

The importance of PDF 2.0

For print production on EFI™ Fiery® FS400 servers

A horizontal, wavy line that transitions from yellow on the left to orange in the middle and red on the right.

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Introduction

The heart of any digital production workflow is the DFE (Digital Front End). It is the technology that processes and rasterizes the file for imaging. DFE's have been around long before digital presses, in fact that is what drove filmsetters and still drives plate setters. At the heart of the DFE there is an interpreter that processes the images, fonts, colour and other embedded file information and then rasterizes it for imaging on the output device. While the older interpreter technology at the core of the DFE was based on PostScript, the newer DFE's are all based on PDF rendering technology. PDF 2.0 is the first new version of PDF since 2008 and was designed to address many of the new requirements dictated by wider adoption of PDF digital file distribution as well as specific use requirements like those of packaging production. While not all of the new features in PDF 2.0 impact print production, some of them do and are supported by Adobe PDF Print Engine (APPE) 5, the core processing engine in DFE's like the EFI Fiery products. PDF/X is the print specific standard developed on top of PDF to ensure successful blind exchange of design and production files. PDF/X-6 which will be the next version of that standard is currently in development and will be based on PDF 2.0.

What are the key print related features in PDF 2.0?

Page-level Output Intents

Output intents are used in PDF files and more specifically PDF/X and PDF/A files to communicate the desired destination device colour reproduction the creator is expecting. By including an output intent in the PDF file creation, you can actually simulate a device's output characteristics or even a standard output intent like GRACoL, FOGRA 39, etc., on different output devices. This should provide a good representation of output providing there is enough colour gamut available on the output device.

In this new feature upgrade, you are not limited to 'file level' output intents and can now have individual 'page level' output intents within a single file. This feature could be helpful if you are aggregating or imposing 2 or more PDF/X or PDF/A files into a single document. PDF 2.0 allows separate output intents to be included for every page individually. For example, it could support jobs where different media are used for various pages, e.g. for the first sheet for each recipient of a transactional print job, or for the cover of a saddle-stitched book. The output intents in PDF 2.0 are an extension of those described in PDF/X, and the support for multiple output intents will almost certainly be adopted back into PDF/X-6 and into the next PDF/VT standard currently in development. This feature will require the use of PDF/X-6.

CxF/X-4 and Spectral Colour Values

When a colorant is printed on a substrate, it reflects/absorbs different amounts of light at different points on the visible spectrum (400-700 nm). Communicating a brand colour by name, or printed swatch, or CIE Lab value is the norm today, but can be problematical. Even worse is the common practice of communicating a colour by "equivalent" RGB or CMYK values. Spectral values are absolute and definitive. Their meaning is not open to misinterpretation, nor dilution by tolerances, with acceptable deviations. Neither are they dependent upon lighting conditions.

Currently PDF only supports CMYK, RGB, LAB and 'named colour spaces' like PANTONE, etc. Since colour is ultimately measured by its spectral wavelength, it is the best way to communicate it as well. Until now the existing methods seemed to suffice. Now that we are seeing more digital packaging and bespoke print manufacturing technologies being introduced, it is important that we can be very specific about the measurement and communication of a colour. The Colour eXchange Format CxF/X-4 (ISO 17972-4) support in PDF 2.0 is the means for including spectral colour information in the PDF file. In this new implementation, APPE will pass the embedded CxF metadata from the file to the DFE (more specifically the Adobe CMM) for ultimate processing and handling.

One or more CxFs can be attached to the Output Intent dictionary within a PDF 2.0 file. This ability will enable greater accuracy in the reproduction of spot colours (critical to brand owners). Spectral colours will enable more accurate emulation of specialty colours on proofing devices, including when they are used in a process fashion (i.e. screened and overprinted). More importantly, future workflows in package printing (both flexo and inkjet), industrial printing and textile printing will benefit from PDF 2.0's ability to convey spot colours with spectral data. (Note: this feature requires use of PDF/X-6.)

This new feature will undoubtedly take the software developers along with DFE and print machine manufacturers some time to understand the best way to take advantage of it in a standardized and best practice way, but APPE 5 is ready.

Black Point Compensation

Black Point Compensation (BPC) is used to preserve detail in dark shadow areas, especially during RGB to CMYK conversions. While BPC has been available in Adobe Photoshop for years, with this new functionality, there is now a standardized way for the designer to communicate the use of the BPC effect, and you can elect to recognize in the DFE if desired. With PDF 2.0, it will be possible to specify BPC instructions (on/off/default), for an entire job, or individual elements within. Like most image conversions, BPC transformations are lossy. So, converting at run-time (late binding) vs. upstream is always preferred. Selecting and embedding a BPC switch for objects at the time of a PDF 2.0 file will enable late-binding BPC conversion in the RIP, e.g. when the rendering is performed by the Adobe PDF Print Engine 5.

Better support of transparency

The current ISO PDF 1.7 and correspondingly the PDF/X-4 standard as well as previous PDF versions were slightly vague about exactly when the colour space of a graphical object involved with PDF transparency needed to be transformed into the blending colour space. This meant that implementations from different vendors could, and in many cases, did produce very different results. Those statements have been greatly clarified in PDF 2.0, through the 'Inheritance of transparency colour spaces'.

Under certain circumstances a PDF 2.0 supported RIP will now automatically apply a colour-managed (CIEBased) colour space when a device colour space (such as DeviceCMYK) is used in a transparent object. It will do that by inheriting it from a containing Form XObject or the current page.

