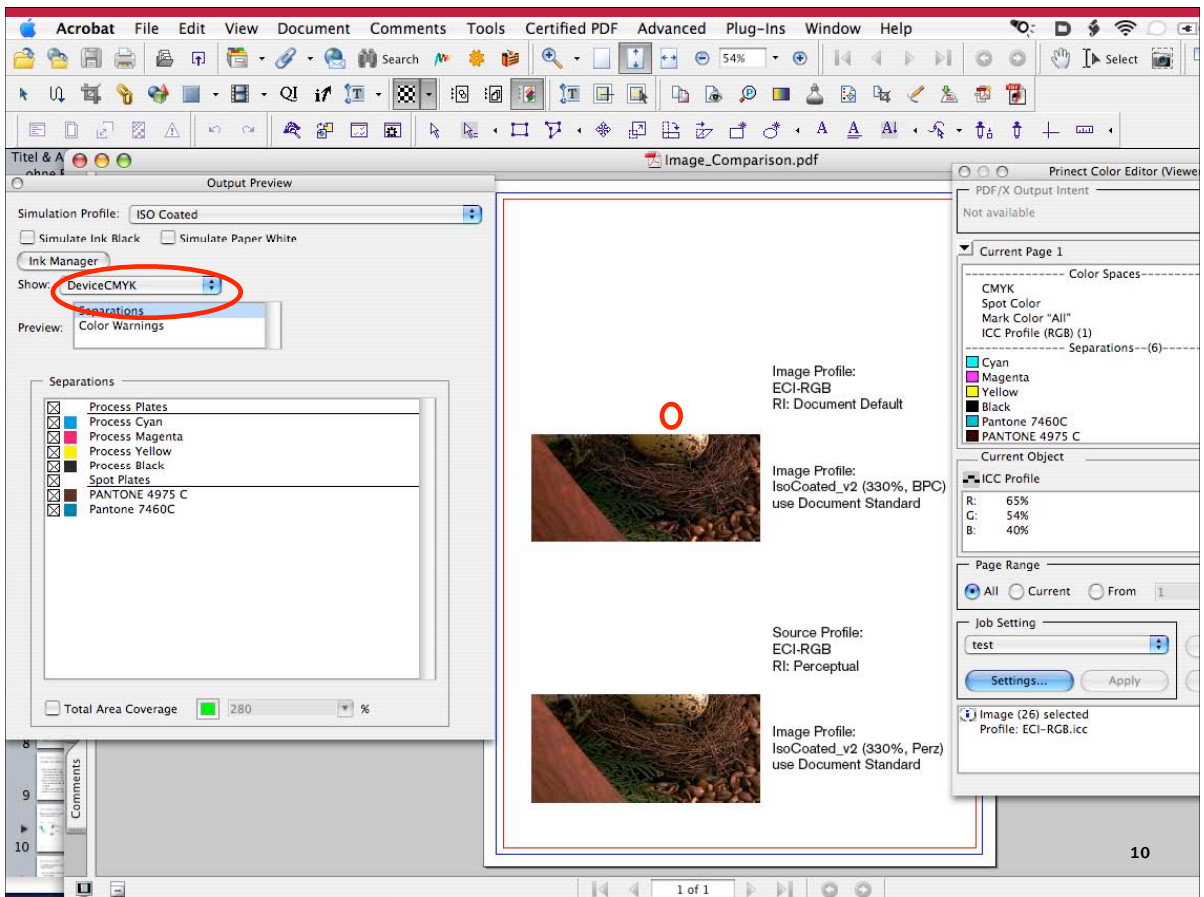
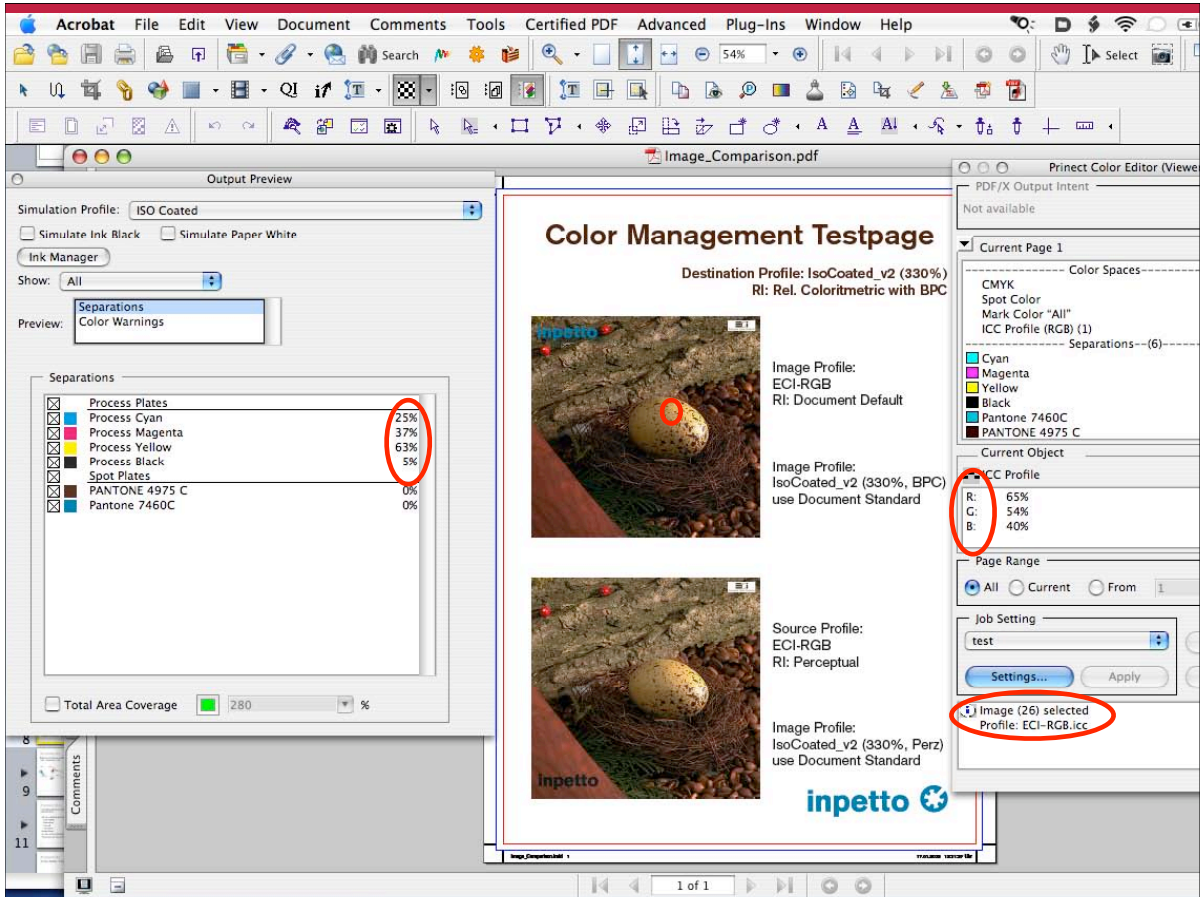
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Acrobat Professional – Important viewing options ...

