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White Paper

PDF, Certified PDF and PDF standards – making sense of it all

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Beyond Preflight – Use PDFs with confidence

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PDF, Certified PDF and PDF standards – making sense of it all

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2. Introduction

The vast majority of print jobs are cooperative efforts involving several companies. Designers create the artwork, prepress companies often finalize the artwork technically, publishers collate input from several sources into one publication, printers let their presses hum producing the end product. Transferring the documents in a way that is both simple and technically reliable is a key challenge for the graphic arts industry.
Initially, film was the medium of transmission. As the artwork was hard coded into molecules there was no risk of misinterpretation. But as the prepress process became increasingly digital and time-sensitive, film lost its appeal as a workable medium. So the quest for a workable digital file format started.

3. A brief history of digital file formats

A number of file formats became popular over the years: native file formats, PostScript, TIFF/IT and vendor specific formats like the Scitex' CT/LW.

3.1. Native file formats

Application-native file formats, such as QuarkXPress, Adobe Photoshop and Adobe Illustrator (the workhorses of the creative community), or Microsoft Word (in an office environment) have the advantage of being fully editable in later stages of the production process – assuming the availability of the application originally used to create the artwork. On the other hand, these formats can be rather unreliable during transmission. A layout may inadvertently change when the file is transferred from one computer (platform) to another, depending on external elements such as printer drivers. Receivers must be knowledgeable in a range of applications, and often need to own multiple versions, on multiple platforms. The risk of receiving incomplete sets of information, with images or fonts missing, is real. Re-linking the artwork to its external components is a potential source of error as well.

3.2. Pixel-based file formats

TIFF/IT (and later TIFF/IT-P1) was developed as a vendor-neutral alternative to proprietary formats such as the Scitex CT/LW. It builds and expands on the "classic" TIFF format, providing a number of advanced features relevant for professional graphic arts work.
These pixel-based formats are much more appropriate for reliably representing "digital film" than the native file formats discussed earlier. Unfortunately, by their very nature, files in pixel-based formats are hard to edit and correct, and tend to be extremely large. Moreover, the tools needed to create and work with these formats are expensive and complex. As a result, the acceptance of TIFF/IT has been limited to industrial workflows involving professional parties.

3.3. PostScript

PostScript was invented by Adobe as a universal print format. It allows any printer connected to a personal computer to print any document created on that machine. The graphic arts community "hijacked" PostScript for the purpose of exchanging files.
Since PostScript can represent text as text and line-art as vectors (as opposed to converting everything to pixels), the resulting files are more compact, and generally scale well between devices of varying output resolution.
Nevertheless, PostScript still has quite a few shortcomings for exchanging files. There are small (but bothersome) incompatibilities between different PostScript drivers and output systems, and PostScript files are hard to render on screen and nearly impossible to edit.

Over the years the graphic arts community learned to live with and work around the limitations of the different file formats. The end result is that a sizeable chunk of the jobs supplied to a printer require intervention on the files before they can be printed. This puts a tremendous burden on the printer and the

prepress department. More often than not the cost is borne by the printer, eating into profitability.
PDF, conceived by Adobe in 1992, although perhaps not perfect, is a much more robust basis for file exchange in the graphic arts community.

4. PDF

PDF, Portable Document Format, is the son of PostScript. By the early 1990's, Adobe identified an important need in the IT community: the ability to view and print a document received from a third party without employing the application used to originally created the document. Adobe developed an interpreter for PostScript, distilling it into a file format that is more reliable and easily visualized on screen.
In its quest for the holy grail of file formats, the graphic arts community adopted PDF. Indeed, PDF has quite a number of unique selling points to warrant the buzz.

4.1. The strengths of PDF

4.1.1. All-in-one

A PDF file contains (or to be precise: can be told to contain) all the components needed to visualize the file. No more juggling separate images, fonts etc. The issues around "re-linking" the elements in a document vanish.

4.1.2. Cross-platform

PDF is conceived to look identical on any computer platform. Gone is the nightmare of seeing the layout reformat because your customer designed it on a PC while you're on a Mac.

