

Migrating your packaging prepress to native PDF 20

User documentation

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Contents

- 1. Introduction..... 3**
 - 1.1. Products and versions..... 3
 - 1.2. Why PDF Native?..... 3
 - 1.3. PDF Native vs. PDF+..... 3
 - 1.4. Main Differences with Normalized PDF..... 4
 - 1.4.1. Processing Steps..... 6
- 2. Components of a native PDF prepress system..... 8**
 - 2.1. PDF Editors..... 8
 - 2.2. PDF Viewers..... 8
 - 2.3. Automation & Rip..... 9
- 3. Proofing..... 13**
- 4. The RIP..... 14**
- 5. Input files..... 16**
 - 5.1. Standardizing your input files..... 16
 - 5.2. Legacy files..... 16
 - 5.3. Illustrator files..... 17
- 6. Metadata and Business Integration..... 18**
- 7. Planning your Migration..... 20**
 - 7.1. Am I ready to migrate?..... 20
 - 7.2. Approach..... 20

1. Introduction

This document describes how you can build or modify your Esko-based prepress system to become native PDF.

1.1. Products and versions

We assume that you have the latest Esko Software from June 2020 installed. That means the following versions:

Automation Engine	20
Imaging Engine	20
ArtPro+	20
DeskPack or Data Exchange (if applicable)	20

1.2. Why PDF Native?

Over the last 20 years, the native file format of Esko's pre-press solutions has evolved from proprietary (GRS and AP) toward open formats (PDF). The Esko **Normalized PDF** format was a very important milestone, but it had its limitations:

- The normalization can be too drastic for today's needs
- Some of the proprietary metadata got bypassed by ISO standards in the meantime
- The format was not designed for a 2-way integration with 3rd party tools (in other words: Normalized PDF files were not designed to be modified by non-Esko tools)
- There was no editor available for Mac

To overcome this, the time is right to step up to PDF native. This means that no conversions or changes are made to input PDF files, unless requested by the user. That also means that 3rd party metadata is preserved.

1.3. PDF Native vs. PDF+

Over the years, the PDF standard has acquired new capabilities to better support print production. Nevertheless, standard PDF is still limited in the area of editability and dynamic behavior.

So, the Esko native PDF components described in [Components of a native PDF prepress system](#) on page 8 not only make optimal use of the latest PDF standards, but also allow you to enrich your native PDF documents with extra information: Esko-proprietary "plus data". That is why we speak of **PDF+**: It's native PDF and more.

The plus-data puts no restrictions on the PDF content. It is also not mandatory. So, there is not really a clear boundary between native PDF and PDF+ and so we will use these terms in an interchangeable way.

Table: Extra Information in a PDF+ file

	Standard PDF	"Plus" Data
Document Structure	<ul style="list-style-type: none"> Page and Page Boxes Layers and Printing State 	<ul style="list-style-type: none"> Groups and named objects (for easier selection) Crosshair position
Production	<ul style="list-style-type: none"> Processing Steps (to identify the technical art). See Processing Steps on page 6 Ink Order 	<ul style="list-style-type: none"> Printing method (eg. "Flexo" vs. "Offset")
Color	<ul style="list-style-type: none"> Ink Color and Solidity (opaque or not) Document Profile (output intent) 	<ul style="list-style-type: none"> Color Engine Inks
Screening	<ul style="list-style-type: none"> Screening Ruling and Angle 	<ul style="list-style-type: none"> Screening Dot shape DGC/Correction Curves
Editability		<ul style="list-style-type: none"> Metadata to update linked images, placed art and structural design objects Metadata to regenerate the barcode(s) Metadata to regenerate the trapping layer Metadata to update dynamic marks Metadata to improve text editing

1.4. Main Differences with Normalized PDF

In this section we describe the most important differences between **PDF+** and **Normalized PDF**.

Processing Steps & CAD

Processing Steps is the new ISO standard for identifying technical art in PDF files such as cut, crease, varnish or emboss. This standard requires you to organize the technical art in separate layers or

sublayers and set the corresponding **Processing Step Layer Type** on each layer or sublayer. See also [Processing Steps](#) on page 6

Compared to Normalized PDF, you no longer need to set inks as 'technical' or 'varnish'. You also don't have to rely on naming conventions for your separations. You can give them any name. For example: With processing steps you can use just one colorant (ink) for all your technical drawings, and still be able to distinguish Cut from Emboss.

Similar to a Normalized PDF, a PDF+ file can link to CAD files. Supported formats are ARD, ZAE (from Esko Studio) and CF2. The technical drawings from the CAD file are automatically put in the correct processing steps.