- **Simulation Profile:**
Intended printing condition (Acrobat automatically selects the PDF/X Output Intent Profile if the respective option is set as shown before)
- Output Preview always shows CMYK and spot color values! CMYK of e.g. RGB objects reflect a color conversion! Measured color tints only reliable for DeviceCMYK and DeviceN.
- Optional Simulation of *Black Ink* and *Paper White*



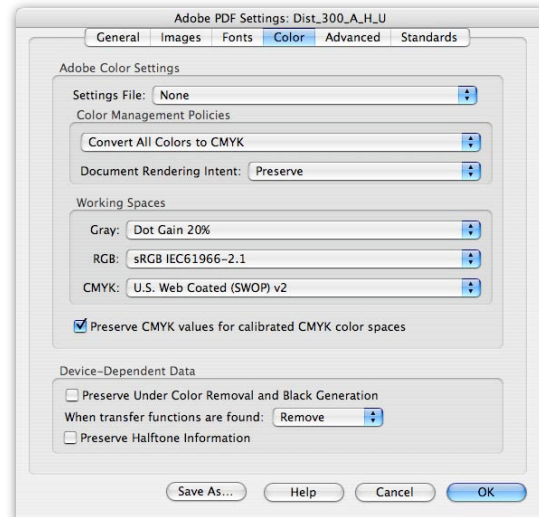
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Convert Colors using Acrobat Distiller

not recommended

- Color conversion strategy
- default profiles
- no support for rgb-gray conversion
- no differentiation between object types