While that may sound very technical, the bottom line is that it will now be much easier to get the correct colour when combining multiple files from different sources together. That's especially the case when you're imposing PDF/X files that use different profiles in their output intents, even though they may all be intended for the same target printing condition. The obvious examples of this kind of use case are placing display advertising for publications or newsprint or imposing for gang-printing.

It tends to be taken for granted that the older PDF specifications would correctly match what Adobe Acrobat does, but that's not always correct. As an example, the implementation in Acrobat has never matched the ColorDodge and ColorBurn transparency blending modes in the PDF specification. In PDF 2.0 the standard and Acrobat will be using the same algorithm in order to make them match.

Halftone Alignment

PDF 2.0 now gives complete freedom to renderers to apply the supplied screening parameters in whatever way they see fit. It does that a new entry called Half-Tone Origin (HTO), where precise specification of the halftone phase is needed. HTO enables the DFE to align pre-imposed objects to the device pixel grid to ensure identical line screen output, minimizing artefacts where they are adjacent. This has multiple benefits.

In one example, pre-imposed sheets for a VLF plate-setter where the DFE can now specify the halftone phase for each imposed page to reduce the misalignment of halftones that can occur across the length or width of the plate. In another example, setting the halftone phase of each label in a set of step-and-repeat labels ensures that the halftone dots are placed in exactly the same position relative to the design in each label, so they look the same when printed no matter where on the sheet or in which orientation they are on the sheet.

Another halftone alignment benefit can be seen in transparent areas. In versions up to and including PDF 1.7 there was a requirement to apply the “default halftone” in all areas in live PDF transparency. This created issues in print technologies like Flexo, where different halftones must be used for different object types to achieve maximum quality. This can now be controlled.

Drop shadows are another area where halftone control can help enhance the reproduction. Drop shadows use transparency to achieve the correct colour but also benefit from using the right halftone to reproduce the highlight end of the shadow without producing artefacts.

Document parts (DPart)

The PDF/VT standard for variable data printing defines a structure of Document parts (commonly called DPart) that can be used to associate hierarchical metadata with ranges of pages within the document. Document part structures carry a tree structure of metadata associated with ranges of pages. In PDF/VT the purpose is to enable embedding of data to guide the application of different processing to each page range.

PDF 2.0 has added the Document parts structure into baseline PDF, although no associated semantics or required processing for that data have yet been defined. It is anticipated that a new ISO standard on workflow control (ISO 21812) currently under development will make use of the DPart structure, as will the next version of PDF/VT and perhaps PDF/X-6.

Backward compatibility

The PDF 2.0 standard doesn't explicitly require products that read PDF 2.0 files, to be able to read anything earlier than PDF 2.0. However, the structural changes from PDF 1.7 to PDF 2.0 are so small, and the commercial benefits to supporting earlier versions as well are so obvious that it would be surprising to find a product that only reads PDF 2.0. The same should hold in the other direction as well. A reader written for PDF 1.7 should be able to read or consume PDF 2.0 files that don't happen to use any of the new features, which provides obvious benefits for users. It is expected that a reader that doesn't read PDF 2.0 yet, could skip any PDF 2.0 features if they are present. This is why the new Fiery print servers include APPE 5 and PDF 2.0 compatibility, even though commonly used creative applications are not able to create PDF 2.0 files yet.

APPE 5 specific features

Edge Enhancement

In addition to PDF 2.0 features, Adobe has included some other print related enhancements into APPE 5. These include high-speed edge enhancement, which smooths image edges on graphics, especially when they meet or overlap other graphic objects, using anti-aliasing technology efficiently.

Better language support

They also upgraded their support of non-roman character sets, like Chinese, Japanese and Korean. This enhanced Unicode support better manages file paths and passwords that are used in some of these types of fonts.

Risks

The biggest risk for people is considering when and how to roll out PDF 2.0 support. Some readers will emit a warning that the file you're opening has a PDF version number that is not explicitly supported. That's helpful, but it can never be more than a warning because that older reader doesn't know anything about any new features in the file or know if they're important to you or to your workflow.

This means that the safest approach to adoption of PDF 2.0 is to ensure that all applications and tools that consume PDF are upgraded to support PDF 2.0 before you start thinking about upgrading file creator software. Some tools are both readers and writers, for example an imposition tool that reads a PDF file and re-saves it as an imposed PDF file. However, in most cases the PDF creation software or writer is different from the reader or consumer like a DFE.

Usually the safest way to approach this type of upgrade is to start at the back end of your workflow (probably the RIP or DFE, or an integrated prepress workflow in a printing situation) and work upstream. That way you'll never be trying to consume PDF 2.0 in a product that doesn't really know what to do with it. The safest and best thing to do is to upgrade to add PDF 2.0 support in your workflow as soon as your vendors can provide it.

When will the PDF 2.0 (ISO 32000-2) be published and available?

PDF 2.0 (ISO 32000-2:2017) was published in July 2017, however it is currently under review and is estimated to be republished 2019-2020.

Note: it is expected to remain substantially the same, however there may be some 'technical writing' edits incorporated.

Some applications are already able to consume PDF 2.0 today. Fiery print servers will also be able to process PDF 2.0 files starting with the support of Adobe PDF Print Engine 5 with Fiery FS400.

Adobe creative applications are expected to be able to create PDF 2.0 creation with the support of PDF/X-6, as this is the ISO specification that defines how to create PDF files suitable for print applications. Current expectations is to see the first Adobe applications creating PDF 2.0 files for print purposes in 2021.



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