Screening

Screening (dot shape, ruling and angle) in native PDF is somewhat different from Normalized PDF. The main differences are:

- With PDF+, screening settings for all the separations are grouped into **Screening Sets**. You can apply a Screening Set to all or some objects. At any location in the design, the RIP will use one screening set.
- In Normalized PDF screening settings are obligatory. PDF+ allows you to set screening to 'none', thereby indicating that you wish to fall back on the *default* screening as configured in the RIP
- When using multiple Screening Sets, this does not show as duplicated separations ("similar inks"). Instead ArtPro+ offers a color-coded view mode to check where each screening set will be used (look for [Object Screening](#) in the ArtPro+ documentation).

Metadata and XMP

Normalized PDF relies heavily on Esko-specific fields in the XMP data. In a native PDF environment, it would not be possible to keep this in sync. Therefore PDF+ does not rely on such Esko-specific fields anymore (but you are free to use standard XMP for other purposes, though).

See [Metadata and Business Integration](#) on page 18 for more information.

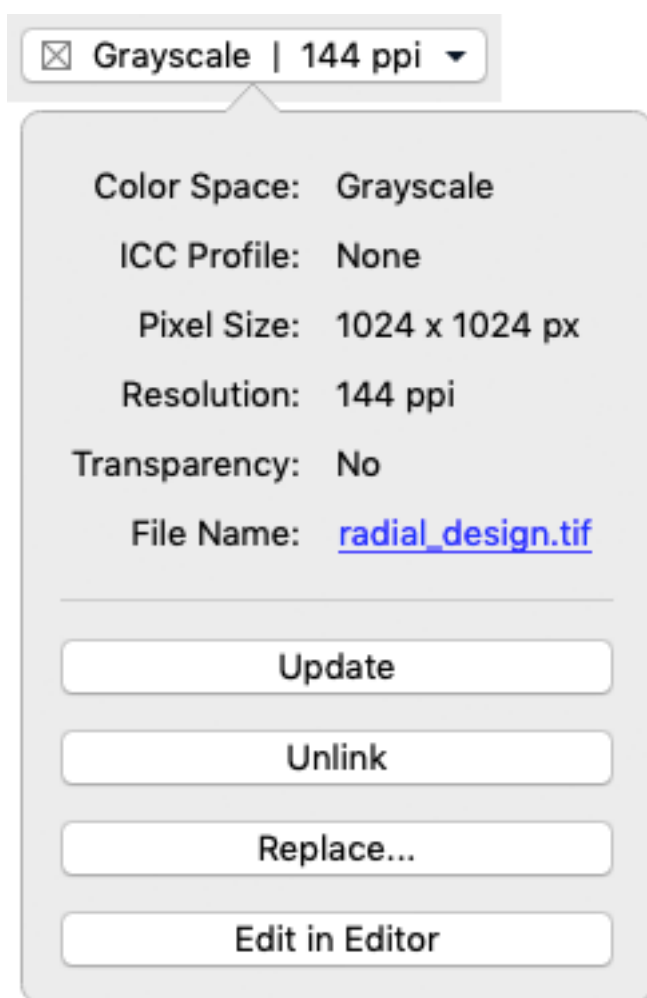
Color Management

In native PDF colors (fills, strokes, images, ...) can be expressed in color spaces that are not necessarily your printing output space. You can for example have RGB images. These are only converted at the last minute: in the RIP. This is different from Normalized PDF or ArtPro files, where such objects were already converted during import. If you prefer to convert earlier, then you can do so with preflight (See [Standardizing your input files](#) on page 16)

Links and Placed Art

When placing images or other art in a PDF+ document, there are two important differences with Normalized PDF or ArtPro files:

- Our native PDF tools will always include a full resolution copy in the PDF+ file (with Normalized PDF this was optional). This ensures that the file can be viewed or RIP'ed without requiring extra files.
- You decide if/when to synchronize the PDF+ file with possible changes in the external files. You can do this with the **Update** button in ArtPro+ (see screenshot) or automate it with the PDF Actions **Update Linked Image** and **Updated Linked Placed Art**. (With Normalized PDF files this was done automatically).



1.4.1. Processing Steps

Processing Steps is the new ISO standard for identifying technical art in PDF files such as cut, crease, varnish or emboss.

There are different Processin Step groups:

1. **Processing Steps describing paths**, for example Cutting
2. **Processing Steps describing surfaces**, for example Embossing
3. **Other Processing Steps**, for example White or Varnish
4. **Legend**

A Processing Step, regardless of what type, needs to follow some requirements:

- The Processing Step objects need to be in a **separate layer**
- The layer needs to have a **Processing Step Definition**
- All objects in the Processing Step need to be **overprinting**
- The Processing Step needs to be on top of the artwork layers.