4.1.3. Compact

In general, a PDF file is significantly smaller than its equivalent in another file format (almost 5 times smaller). Elements in the file are compressed with a suitable algorithm depending on the type of element, and images can be resampled to an appropriate resolution. So the 300 dpi A4 image that was scaled down to thumbnail size isn't going to transit at 6.000 dpi.

4.1.4. Easy to use and inexpensive

All you need to create a PDF file is Adobe Acrobat Distiller. The product is sold as part of Adobe Acrobat and is presented as an office application for any PC user. As any application can generate PostScript, and PostScript can be distilled into PDF, PDF can be generated from every application.

4.1.5. Structured

Quite some thought has gone into the underlying architecture of a PDF file. The shape and attributes of every component are stored inside the file, including text, fonts, colors, Bézier curves, vectors, and images. Shapes and attributes can be accessed and modified individually, without touching anything else in the file.
As a result last minute changes can be made to the document, using PDF editing tools such as Enfocus PitStop Professional.

4.1.6. Multi-purpose

Adobe conceived PDF as a format that could be used to exchange office documents between diverse computer platforms. When the Internet took off, PDF became the format of choice to post layout-sensitive documents on the Internet. The graphic arts community adopted the format for the transmission of

print jobs. These varying uses set different requirements on the file: color spaces used, resolution of images, ability to annotate the documents, print-technical specifications (overprint, page boxes), security requirements, and so forth. The specifications of PDF have evolved over the years (we are at version 1.7) to include all these elements.
It is quite an achievement for Adobe to succeed in designing a format that responds to such disparate needs. At the same time this is the format's major weakness, as we will see later on.

4.1.7. Public

Adobe authors (and controls) the technical PDF specifications. The company publishes these specifications, making them accessible to anyone. As a result any determined party can build tools around the PDF format. It also becomes possible to refer to these public specifications in official ISO standards, such as PDF/X.

Summing up these features, it becomes clear that PDF is in a unique position to be the format of choice for graphic arts file exchange. Although some trade-offs may need to be made, it has many advantages compared to the other formats discussed.

4.2. The imperfections of PDF

4.2.1. One format fits all

Unfortunately, the world of PDF is not perfect. PDF suffers from *the weaknesses of its strengths*. It is so flexible as format, that you can use it to transmit a contract to your client for review, post flyers on the Web, and transmit ads to a magazine publisher. The same product is used, the same actions are performed. However, different settings should be used in each case.
It is so often forgotten: a PDF file must be generated with a purpose in mind. The creation settings differ fundamentally depending on how the file will be used: resolution of images, embedding of fonts, color spaces used, and so forth. Getting that message (AND the correct settings!) across to the creator is the major challenge facing printers and publishers in the adoption of PDF.
PDF makes it look so simple. Users will ask incomprehensibly "If it looks good on my screen, and I can print it on my $300 ink jet printer, why can't you print it on your $300.000 press?" Before the desktop publishing revolution, only experienced professionals were able to prepare documents fit for print. Today, the creation of print-ready files is accessible to *the rest of us* - newborn designers, often unaware of the technicalities of the process.
It is therefore essential to check (or "preflight") a PDF file before declaring it fit for print. Any user who creates or modifies a PDF file should preflight the file against the appropriate requirements before sending it to the next station in the workflow. Failing that, the receiver should at least preflight the PDF file at the moment of reception.

4.2.2. More limited editing than with native files

Printers and publishers are often faced with strict deadlines. The ability for prepress departments to correct shortcomings identified by the preflight or to perform last minute edits (such as correcting typo's) can be a lifesaver. While being far more editable than PostScript and TIFF/IT, PDF is still limited in this domain, particularly when compared to application-native file formats.

4.2.3. The devil is in the details

Other shortcomings of PDF are highly detailed technical ones, or concern limitations of the products used to create or consume PDF. Such issues tend to get resolved in new releases of the products but other issues arise to replace them. This is unavoidably linked to the variety and complexity of the design and print processes.

Many of these issues can be detected during a detailed preflight scan of the file. But in general, of course, there is no automatic "miracle cure". In those cases, a good editing tool – and a responsive support department – may jigger the work in order to complete the job.