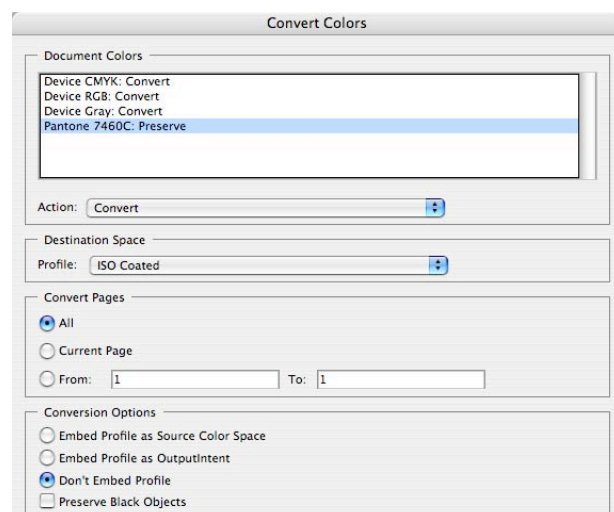


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Convert Colors using Acrobat Professional

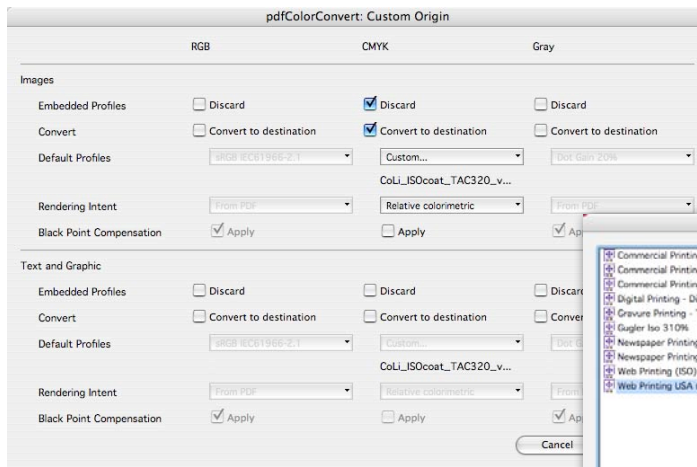
not recommended

- List of colors found in document
- Action to perform for selected color
- Destination profile
- Page range
- Treatment of destination profile
- Black Option (literal)



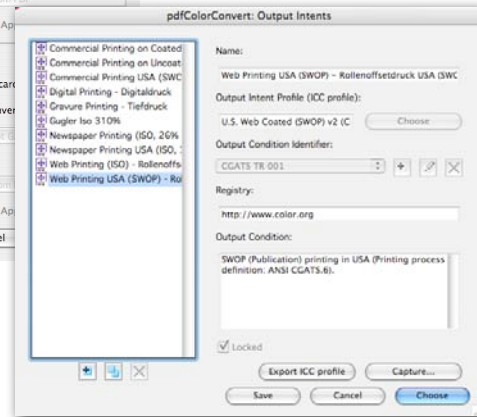
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preferred Color Setup - Example from callas pdfColorConvert



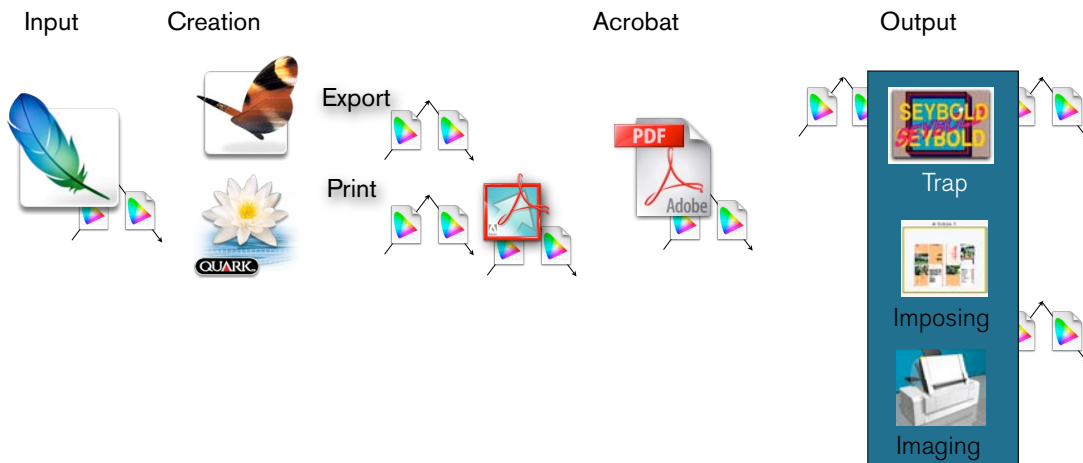
- Source object handling

- Definition of destination profile (output intent)