For each group of Processing Steps, additional specific requirements need to be followed, about what objects and object characteristics are allowed and how a processor (e.g. a finishing device) has to evaluate them:

- **Cutting** is an example of the first category, which only allows **stroked paths**
- **Foil Stamping** is in the second category: only PDF path and text objects are allowed, no images, etc A processor takes the objects as defining a surface (so any halftoning is ignored)
- **White** and **Varnish** are in the 3th category: all objects allowed, a processor needs to take the rendered result
- **Legend** is a special category and has no restrictions on content

These rules separate the colorants (separations) of a PDF file in two disjoint categories:

- Artwork Colorants (shown in AP+ and DeskPack as squares)
- Colorants used only in Processing Steps (shown in AP+ and DeskPack as circles)

2. Components of a native PDF prepress system

2.1. PDF Editors

ArtPro+ is the only native PDF editor that can make full use of the plus data. Therefore it is the editor of choice. It runs on Mac and PC.

Note:

ArtPro+ can also open, edit and save Normalized PDF files, but that falls outside the scope of this document ([read more in the ArtPro+ manual](#)).

PackEdge and ArtPro are not suitable for native PDF workflows. These editors were built on previous generation graphic kernels and therefore not able to handle every variety of PDF file. In other words: they do a conversion/normalization at import.

Any native PDF editor can be used in a native PDF workflow. Neo is a native PDF editor, but it is agnostic of some recent standard PDF features and the plus data. So, it won't make use of all the available information. The same applies to 3rd party editors. Hence, we advise to use ArtPro+.

Note: Adobe Illustrator is not a PDF editor, but using Esko Data Exchange, you can get more control over the Illustrator to PDF conversion, with full support for processing steps. For more information, see [Input files](#) on page 16

2.2. PDF Viewers

For viewing graphics and separations, any reliable PDF viewer should do the job:

- Automation Engine Viewer *
- ArtPro+
- Adobe Acrobat (properly configured)
- ...

* To make sure that the Automation Engine 20 viewer is not normalizing the document, check the configuration: **Configure > Viewer > View as: ArtPro+**.

Obviously, Esko cannot be held accountable for the reliability of PDF viewers from other vendors.

If you need to inspect the content of the different processing steps or inspect where the different screening sets are applied, then you should use ArtPro+ as a viewer for now (Currently, the AE viewer will not show this information).

2.3. Automation & Rip

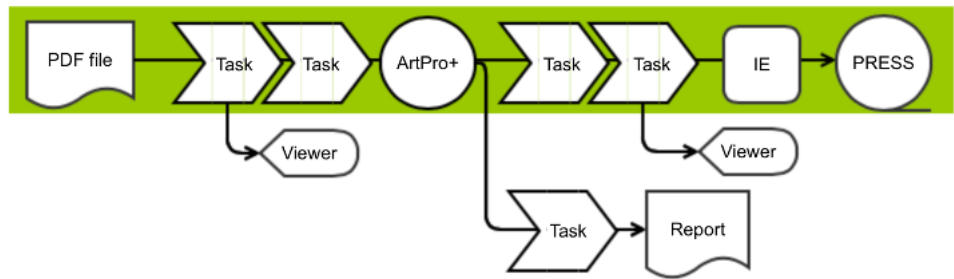
To build a native PDF packaging workflow, we apply the following guiding principles:

- If the input file is PDF and not an Esko Normalized PDF, then keep it native PDF all the way to the RIP.
- If the input file is an Esko Normalized PDF, Illustrator file, or ArtPro file, then choose the point in your flow where you want to convert to native PDF (preferably as early as possible). Beyond that point, you keep it native PDF all the way to the RIP (see [Input files](#) on page 16)
- A prepress workflow often has 'sidetracks', that do not directly contribute to the printed result. Sidetracks do not touch, change or adapt the production files of the main track. For these sidetracks, it is less critical to use PDF+ compatible tasks. However, it might be important that these tasks correctly honor the plus data.

In the following sections, we'll go in more detail.

Native PDF from input to RIP

If the input file is a regular PDF file (so not an Esko normalized PDF file), then the goal is to keep it as native PDF. That is especially important for all the steps that actually affect the print production. So in this section we focus on the main path in the workflow: the one that connects the input file with the press. Such a path can involve modifications in the editor (ArtPro+) and one or more Automation Engine workflows, ending with an imaging task producing LEN files that get imaged and printed.



To ensure a native PDF workflow, you need to be mindful of which Automation Engine tasks to use in the main path. Below is a list of graphics processing tasks that are safe to use in a native PDF workflow, because:

- They don't do unsolicited conversions or normalizations
- They honor all the information that can be present in PDF+ files.