In summary, to help PDF become the perfect format for graphic arts, we need standardization. Someone must define the – detailed – requirements for a PDF file to be "fit for print".

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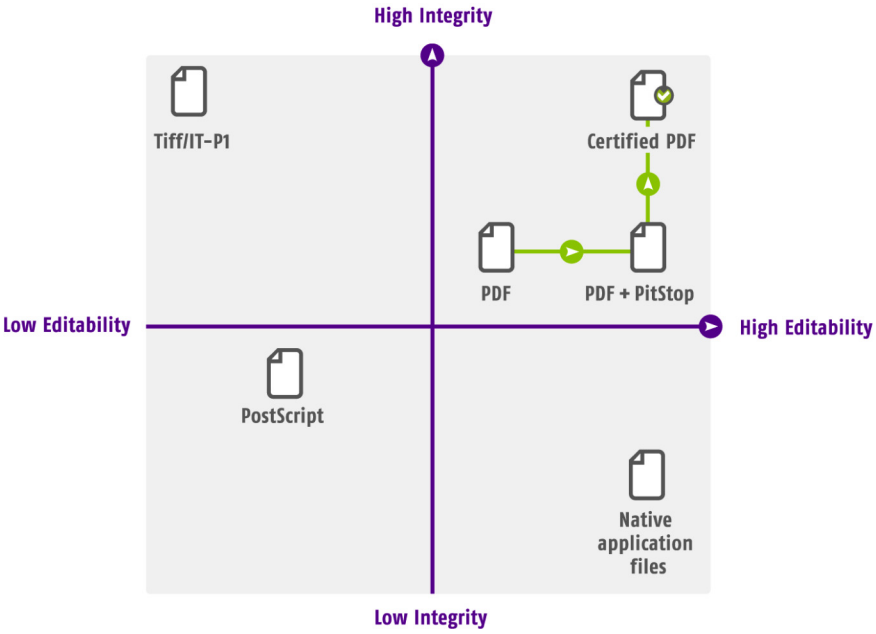
5. Enfocus Certified PDF

Over the years the Enfocus Certified PDF technology has become part of many companies' PDF standard operating procedure. This technology was conceived and developed by Enfocus, the leading PDF developer for the graphic arts industry. Since its foundation in 1993, Enfocus' mission has been to provide affordable tools for standard graphic arts document formats. The company was among the first to identify the potential of PDF in this industry, and since 1997 it focused exclusively on PDF.
Enfocus' work in editing and quality control of PDF files lead to the realization that a number of important requirements are going unmet by the PDF specifications. These needs all revolve around the same issue: PDF files have no "memory".



Performing a preflight operation leaves no trace in a traditional PDF. It is impossible to see whether a file has been preflighted or not, against which settings the file has been checked, and whether the preflight has detected any errors. Consequently, when receiving a file from the previous user in a workflow process, it is impossible to rely on any actions performed by that user, and at each stage the preflight must be performed all over again.
Editing is another domain where this lack of memory can be a major problem. It is impossible to trace edits made to a traditional PDF, to compare the file before and after the editing session, and to identify who has made those edits. This can cause finger pointing and denial of responsibility when a print job ends up looking unrecognizable to the client.
To cater to these needs Enfocus developed the Certified PDF technology. A Certified PDF file is self-aware. It records whether or not it was preflighted, the settings that were used, and whether or not the file passed the test. When opening a Certified PDF the preflight status is indicated visually, so re-preflighting is superfluous. A complete log of all edits performed to the file is

recorded: what was edited and by whom. It is possible to roll back to previous versions, and compare files in different stages of the editing process. Moreover, whenever a file is edited the operator will be prompted to re-preflight the file before saving.
The Certified PDF technology has been greeted with much acclaim by the industry. It has been awarded the prestigious GATF Intertech award, and is becoming part of the standard toolset of the graphic arts professional, much like the PitStop editing and preflight features have in the past.