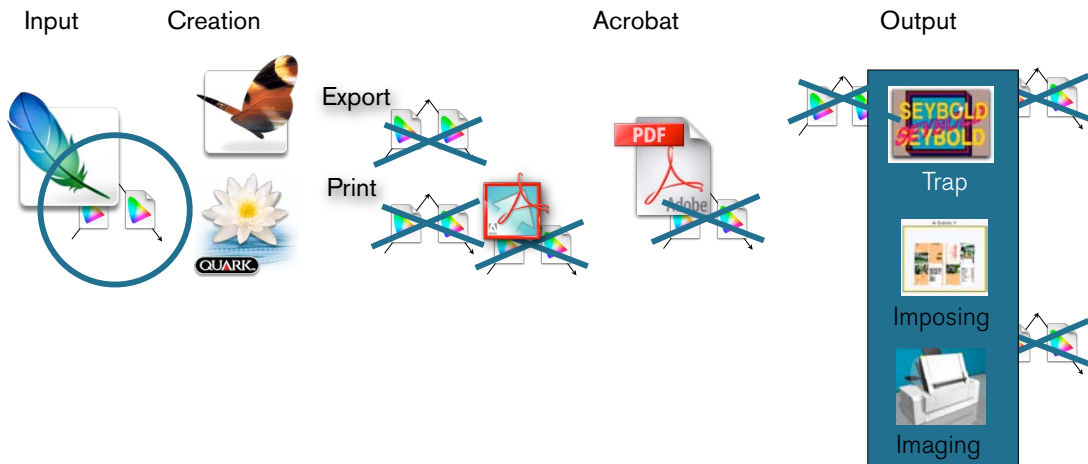
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Where in a PrePress workflow ***CAN*** color conversion occur



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Where in a device dependent workflow ***SHOULD*** color conversion occur



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Color Management on device dependent files PDF (X-1a/3/4)

- all Colors defined device dependent
 - DeviceCMYK
 - DeviceGray
 - DeviceN
 - Separation
- Output Intent (planned printing condition)
- no Source ICC profiles allowed
- Transparencies have to be flattened for X-1a and X-3

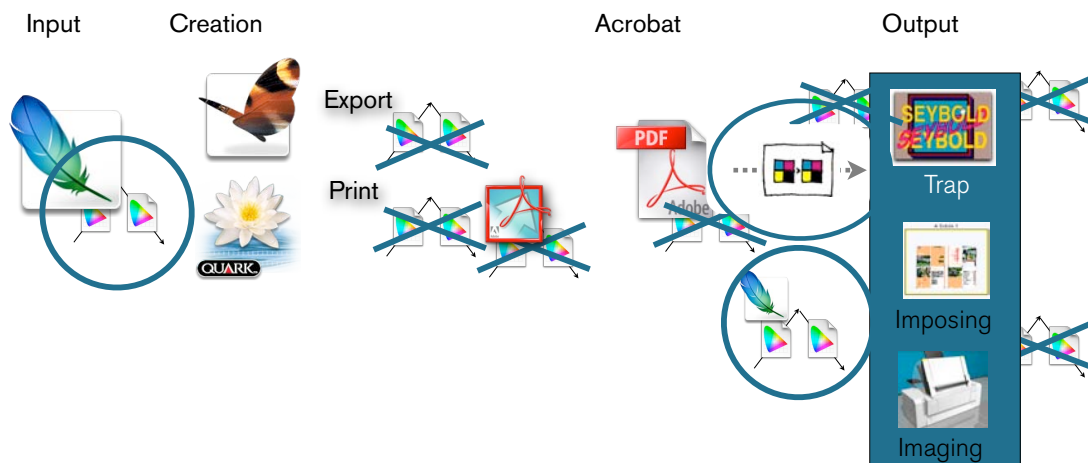
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Color Management on device dependent files Preparation