Table: Automation Engine Tasks that are compatible with PDF+

<ul style="list-style-type: none">• Preflight with PitStop¹• Optimize PDF• Apply PDF Action List²• Trap
--

- Export PDF Info
- Create Report
- Expand Dynamic VDP Data
- Step & Repeat Tabular (Dynamic)
- Step & Repeat Template based (Dynamic)
- Step & Repeat CAD based (Dynamic)
- Add Dynamic Marks
- IE tasks³:
 - Image to Screened Separations
 - Image to Unscreened Separations
 - Image to Content Proof (RGB)
 - Image to Unscreened Proof
 - Proof for Content Approval
 - Proof for Contract Approval

¹ For normal preflight use-cases. If you include drastic modifications in the Enfocus PDF action lists, then some plus-data might get lost.

² PDF Action lists offer a versatile and easy mechanism to build automations and execute them consistently in the ArtPro+ editor, or as part of an Automation Engine workflow.

³ Make sure to read the chapter about the RIP below

Tasks that don't process graphics are obviously also safe to use in a native PDF workflow:

Table: Automation Engine Tasks that don't process graphics

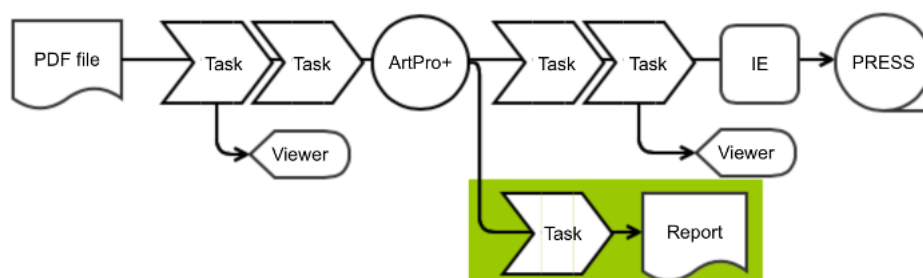
Add to Products	Download WebCenter Document	Remove Product
Archive Job	Export ArtiosCAD Design Info	Resize Shape
Add to Pages View	Export Imposition to JDF Layout	Restore Job
Add Marks to Imposition	Export Imposition to PDF File	Run ArtiosCAD Standard
Apply Creep	Export Imposition to PostScript File	Run Script
Add Margins to LEN File	Export Kongsberg Cutting History	Select File
Assign PDF Pages to RunList	Export to VRML File	Send E-mail
Calculate Ink Key Settings (CIP3)	Fill Printing Lanes	Send to AE
Change Imposition Layout	Import Die	Send to Nexus
Check Dynamic VDP Database	Import JDF Stripping	Send to Odystar
Convert JSON to XML	Import Sheet Sizes from XML	Share Job
Convert Selection	Import Substrate Sizes from XML	Smart Task
Convert XML to JSON	Inspect Artwork	Split XML File
Copy or Move File	Inspect Barcodes	Submit XML to Gang Run
Create ArtiosCAD Layouts	Inspect Braille	Submit to CDI
Create ArtiosCAD Report from XML	Inspect Spelling	Submit to Esko DFE
Create Job		Submit to Gang Run

Create Imposition	Inspect Text	Submit to HP SmartStream Production Pro Print Server
Create Imposition from JDF Layout	Integrate via External Hot Folder	Submit to Kongsberg Table
Create Imposition from Runlist	Integrate with WebCenter	Submit to Plate Merger
Create Imposition Sheet Report	Interact using JDF	Synchronize ArtiosCAD Boards
Create Job Report	Interact using JMF	Synchronize ArtiosCAD Companies
Create Merged Plate	Interact with Database	Unshare Job
Create RunList from PDF	Interact with SAP	Unzip
Create Packshot from XML	Interact with Web Service	Upload Files to Esko Cloud Job Folder
Create or Modify WebCenter Project	Join XML Files	Upload Product to Esko Cloud
Create Runlist	Link Product to Job	Upload to Cloud Storage
Create or Modify WebCenter Project	Manage Milestone	Upload to SFTP
Create PDF from Runlist	Manage Product Status	Upload via FTP
Create XML	Map Data	Wait
Crop LEN File	Mark as Proof	Wait for Action (Checkpoint) Chain
Delete File	Preflight Color for Digital Printing	Wait for Files
Download Files from Esko Cloud Job Folder	Publish Imposition on WebCenter	Wait for Files (via JDF)
Download Products from Esko Cloud	Relocate Job	Wait for Product Status
	Remove Job	Zip

As Workflow Controls such as Data Collector, Data Splitter, Router, etc. are not processing files but rather controlling the behavior of a workflow, they are safe to use.

Workflow Sidetracks

In the previous section we focused on the tasks that directly affected the print production, but a workflow typically also has some 'side-tracks'. E.g. tasks that produce extra artifacts, such as reports, PDF for viewing, 3D pack shots, etc...