5.1. Proprietary

Some have voiced the concern that Certified PDF is an Enfocus proprietary technology. Enfocus Certified PDF is indeed not a public specification like PDF. Enfocus has invented and developed the technology and believes it is entitled to a return on this investment.
At the same time, true to its mission statement, Enfocus makes the technology available at reasonable conditions to everyone. Prices of the Enfocus products supporting Certified PDF are low, and any OEM partner wishing to integrate the technology can do so, at consistent prices. Enfocus markets the free Enfocus StatusCheck, to view the Certified PDF information logged into the file.

As we will see in the next chapter the Enfocus Certified PDF technology is well placed as one of the cornerstones in the standardization efforts going on in the graphic arts industry.

6. Standardizing PDF for print

As indicated in the previous chapter, not all PDF files are suited for print purposes. In order to be fit for print a PDF must comply with a set of more restrictive criteria. These criteria are to be used when creating the file, to check files before they are sent off, and when receiving files from third parties.
Several organizations have taken the initiative to define these criteria. In this chapter we will review these different initiatives, and the relation between them. We will also elaborate on what these different PDF-for-print specifications actually specify.

6.1. Types of specifications

The first organizations to set such specifications were large individual printers and publishers, who defined requirements and guidelines based on their own workflows. Later on, national industry associations started defining specifications for their respective industry segments. Over the last years two important international initiatives developed: PDF/X and the Ghent PDF Workgroup. PDF/X defines a common ground for PDF used in print workflows, while the Ghent PDF Workgroup aims at defining industry-segment-specific settings. We will elaborate on these different initiatives.

6.1.1. Industry associations

Over the years, several associations have taken initiatives in setting specifications for PDF files. National associations in countries such as Australia, Finland, the United Kingdom and the United States have set "local" countrywide specifications. Ad delivery is typically one of the first areas being addressed, likely because of its unique combination of strict deadlines and the multitude and variety of ad creators.
These specifications can generally be found through the websites of the respective associations. The Enfocus website contains links to many of these associations, as well as the settings themselves expressed in Enfocus' preflight technology.

6.1.2. PDF/X

A number of organizations took the initiative to define a common ground for PDF used in print. A working group was created inside the Committee for Graphic Arts Technology Standards (CGATS), initiated by the American Digital Distribution of Advertising for Publications (DDAP) and the Newspaper Association of America (NAA), and involving several industry vendors and users. The specification proposed by the CGATS working group was later adopted by the International Organization for Standards (ISO) as a recognized international standard.
The resulting PDF/X specification (ISO 15930) is a true standard, similar to standards for camera film sensitivity ("400 ISO") or quality management (ISO 9000). The PDF/X standard is public and vendor independent. The "/X" stands for blind eXchange. The objective of PDF/X is to allow "blind exchange" of PDF Files in a graphic arts workflow.
PDF/X is a subset of PDF. The specification defines a set of restrictions, *i.e.* a list of things that are obligatory (the fonts must be embedded) or excluded (no annotations allowed) when using PDF for print. As of today the most relevant types of PDF/X are PDF/X-1a:2001, PDF/X-3:2002 and PDF/X-4. Later we will detail the restrictions covered in these standards.