- define everything in Device Colors (DeviceGray/CMYK/N)
- leave color unchanged during Export
 - do not embed profiles (on Export)
 - no Color Management (on Print)
- convert to PDF/X-4, PDF/X-3 or PDF/X-1a after proper preflight
 - embedding the proper output intent

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Where in a device dependent workflow ***SHOULD*** CMYK to CMYK conversion occur



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Device Link Profile for CMYK to CMYK transformation

- **What is that?**
 - predefined combination of 2 profiles without the need of a connection color space
- **Why use it?**
 - pure color/ink preservation
 - exceptional colorimetric accuracy
 - preservation of black channel
 - ink saving
 - reduction of total ink coverage

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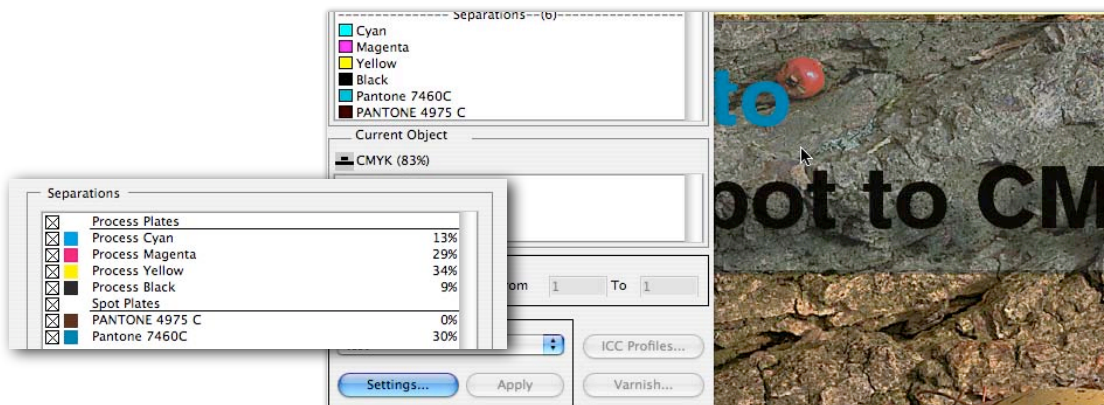
Color Management on device dependent files Conclusion

- **When performing a CMYK to CMYK conversion**
 - leave vectors alone
 - make usage of DeviceLink Profiles
 - use Output Intent as source profile
- **The usage of DVL technology makes a PDF reusable for other printing conditions**
 - **Drawback: The Output Intent of the PDF/X file gets ignored**
 - You have to make sure to apply the correct DL profile from Source (Output Intent) to Destination (new Output Intent) gets used

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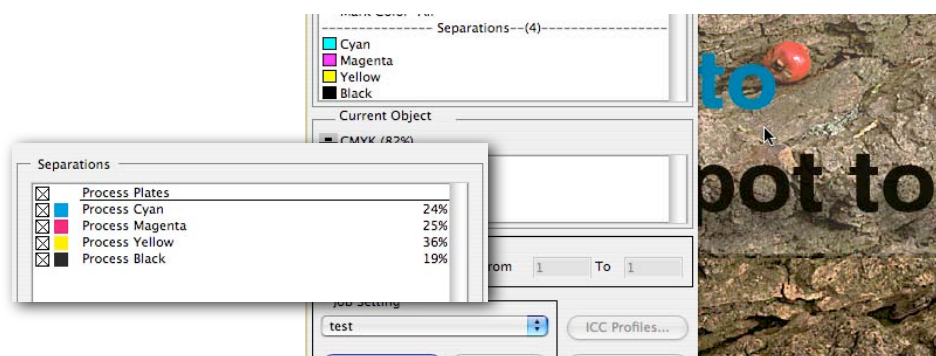
Color Management on device dependent files Transparency - a new challenge

- flattened transparency with Spot Colors
 - Image is set to overprint of a 30% tinted Spot Color Object



Color Management on device dependent files Transparency - a new challenge

- flattened transparency with Spot Colors mapped to CMYK
 - Converting Spot to CMYK or changing the overprint settings results in a different and unwanted color appearance