For these tasks it is less critical to be native PDF. So, next to all the tasks mentioned above, here are some more tasks that you can use in side-track workflows:

Task	Comment
Export to 3D	This task will currently normalize the PDF, but that should not affect the appearance of the artwork. This task will also preserve the structural design information (if there is only one structural design part placed per file). Under those conditions, the pack shot will look correct.
Create Report (ReportMaker)	<p>As of Automation Engine 20, a new Create PDF Report task is available, based on templates prepared in ArtPro+.</p> <p>As a fallback the legacy Create Report (ReportMaker) task can also still be used. This task will normalize the input file (and requires a Normalized PDF file as template), but that should not affect the appearance of the artwork or the separations.</p>
Export to PDF File	<p>To create a self-contained file (eg. for sharing): There's no task needed, as a native PDF is self-contained.</p> <p>To a standard (eg. PDF/X4): The task Preflight with Pitstop is recommended instead.</p> <p>Optimize for viewing/proofing (eg. convert to RGB): This is such a drastic conversion, so it doesn't really matter that much that this task performs a normalization first.</p> <p>Export for Illustrator: We recommend PDF Import plug-in for Adobe Illustrator instead.</p> <p>See also Standardizing your input files on page 16</p>
Extract Metadata	<p>To integrate with MIS systems:</p> <p>The new Export PDF Info task to extract metadata of a PDF+ file can be used. The legacy task Create PAF / JPG / XML (LinkEdge) task can still be used to extract XMP information from a Normalized file. If the input file would be a PDF(+) file, the file will get Normalized on the fly (auto-normalization)</p>

3. Proofing

Esko PackProof can RIP native PDF files, and hence also PDF+ files. But make sure that the document's output intent (called **Document Profile** in ArtPro+) matches the input profile of the chosen Color Strategy. This to ensure that RGB images or other tagged objects are treated consistent with the RIP.

See also [The RIP](#) on page 14 on how to filter on processing step layers to include/exclude the technical drawing.

4. The RIP

The Imagine Engine tasks (Image to ...) were mentioned above as safe to use in a native workflow. However, there are some limitations and constraints that you need to be aware of.

Avoid Normalization in your Imagine Engine Tasks

For your workflow to remain native PDF, make sure not to choose a SmartMark set in the **General** tab of the "Image to ..." tickets. Instead you can add Dynamic Mark sets in any earlier step of the workflow (for example in a PDF Action List). RIP specific marks are currently not supported.

Correction Curves

Color correction curves (which can be set as of ArtPro+ 20) will be honored by the RIP (Imagine Engine 20), but only if you follow the guidelines in this document so that your entire workflow from editor to RIP is native PDF.

Exclude Technical Art from RIP output

Usually there are separations/part of the artwork that you wish to exclude from being RIP'ed. First you can filter on printing method. That works the same as in Normalized PDF. Secondly, you might want to filter on processing steps (eg. Exclude all processing steps). The RIP tasks don't support filtering on processing steps yet. If you need to exclude processing steps from being RIP'ed, then we recommend this workaround:

Remove All Technical Inks

If you enable the option "Remove all Technical Inks" on native PDF files, then all separations used exclusively in processing step layers will be excluded.

Filter with Enfocus PDF Action List

If you need more fine-grained control, then you create an Enfocus PDF Action List (not a PDF Action List) with the following steps:

- Select layers by processing step
- Change Layer Properties (visibility) to invisible.

Then you use a Preflight with Pitstop task to execute this action list before the imaging task. As a result, all artwork in these processing step layers will be set invisible and non-printing. The RIP will then ignore that artwork, as well as any separations that was used exclusively by that artwork.

Filter by Separation Name

Alternatively, you could of course keep using naming conventions in your separations and have the RIP filter on those. However, that would not be leveraging the new PDF standard to its full potential.

Esko DFE (output to a digital press)

The Esko DFE is designed to take any PDF as input, without performing a Normalization. So it is capable of processing PDF+ files. However, the DFE features are currently exclusively for Normalized PDF files and not available on PDF+ files:

Exclusive to Normalized PDF files	Workaround for PDF+ files
Do not output technical inks	1. Filter on separation name

Exclusive to Normalized PDF files	Workaround for PDF+ files
Identify colors from any Color Engine ink books.	<div>2. Or Normalize* the PDF+ file prior to DFE</div> <div>1. Match separation name from a single Color Engine ink book per job.</div> <div>2. Or Normalize* the PDF+ file prior to DFE</div>

* Normalizing would defy the purpose of migrating to native PDF. But if your production is a combination of conventional and digital, you could still choose to migrate your workflows, editors and files to native PDF and perform a last-minute Normalization only for the digital output.