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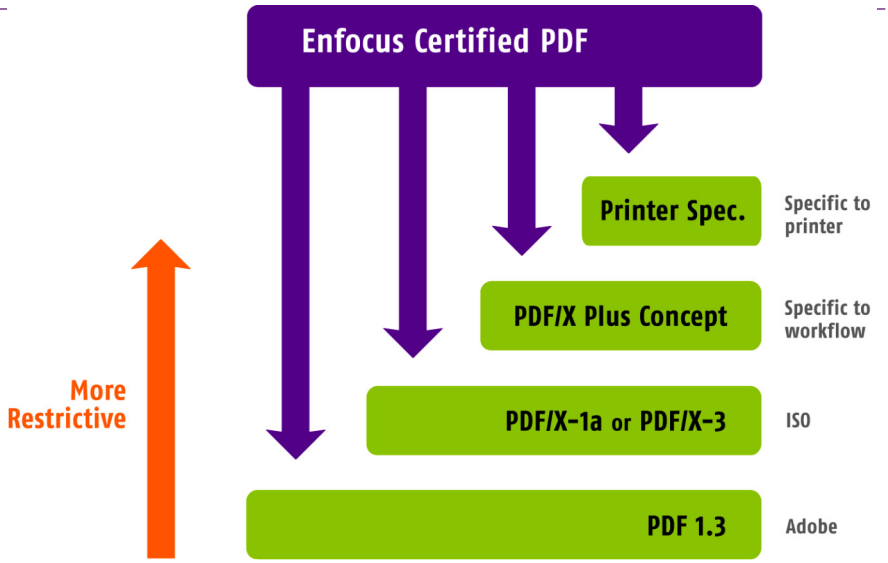
PDF/X is designed to be sufficiently generic to cover all market segments of the print industry: from newspaper ad delivery to oversized poster printing. This limits the number of criteria that could be defined in the PDF/X specification: there is no definition of minimal image resolution, no check on number of color separations, and so forth. Moreover, it is nearly impossible to tackle complex technical and often temporary issues through the ISO standardization process. While PDF/X does an excellent job at restricting PDF to those elements that are relevant to print production, experts agree that checking solely on PDF/X compliance does not guarantee printability.
Taking PDF/X a step further, by developing more segmented and detailed specifications, is the objective of the Ghent PDF Workgroup.

6.1.3. The Ghent PDF Workgroup

It all started when Medibel+, a Belgian association representing the players in the ad delivery process (ad agencies, publishers and printers), decided to set specifications for ads exchanged in the Belgian market. Roularta, Belgium's largest publisher and magazine printer, was in charge of the project. It decided to hold a pragmatic bottom-up approach to the issue: what are the typical problems with PDF files received from designers, and which preflight product best detects those issues. After extensive testing, it turned out that Enfocus PitStop Professional could identify 96% of all concerns– far better than any alternative solution. So Medibel+ expressed its specifications as an Enfocus PDF Profile (a set of preflight rules) and Adobe Acrobat Distiller job options. These specifications were distributed to the parties delivering ads, so they could check files before sending them out to the publishers.
The approach was a success, dramatically reducing error rates of incoming files. Industry associations in nearby countries, active in ad delivery and commercial print, took notice. In 18 months time, seven associations from four countries had set detailed PDF specifications for their respective market segments, expressed as Enfocus PDF Profiles.
All along, Enfocus worked actively with these associations, assisting with field tests, adding product features to solve residual problems, and helping to minimize the differences among specifications in neighboring countries. It became clear that a structure was needed to formalize and streamline this coordination process. The idea of an international workgroup with the intent of defining a set of common specifications for the graphic arts industry was initiated. Seven founding members joined to create the Ghent PDF Workgroup in June 2002.
Since then, the Ghent PDF Workgroup has been growing steadily. In November 2007, the group had 47 members of which 23 associations, 21 vendors and 3 industry members.

During 2002 the Ghent PDF Workgroup developed a number of market-segment specific PDF specifications. From the outset, it was agreed that all specifications would build on PDF/X-1a:2001, to comply fully with this more generic standard. In that context, Enfocus coined the term "PDF/X-Plus". Early in 2003, nine specifications were approved, covering ad delivery in magazines (CMYK only) and newspapers (CMYK + spot) on web press, commercial sheet fed printing jobs and commercial web (rotation) printing jobs. There are different options available for the sheet fed and the web printing jobs: high or low resolution jobs; allowing CMYK only or CMYK + spot colors.
Since then, 4 new market-segment were added (screen print and very high resolution/large format printing, both as CMYK only or CMYK + spot), the specifications are now also based on PDF/X-3:2002 in addition to PDF/X-1a:2001 and all specifications have continuously been updated.



The individual member associations will each endorse and promote the Ghent PDF Workgroup specifications (or at least those that are relevant to their respective memberships). The specifications are publicly available and may be adopted, endorsed or promoted by any third party, including non-workgroup members.
The fact that the specifications are expressed as Enfocus PDF Profiles (a set of preflight rules stored in a file) makes them very simple to implement in a Certified PDF workflow. A designer can create a PDF file according to the appropriate specification and immediately certify the document – or take corrective action if certification fails. The printer or publisher receives a Certified PDF file, and knows it is compliant without having to preflight it.

Some publishers or industry associations explicitly require the use of Certified PDF files; others strongly advocate the technology.
Preflight tool vendors are invited to support the Ghent PDF Workgroup specifications. As long as a preflight engine produces the same results as the reference implementation using Enfocus Certified PDF, it is considered as complying. Preflight vendors are not required by the Ghent PDF Workgroup to fix preflight errors, nor to produce Certified PDF files. Enfocus does offer these options to make GWG compliancy more accessible.

6.2. What do standards and specifications specify?

It lies outside the scope of this document to give a detailed description of the different standards and specifications; we limit ourselves to a broad categorization. We refer to the Enfocus PDF Guides for in-depth descriptions of the settings, an analysis of possible errors and warnings, and guidance on how to solve and avoid these issues.
Summary of the most important elements

- Document Format and Info: PDF Version, Producer, ...
- Security settings
- Page box layout

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- PDF/X specific settings: PDF version key, trapnet annotation, output intent, ...
- Page Info: number of pages, page size, empty pages
- Process colors and spot colors
- Transparency
- Font types and embedding

- Image resolution and compression
- Use of OPI and annotations
- ...

7. PDF standards and you

7.1. Do they apply to you?

The PDF standards and specifications described above are "best efforts" by the various industry experts involved. They have no force of law, and individual companies must decide whether or not to adhere to them.
As noted earlier in the text, magazine and newspaper ad delivery typically faces the most pressing need for standardization, because of the large number of designers with varying backgrounds. In order to streamline this process it is in the immediate interest of all parties involved to establish specifications on a national, and preferably international scale. Publishers are typically in a good position to push such specifications into the market.
For commercial print jobs the situation is less clear-cut. The tough competitive situation gives printers less leverage over their customers, and the print processes vary between commercial printers. On the other hand, one thing is certain: NOT checking PDF files against a number of quality requirements is a recipe for disaster. The specifications mentioned above are a reliable guideline. Implementing the specifications as defined above is in the interest of all parties, especially the printer's customer.
For specialty segments, such as packaging, books, silkscreen or digital printing, no tailored specifications are available. Some of these will be covered by the next release of the Ghent Workgroup PDF specifications.

7.2. Should you make your own specifications?

Per definition, PDF specifications are a common denominator: they allow or reject certain technical elements based on what "the average" prepress system and press can handle at any given moment. Some parties may not yet be equipped to handle certain elements that are permitted by the specifications (e.g. two-byte fonts), while others may have equipment that is capable of handling elements that were banned because they are too new (ie... transparency).
Therefore, but only after careful consideration, printers or publishers may decide to depart from these specifications, because they are too loose or too restrictive for their equipment. In those cases, the specifications should be used as a baseline, and variations should be introduced only where necessary.

7.3. How do I implement this?

At first glance it may seem complex. However, implementing PDF specifications is really not that difficult. The Ghent PDF Workgroup and the various industry associations have made every attempt to keep things simple. All necessary information is available from their respective websites, providing ready-to-use tools and guidance.
Enfocus further facilitates the process through its products, and through resources offered on its web site, including documentation, white papers, and on line training. Check out the white paper "Implementing Certified PDF Workflows" for more details on how to proceed.

7.4. Where do I find help?

Enfocus Software: www.enfocus.com
Ghent PDF Workgroup: www.gwg.org

Overview of the most commonly seen differences between the PDF/X standards

- PDF/X-1a:2001 is based on PDF 1.3 and supports CMYK + spot colors
- PDF/X-3:2002 is based on PDF 1.3 and supports a fully color managed workflow with spot colors.
- In 2003 these standards were updated to address some ambiguities and inconsistencies leading to PDF/X-1a:2003 and PDF/X-3:2003. But as these offer no new functionality and remain compatible with the older standards, the use of PDF/X-1a:2001 and PDF/X-3:2003 is still recommended.
- PDF/X-4 is based on PDF 1.6 and supports a fully color managed workflow with spot colors with transparency and brings the PDF file format up to date (JPEG2000, layers for versioning, ...)
- PDF/X-2 and PDF/X-5 also exist but are for very specialized purpos