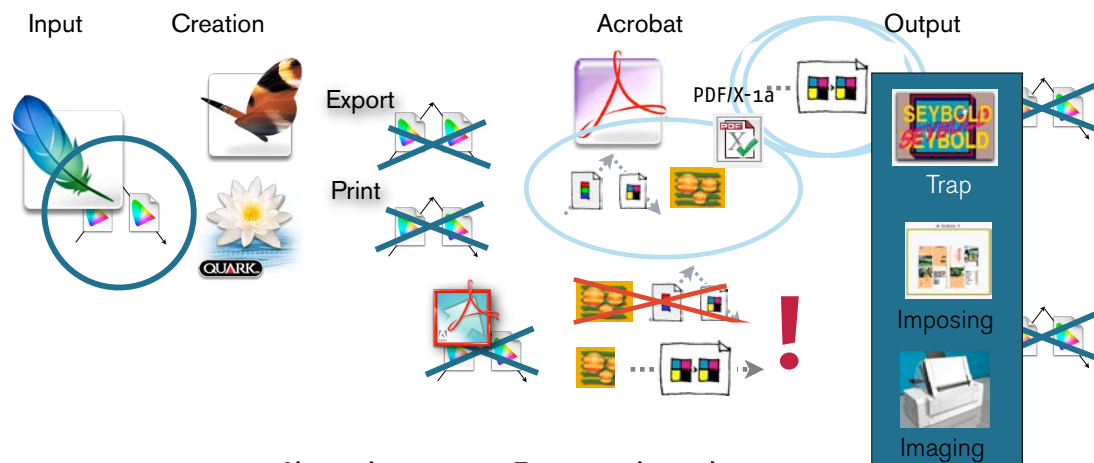


device dependent files with transparency effects Conclusion

- Only perform color management on flattened files using DeviceLink Profiles
- When converting spot colors to CMYK, check that the visual appearance did not change
- Do not change overprint settings of a flattened file
- **Better: Bring the transparent objects into the PDF and flatten at a later stage**
 - use PDF/X-4, which will allow live transparency (Support in CS3)

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color conversion with transparency



Alternative: preserve Transparencies and use native PDF renderer for output

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Color Management on device independent files PDF (X-3/4)

- all Colors defined device dependent and/or independent
 - ICCbased
 - DeviceCMYK
 - DeviceGray
 - DeviceN
 - Separation
- Output Intent
- use X-4 when working with live transparencies

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Color Management on device independent files most common: Office PDF's with DeviceRGB

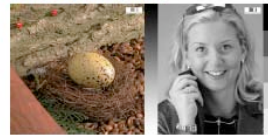
- steps required for such PDF's
 - valid assumption: all RGB is based on sRGB
 - if you now know which printing condition is required, you can make a valid PDF/X-3 file
 - for Vector Elements we should break the ICC law: convert according a *Lookup Table*
 - RGB Red should be come 100/100 Red
 - Office Cyan should become 100 Cyan
 - Office Gray should stay gray
 - convert to DeviceCMYK using *intelligent* pdfColorConversion methods

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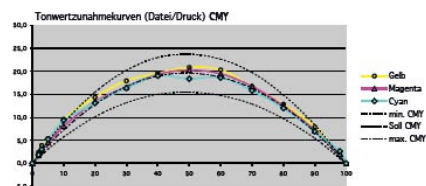
Color Management on device independent files most common: convert Office PDF's with DeviceCMYK

- expected Result:
 - red Text: 0/100/100/0
 - gray image: stay Gray
 - color image: convert to CMYK
 - blue text: 100/100/0/0
 - gray background and black lines

This is a great Office Document



Excel Graph copied and pasted.



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Color Management on device independent files very common: unwanted RGB elements and ICC profiles

- Some images in RGB
- Some images with source profiles
- Target: Offset Printing using CMYK - *standard printing condition*
- valid assumption for RGB Objects: like Office RGB
- valid assumption for CYMK profiles: discard Profiles
 - check Profile name - most of images get prepared for *standard printing condition*: 150 lpi on coated stock
- convert to DeviceCMYK
- check the color of the result using a (soft)proof

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Color Management on device independent files not common yet: REAL Device Independent

- Preparation
 - define vector elements in Device Colors
 - all images have to be tagged using the proper ICC profile
 - don't change color when creating PDF
 - preserve source profiles when exporting
 - Exception: source Profiles that define the same color space as the output intent should get discarded
- **NOTE: generation of device independent via PostScript utilizing PostScript Color Management is possible, but *sub optimal***

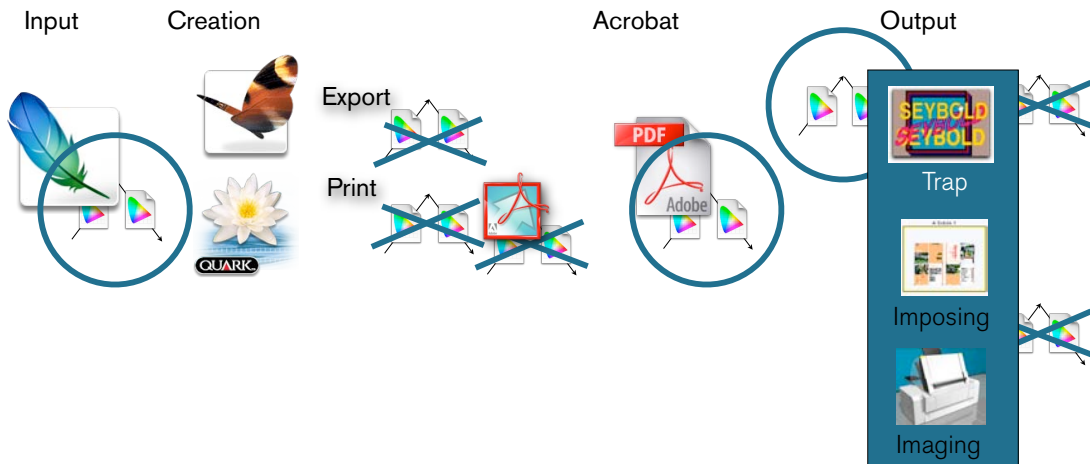
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How to create ICCbased colors in a PDF

- PostScript can not contain ICC profiles
 - Exception: PostScript Color Management
 - EPS files only
 - Engine generating PDF must have local access to the ICC profile
- Direct export to PDF
 - Recommendation: only with applications from Creative Suite
 - Tag all contents with ICC profile
- by Mistake
 - Distiller setting to tag everything for color management

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Where in a device independent workflow ***SHOULD*** color conversion occur



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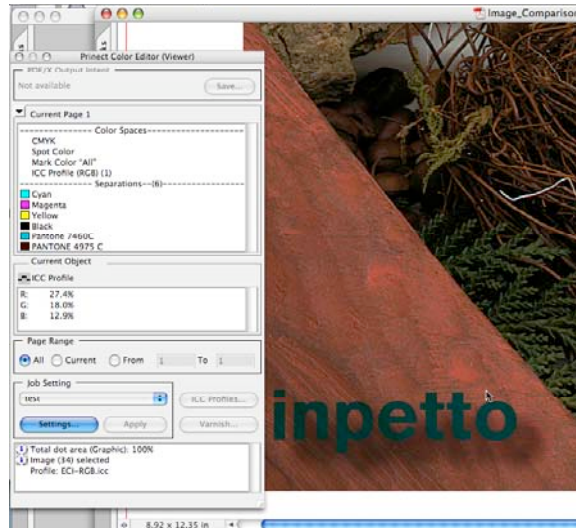
device independent files with transparency effects a real Challenge

- The use of transparency out rules the use of device independent colors when generating PDF/X-3 files
 - transparencies need to get flattened
 - flattening is done using the transparency color space, which can be either CMYK or RGB
 - images get chopped into peaces where some of the get converted
- use PDF/X-4
 - allows transparencies and layers
 - also allows JPEG 2000 for better compression of images

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device independent files with transparency effects Export preserving transparencies

- PDF Workflow tasks to perform
 - map spot colors
 - convert colors
 - flatten transparencies
 - perform CMYKtoCMYK conversion if required



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Principles and Statements

- A final PDF (after all needed conversions) is always defined in ***Device Colors*** for a specific printing condition - PDF/X-1a
- ICC based Color Management works best on images - colors used in vector elements are often seen as ***dirty*** after conversion (when printed with AM screen)
- ICC based Color Management does not create solid ink values from RGB colored vector elements without specialized software support (DeviceLink Profiles, Pure Color Features, Color Lookup Tables)

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Principles and Statements

- After flattening a transparent PDF, you must not map Spot Colors nor apply Color Management using different strategies for pixel and vector information
- After flattening a transparent PDF, you must not change the overprint settings
- To preserve pure colors in images, you have to use software that creates Device Link Profiles with this behavior
- Color management can not enhance the quality of bad images
- Color management only works if ICC profiles are used correctly

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Thank you!

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