5. Input files

5.1. Standardizing your input files

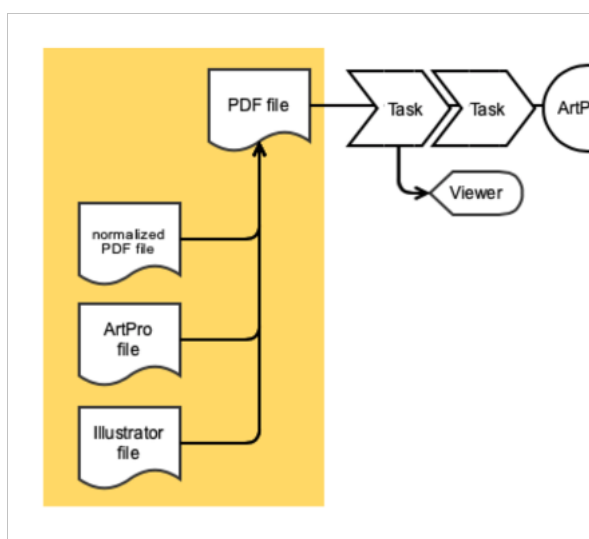
A Normalized PDF workflow had the advantage that undesirable variation in the input PDFs is automatically reduced to a common standard as part of the automatic Normalization. In a native PDF flow this no longer happens implicitly. Instead you can insert it in your workflow. And this time you have full control:

- **Pitstop Preflight:** Available in ArtPro+ and as an Automation Engine task. Will fix your PDF file based on a preflight profile, this can be an industry standard (e.g. PDF/X4) or your own profile.
- **Optimize PDF:** Is a collection of common tools to bring a PDF to your house standards.
- Other, more advanced, modifications can be done with a PDF action list, either in ArtPro+ or using the **Apply PDF Action List** task in Automation Engine.

5.2. Legacy files

If the input file is an Esko Normalized PDF file or an ArtPro file (e.g. when you are processing a reprint order), then you could run them through your old workflows (We don't intend to deprecate these tasks anytime soon). But for consistency, it is advised to convert them to native PDF as early as possible in the workflow, and then make sure to keep them native PDF (as described above).

To achieve this: Normalized PDF files and ArtPro files can be opened in ArtPro+ and converted to PDF+ there or converted with the PDF Action "Convert to PDF+".



5.3. Illustrator files

An Adobe Illustrator documents needs to be converted to PDF^{*} before it can be used in an output workflow. It is your choice at what point in the workflow you do this conversion:

- If you prefer to prepare the one-up in Illustrator, using the Esko DeskPack and/or Data Exchange plug-ins, then you can export directly to PDF+: In the **Ink Manager**, set your document mode to **PDF +**, and then export to **Esko PDF**. (read more in the [DeskPack manual](#)).
- If you prefer to use ArtPro+ for your editing needs, then you can just use Illustrator's built-in PDF save or export capability and process the file as a native PDF file. You can also directly use the Illustrator file (if it's PDF compatible) but note that as soon as that PDF file is modified, you will not be able to open it natively in Illustrator anymore.

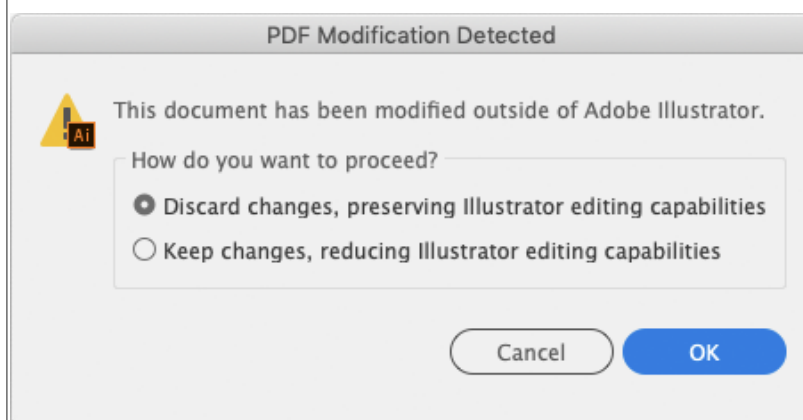
Note: As an Illustrator User providing Illustrator PDF files, you should enable the **Add top level layers** option to ensure you have a layered PDF file inside a PDF editor. You should also disable the **Preserve Illustrator Editing Capabilities** option^{*}

(*): Illustrator can also write an "Illustrator PDF with Editing Capabilities", suggesting that you can go back and forth between Illustrator and PDF without a conversion. **This is not true.** Illustrator and PDF are very different formats, and a conversion is inevitable. An "Illustrator PDF file with Editing Capabilities" actually consists of 2 parts:

1. PDF data (equivalent to exporting to PDF)
2. The original AI-document

The PDF data can be used by any viewer, printer or RIP, while the AI data is used by Illustrator when reopening the file.

If you edit such a file in a PDF editor, you are breaking the consistency between the PDF and AI information. When reopening the file in Adobe Illustrator, you will have a choice:



If you choose **Discard changes, preserving Illustrator editing capabilities** you discard all changes you made in the PDF editor, and open the original Adobe Illustrator file instead.

In ArtPro+, you can avoid this by removing the Adobe Illustrator portion of the file. To do this, create and run a PDF Preflight profile containing an Action List that removes the "PierceInfo" metadata. For more information, see <https://wiki.esko.com/pages/viewpage.action?pageId=297176305>

6. Metadata and Business Integration

PDF+ no longer relies on Esko proprietary tags in the XMP section. This has implications for your MIS integration and your Automation Engine workflows.

MIS Integration

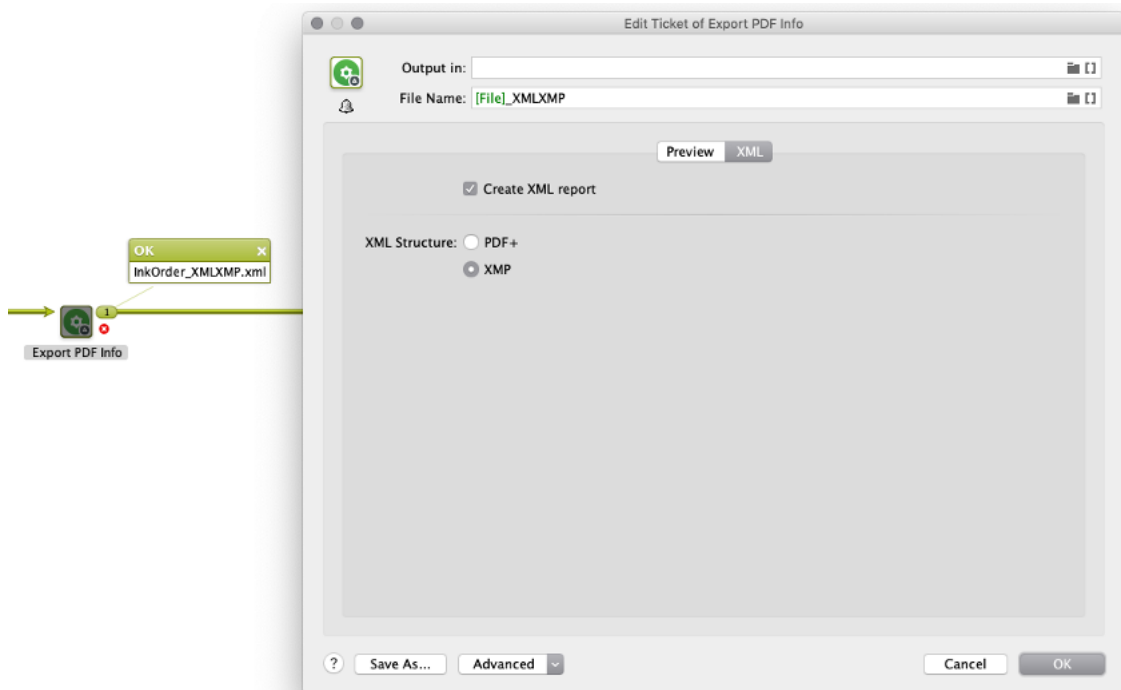
In a standard MIS integration, Automation Engine will push XMP information to the business system. This XMP information includes the number of inks, the ink names, other ink attributes and ink coverage data.

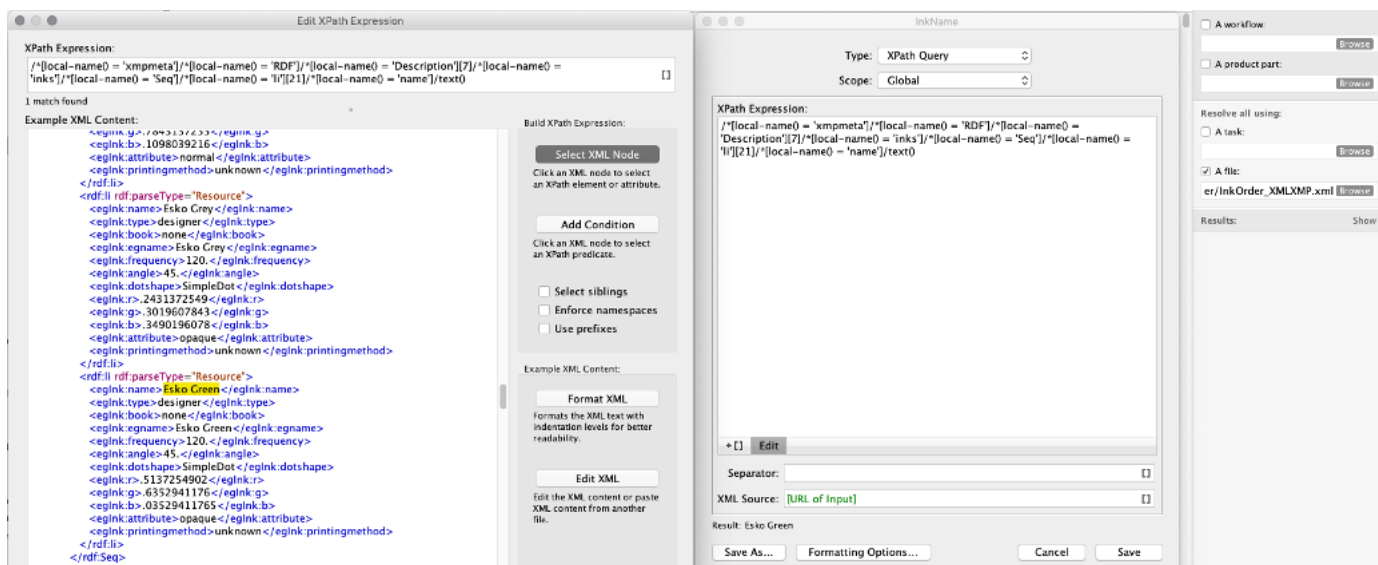
For PDF+ files, we recommend that you use the **Export PDF Info** task instead of the **Create PAF / JPG / XML (LinkEdge)** task. If there was already an MIS integration then you can configure this task to export XML files that are backwards compatible. For new integrations, you can choose for an updated XML scheme. For detailed information, search for **XML specification of Metadata+** in the [Automation Engine](#) documentation.

Controlling the Workflows with Metadata

SmartNames are a powerful mechanism to control the Automation Engine workflow. When migrating to a PDF+ workflow, all SmartNames will still work in a similar way, except for XMP XPath SmartNames. They will not resolve, as there are no Esko tags in the XMP section of the file.

The workaround is to export the XMP to a separate and temporary file, then perform an XPath query on that file, as shown in this example:





7. Planning your Migration

7.1. Am I ready to migrate?

Before diving into the migration, best to check if you and your tools are ready for it. You can start by reading this document from start to finish, as it lists some limitations in the current software versions. If these limitations and the presented workarounds do not fit your business requirements, then it might be better to wait for a future update of our software. You can let us know via the [Esko Ideas](#) platform.

7.2. Approach

Migrating to native PDF is a unique opportunity to review, standardize and update your system. In our experience you can end with a significantly simpler and easier to maintain system. We would not advice that you replace your current workflows one task at a time, as you will miss this opportunity to simplify.

You'll only get the full benefit from native PDF after you have migrated your entire system (software, workflows, marks, ...). It's unlikely (and risky) that you will switch overnight. So you will need a phased approach. Luckily you can use your old and new workflows and editors alongside

Rebuild Backwards

One way to phase the migration, is to start at the end of your workflow and then move upstream:

- First you reimplement your production workflow (**Step&Repeat** and **RIP**), using dynamic marks and the new S&R tickets. This workflow starts by a PDF Action that converts Normalized PDF or ArtPro one-ups to PDF+.



- In a next step, you can reimplement your technical reports, using dynamic marks and the new **Create PDF Report** ticket.
- In the meantime, you gradually roll out **ArtPro+** as prepress editor and QA viewer. Even for opening Normalized PDF files. If you're using Illustrator as editor, then this is the time to start exporting PDF + files.
- Lastly you reimplement your prepress (one-up) workflows

Migrate by Job Category

Another successful approach is to choose one category of jobs, and build, test and deploy a completely new native PDF workflow for that. Then gradually add more categories, until you can handle the most complex job.

As you can probably imagine, you can also mix these two phasing strategies.

Marks

For your native PDF workflow, you will need to create new mark sets, based on **ArtPro+ dynamic marks**. If you were previously using **SmartMarks** or **ArtPro marks** then you will need to create new sets. Use this opportunity to review your requirements and simplify your mark sets. Before you get started, make sure to watch the e-learnings (see <https://www.esko.com/en/support/blendedlearning>). Also look at the example marks that are shipped with ArtPro+. You can immediately integrate them in your mark sets, modify them to your needs, or just inspect how they were built up to learn from it.

The traffic light, for example, is primarily a **Repeat for Separation Mark**, with as repeating content a square, a circle and **Point Text Mark** for the index number:

