3-Heights™ PDF to PDF/A Converter API

PDF/A compliant

Version 4.10

PDF-TOOLS.COM
Premium PDF Technology

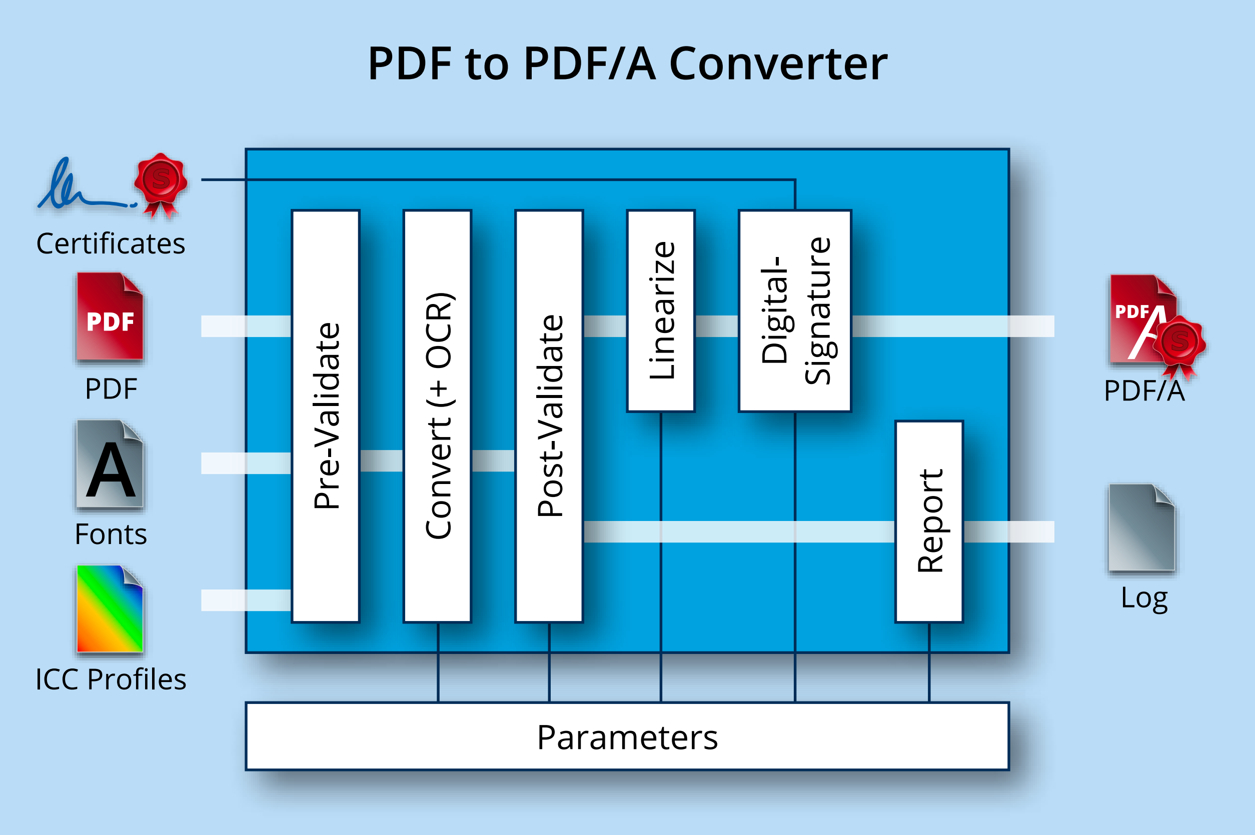
Contents

1 Introduction

1.1 Description

The 3-Heights™ PDF to PDF/A Converter API converts PDF files into PDF/A files. PDF/A has been acknowledged world-wide as the ISO standard for long-term archiving since 2005. The tool analyzes and converts the input file, applying a digital signature where required.

The integrated validator then optionally checks conformity once again. This product is robust and powerful and therefore predestined for archive migrations of any size.



1.2 Functions

The 3-Heights™ PDF to PDF/A Converter API accepts files from many different applications and automatically converts them into PDF/A. The level of conformity can be set to level A, U, or B. ICC color profiles for device-dependent color profiles and font types are embedded in the document. There is an option to provide the entire character set for fonts (no subsetting) to facilitate editing at a later stage. Missing fonts are reproduced as close to the original as possible via font recognition. Metadata can be generated automatically or added from external sources. The tool also detects and automatically repairs problems typical of the PDF format. A digital signature can be applied and a conformity check carried out at the end of the process. The optional OCR Add-On and linearization for fast web display are valuable additional functions.

1.2.1 Features

- Convert PDF documents to PDF/A-1, PDF/A-2, PDF/A-3

  - Support for all PDF/A compliance levels
  - Make color spaces device-independent, e.g. by embedding ICC profile or setting an output intent
  - Embed and subset fonts
  - Colorants management (PDF/A-2 and later)
  - Recover corrupt documents
  - Repair corrupt data such as embedded font programs or images
  - Remove transparency (PDF/A-1 only)
  - Remove malicious content such as attached files (PDF/A-1 and PDF/A-2) and JavaScript actions
  - Remove multimedia content such as video and sound
  - Conversion of embedded and attached files (PDF/A-2 and later)
  - Repair metadata and make them consistent
- Conversion process control
  - Pre- and post-validation
  - Conversion reporting
  - Write the application log to a log file
  - Automatically determine optimal compliance based on input file (optional)
  - Enables sophisticated error handling
- Digital signatures, PDF/A-compliant
  - Apply PAdES-LTV (Long Term Validation) signatures
  - Embedded trust chain, time-stamp and revocation information (OCSP, CRL)
  - Various types of cryptographic providers
    - Windows certificate store
    - Hardware such as hardware security module (HSM), smart cards, and USB tokens
    - Online signature services
      - 3-Heights™ Signature Creation and Validation Service
      - SwissSign Digital Signing Service
      - SwissSign SuisseID Signing Service
      - QuoVadis sealsign
      - Swisscom All-in Signing Service
      - GlobalSign Digital Signing Service
  - Add an optional visual appearance of the signature (page, size, color, position, text, background image, etc.)
  - Mass signing of documents
- Read input from and write output document to file or memory
- Read encrypted input files
- Enhance output file
  - Set metadata
  - Linearization for fast web view
  - Use PDF file compression features (PDF/A-2 and later)
- Text recognition using OCR engine (optional)
  - Replace old OCR text or skip images with existing OCR text
  - Set the OCR language and options
  - Deskew and de-noise images
  - Detect barcodes
  - List OCR plug-ins
- Add embedded files (PDF/A-2) and associated files (PDF/A-3)
- Embedded XML invoice data conforming to the ZUGFeRD specification (PDF/A-3)

1.2.2 Formats

Input Formats

- PDF 1.x (PDF 1.4, PDF 1.5, etc.)

Target Formats

- PDF/A-1a, PDF/A-1b
- PDF/A-2a, PDF/A-2b, PDF/A-2u
- PDF/A-3a, PDF/A-3b, PDF/A-3u

1.2.3 Compliance

- Standards:
  - ISO 19005-1 (PDF/A-1)
  - ISO 19005-2 (PDF/A-2)
  - ISO 19005-3 (PDF/A-3)
  - ISO 32000-1 (PDF 1.7)
  - PAdES (ETSI EN 319 142) signature levels B-B, B-T, CMS
  - Legacy PAdES (ETSI TS 103 172) Part 2 and Part 4 (Long Term Validation, LTV)
  - Cryptographic Suites (ETSI TS 119 312)
  - ZUGFeRD
- Quality assurance: veraPDF test corpus and Isartor test suite

1.3 Interfaces

The following interfaces are available

- C
- .NET
- Java
- COM
- PHP

1.4 Operating Systems

The 3-Heights™ PDF to PDF/A Converter API is available for the following operating systems:

- Windows 7, 8, 8.1, 10 – 32 and 64 bit
- Windows Server 2008, 2008 R2, 2012, 2012 R2, 2016 – 32 and 64 bit
- HP-UX 11i and later PA-RISC2.0 – 32 bit
- HP-UX 11i and later ia64 (Itanium) – 64 bit
- IBM AIX 6.1 and later – 64 bit
- Linux 2.6 – 32 and 64 bit
- Oracle Solaris 2.8 and later, SPARC and Intel
- FreeBSD 4.7 and later (32 bit) or FreeBSD 9.3 and later (64 bit, on request)
- macOS 10.4 and later – 32 and 64 bit

1.5 How to Best Read this Manual

If you are reading this manual for the first time, i.e. would like to evaluate the software, the following steps are suggested.

1. Read the chapter Introduction to verify this product meets your requirements.
2. Identify what interface your programming language uses.
3. Read and follow the instructions in the chapter Installation and Deployment
4. In the chapter Programming Interfaces find your programming language. Please note that not every language is covered in this manual.
   For many programming languages there is sample code available. For a start it is generally best to refer to these samples rather than writing code from scratch.
5. (Optional) Read the chapter User's Guide for general information about the API. Read the Reference Manual for specific information about the functions of the API.

1.6 Digital Signatures

1.6.1 Overview

Digital signature is a large and slightly complex topic. This manual gives an introduction to digital signatures and describes how the 3-Heights™ PDF to PDF/A Converter API is used to apply them. It does however not describe all the technical details.

1.6.2 Terminology

Digital Signature is a cryptographic technique of calculating a number (a digital signature) for a message. Creating a digital signature requires a private key from a certificate. Validating a digital signature and its authorship requires a public key. Digital Signature is a technical term.

Electronic Signature is a set of electronic data that is merged or linked to other electronic data in order to authenticate it. Electronic Signatures can be created by means of a digital signature or other techniques. Electronic Signature is a legal term.

Abbreviations

CA	Certification Authority
CMS	Cryptographic Message Syntax
CRL	Certificate Revocation List
CSP	Cryptographic Service Provider
HSM	Hardware Security Module
OCSP	Online Certificate Status Protocol
PKCS	Public Key Cryptography Standards

Abbreviations

QES	Qualified Electronic Signature
TSA	Time-stamp Authority
TSP	Time-stamp Protocol

1.6.3 Why Digitally Signing?

The idea of applying a digital signature in PDF is very similar to a handwritten signature: A person reads a document and signs it with its name. In addition to the name, the signature can contain further optional information, such as the date and location. A valid electronic signature is a section of data that can be used to:

- Ensure the integrity of the document
- Authenticate the signer of the document
- Prove existence of file prior to date (time-stamp)

Digitally signing a document requires a certificate and its private key. How to access and use a certificate is described in the chapter Cryptographic Provider.

In a PDF document, a digital signature consists of two parts:

A PDF related part This part consists of the PDF objects required to embed the signature into the PDF document. This part depends on the signature type (Document Signature, MDP Signature, see table below). Information such as name of the signer, reason, date, location is stored here. The signature may optionally have a visual appearance on a page of the PDF document, which can contain text, graphics and images.

This part of the signature is entirely created by the 3-Heights™ PDF to PDF/A Converter API.

A cryptographic part A digital signature is based on a cryptographic checksum (hash value) calculated from the content of the document that is being signed. If the document is modified at a later time, the computed hash value is no longer correct and the signature becomes invalid, i.e. the validation will fail and will report that the document has been modified since the signature was applied. Only the owner of the certificate and its private key is able to sign the document. However, anybody can verify the signature with the public key contained in the certificate.

This part of the signature requires a cryptographic provider for some cryptographic data and algorithms.

The 3-Heights™ PDF to PDF/A Converter API supports the following types of digital signatures:

Document Signature Check the integrity of the signed part of the document and authenticate the signer's identity. One or more document signatures can be applied. A signed document can be modified and saved by incremental updates. The state of the document can be re-created as it existed at the time of signing.

MDP (Modification detection and prevention) Signature Enable detection of disallowed changes specified by the author. A document can contain only one MDP signature; which must be the first in the document. Other types of signatures may be present.

Document Time-stamp Signature A time-stamp signature provides evidence that the document existed at a specific time and protects the document's integrity. One or more document time-stamp signatures can be applied. A signed document can be modified and saved by incremental updates.

1.6.4 What is an Electronic Signature?

There are different types of electronic signatures, which normally are defined by national laws, and therefore are different for different countries. The type of electronic signatures required in a certain process is usually defined by national laws. Quite advanced in this manner are German-speaking countries where such laws and an established terminology exist. The English terminology is basically a translation from German.

Three types of electronic signatures are distinguished:

- Simple Electronic Signature “Einfache Elektronische Signatur”
- Advanced Electronic Signature “Fortgeschrittene Elektronische Signatur”
- Qualified Electronic Signature (QES) “Qualifizierte Elektronische Signatur”

All applied digital signatures are PDF/A and PAdES compliant.

Simple Electronic Signature

A simple electronic signature requires any certificate that can be used for digital signing. The easiest way to retrieve a certificate, which meets that requirement, is to create a so called self-signed certificate. Self-signed means it is signed by its owner, therefore the issuer of the certificate and the approver of the legitimacy of a document signed by this certificate is the same person.

Example:

Anyone could create a self-signed certificate issued by “Peter Pan” and issued to “Peter Pan”. Using this certificate one is able to sign in the name of “Peter Pan”.

If a PDF document is signed with a simple electronic signature and the document is changed after the signature had been applied, the signature becomes invalid. However, the person who applied the changes, could at the same time (maliciously) also remove the existing simple electronic signature and—after the changes—apply a new, equally looking Simple Electronic Signature and falsify its date. As we can see, a simple electronic signature is neither strong enough to ensure the integrity of the document nor to authenticate the signer.

This drawback can overcome using an advanced or Qualified Electronic Signature.

Advanced Electronic Signature

Requirements for advanced certificates and signatures vary depending on the country where they are issued and used.

An advanced electronic signature is based on an advanced certificate that is issued by a recognized certificate authority (CA) in this country, such as VeriSign, SwissSign, QuoVadis. In order to receive an advanced certificate, its owner must prove its identity, e.g. by physically visiting the CA and presenting its passport. The owner can be an individual or legal person or entity.

An advanced certificate contains the name of the owner, the name of the CA, its period of validity and other information.

The private key of the certificate is protected by a PIN, which is only known to its owner.

This brings the following advantages over a simple electronic signature:

- The signature authenticates the signer.
- The signature ensures the integrity of the signed content.

Qualified Electronic Signature

Requirements for qualified certificates and signatures vary depending on the country where they are issued and used.

A Qualified Electronic Signature is similar to an advanced electronic signature, but has higher requirements. The main differences are:

- It is based on a qualified certificate, which is provided as a hardware token (USB stick, smart card).
- For every signature it is required to enter the PIN code manually. This means that only one signature can be applied at a time.
- Certificate revocation information (OCSP/CRL) can be acquired from an online service. The response (valid, revoked, etc.) must be embedded in the signature.
- A time-stamp (TSP) that is acquired from a trusted time server (TSA) may be required.

This brings the following advantages over an advanced electronic signature:

- The signature ensures the certificate was valid at the time when the document was signed (due to the embedding of the OCSP/CRL response).
- The signature ensures the integrity of the time of signing (due to the embedding of the time-stamp).
- Legal processes that require a QES are supported.

Note: A time-stamp can be added to any type of signature. OCSP/CRL responses are also available for some advanced certificates.

1.6.5 How to Create Electronic Signatures

This is a simple example of how to create an electronic document signature. More detailed examples can be found in How to Create Digital Signatures.

Preparation Steps

1. Identify whether an advanced or a qualified signature is required. For most automated processes an advanced signature is sufficient.
2. Acquire a corresponding certificate from a CA. Note that some CA offer USB sticks or smart cards that contain both, an advanced and a qualified certificate.
3. Setup and configure the certificate's Cryptographic Provider.
   - In case the certificate resides on hardware such as an USB token or a Smart Card, the required middleware (driver) needs to be installed.
   - In case the certificate is a soft certificate, it must be imported into the certificate store of a cryptographic provider.
4. Identify regulatory requirements regarding the content and life cycle of the signature:
   - Is a time-stamp required to prove that the signature itself existed at a certain date and time?
   - Should validation information be embedded, in order to allow the signature to be validated long time after its generation?
   - Should the integrity of the validation material be protected?

   These requirements (or regulatory requirements) define the signature level that must be used.
5. Optional: Acquire access to a trusted time server (TSA) (e.g. from the CA of your signing certificate).
6. Optional: Ensure your input documents conform to the PDF/A standard. It is recommended to sign PDF/A documents only, because this ensures that the file's visual appearance is well defined, such than it can be reproduced flawlessly and authentically in any environment. Furthermore, PDF/A compliance is typically required if the file is to be archived. Because signed files cannot be converted to PDF/A without breaking its signatures, files must be converted before signing.

Note: A detailed guidance on the use of standards for signature creation can be found in the technical report ETSI TR 119 100.

Application of the Signature

Apply the signature by providing the following information:

1. The Cryptographic Provider where the certificate is located
2. Values for the selection of the signing certificate (e.g. the name of the certificate)
3. Optional: Time-stamp service URL (e.g. “http://server.mydomain.com:80/tsa”)
4. Optional: Time-stamp service credentials (e.g. username:password)
5. Optional: Add validation information
6. Optional: Visual appearance of the signature on a page of the document (e.g. an image).

Example: Steps to Add an Electronic Document Signature

The 3-Heights™ PDF to PDF/A Converter API applies PDF/A compliant signatures. This means if a PDF/A document is digitally signed, it remains PDF/A compliant.

In order to add an electronic document signature with the 3-Heights™ PDF to PDF/A Converter API the following steps need to be done:

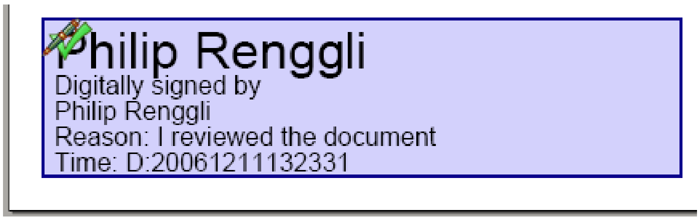
1. Create a new `PdfSignature` object
2. As value of the `PdfSignature`’s name, the name of the certificate that is to be used must be provided. The name of the certificate corresponds to the value “Issued to:”.
3. If the certificate’s private key is PIN protected, the PIN can be passed in the provider configuration.
4. Additional parameters can now be set such as the reason why the signature is applied, etc.

In Visual Basic the four steps above look like this:

```
Dim conv As New Pdf2PdfAPI

Dim Signature As New PdfSignature
Signature.Name = "Philip Renggli"
Signature.Provider = "cvp11.dll;0;secret-pin"
Signature.Reason = "I reviewed the document" ' optional
Signature.Rect = Array(10, 10, 210, 60) ' optional visual appearance
Signature.TimeStampURL = "http://server.mydomain.com:80/tsa" ' optional

cnv.AddSignature Signature
conv.Convert "input.pdf", "password", "output.pdf", "log.txt"
```

Of course, you would use your own name instead. The name of the certificate is defined by its common name (CN), which is displayed as “issued to” in the Windows Certificate Store.

The visual appearance of the digital signature on a page of the resulting output-document looks as shown below:



Philip Renggli
Digitally signed by
Philip Renggli
Reason: I reviewed the document
Time: D:20061211132331

2 Installation and Deployment

2.1 Windows

The 3-Heights™ PDF to PDF/A Converter API comes as a ZIP archive.

The installation of the software requires the following steps.

1. You need administrator rights to install this software.
2. Log in to your download account at `http://www.pdf-tools.com`. Select the product "PDF to PDF/A Converter API". If you have no active downloads available or cannot log in, please contact `pdfsales@pdf-tools.com` for assistance.
   You will find different versions of the product available. We suggest to download the version, which is selected by default. If another is required, it can be selected using the combo box.
   The product comes as a ZIP archive containing all files.
   There are 32 and 64-bit versions of the product available. While the 32-bit version runs on both, 32 and 64-bit platforms, the 64-bit version runs on 64-bit platforms only. The ZIP file contains both the 32-bit and the 64-bit version of the product.
3. Unzip the archive to a local folder, e.g. `C:\Program Files\PDF Tools AG\`.
   This creates the following subdirectories:

Subdirectory	Description
`bin`	Contains the runtime executable binaries.
`doc`	Contains documentation.
`include`	Contains header files to include in your C/C++ project.
`jar`	Contains Java archive files for Java components.
`lib`	Contains the object file library to include in your C/C++ project.
`samples`	Contains sample programs in various programming languages

4. (Optional) Register your license key using the License Management.
5. Identify which interface you are using. Perform the specific installation steps for that interface described in chapter Interface Specific Installation Steps
6. Ensure the cache directory exists as described in chapter Special Directories.
7. Make sure your platform meets the requirements regarding color spaces and fonts described in chapters Color Spaces and Fonts respectively.
8. If you want to sign documents, proceed with setting up your cryptographic provider as described in chapter Cryptographic Provider.

2.2 Unix

This section describes installation steps required on all Unix platforms, which includes Linux, macOS, Oracle Solaris, IBM AIX, HP-UX, FreeBSD and others.

The Unix version of the 3-Heights™ PDF to PDF/A Converter API provides three interfaces:

- Java interface
- Native C interface
- PHP interface - Linux only

Here is an overview of the files that come with the 3-Heights™ PDF to PDF/A Converter API:

File Description

Name	Description
bin/‹platform›/libPdf2PdfAPI.so	This is the shared library that contains the main functionality. The file's extension varies depending on the type of UNIX system. The directory ‹platform› is either x86 containing the 32-bit version of the library, or x64 for the 64-bit version.
bin/‹platform›/php*_pdftools.so	The PdfTools PHP extension.
doc/*.*	Documentation
include/*.h	Contains header files to include in your C/C++ project.
jar/CNVA.jar	Java API archive.
samples	Example code.

2.2.1 All Unix Platforms

1. Unpack the archive in an installation directory, e.g. /opt/pdf-tools.com/
2. Copy or link the shared object into one of the standard library directories, e.g:

```
ln -s /opt/pdf-tools.com/bin/‹platform›/libPdf2PdfAPI.so /usr/lib
```

3. Verify that the GNU shared libraries required by the product are available on your system:
   - *On Linux*:

   ```
   ldd libPdf2PdfAPI.so
   ```

   - *On AIX*:

   ```
   dump -H libPdf2PdfAPI.so
   ```

   In case the above reports any missing libraries you have two options:

   a. Use your system's package manager to install the missing libraries. On Linux it usually suffices to install the package libstdc++6.
   b. Use the PDF-Tools provided GNU shared libraries:
      1. Go to http://www.pdf-tools.com and navigate to "Support" →"Utilities".
      2. Download the GNU shared libraries for your platform.
      3. Extract the archive and copy or link the libraries into your library directory, e.g /usr/lib or /usr/lib64.
      4. Verify that the GNU shared libraries required by the product are available on your system now.
4. Optionally register your license key using the Command Line License Manager Tool.
5. Identify which interface you are using. Perform the specific installation steps for that interface described in chapter Interface Specific Installation Steps
6. Ensure the cache directory exists as described in chapter Special Directories.

7. Make sure your platform meets the requirements regarding color spaces and fonts described in chapters Color Spaces and Fonts respectively.
8. If you want to sign documents, proceed with setting up your cryptographic provider as described in chapter Cryptographic Provider.

2.2.2 macOS

The shared library must have the extension `.jnilib` for use with Java. We suggest that you create a file link for this purpose by using the following command:

```
ln libPdf2PdfAPI.dylib libPdf2PdfAPI.jnilib
```

2.3 Interfaces

The 3-Heights™ PDF to PDF/A Converter API provides five different interfaces. The installation and deployment of the software depend on the interface you are using. The table below shows the supported interfaces and examples with which programming languages they can be used.

Interface	Programming Languages
`.NET`	The MS software platform .NET can be used with any .NET capable programming language such as: ■ C# ■ VB .NET ■ J# ■ others This interface is available in the Windows version only.
`Java`	The Java interface is available on all platforms.
`COM`	The component object model (COM) interface can be used with any COM-capable programming language, such as: ■ MS Visual Basic ■ MS Office Products such as Access or Excel (VBA) ■ C++ ■ VBScript ■ others This interface is available in the Windows version only.
`C`	The native C interface is for use with C and C++. This interface is available on all platforms.
`PHP`	The PHP interface is available on Windows and Linux. Supported PHP versions are PHP 5.6 & 7.0 (Non Thread Safe).

2.3.1 Development

The software developer kit (SDK) contains all files that are used for developing the software. The role of each file with respect to the five different interfaces is shown in table Files for Development. The files are split in four categories:

Req. This file is required for this interface.

Opt. This file is optional. See also table File Description to identify which files are required for your application.

Doc. This file is for documentation only.

Empty field An empty field indicates this file is not used at all for this particular interface.

Files for Development

Name	.NET	Java	COM	C	PHP
bin\‹platform›\Pdf2PdfAPI.dll	Req.	Req.	Req.	Req.	Req.
bin*NET.dll	Req.				
bin*NET.xml	Doc.				
bin\‹platform›\php*_pdftools.dll					Req.
bin\‹platform›*.ocr	Opt.	Opt.	Opt.	Opt.	Opt.
doc*.pdf	Doc.	Doc.	Doc.	Doc.	Doc.
doc\Pdf2PdfAPI.idl			Doc.		
doc\javadoc\*.*		Doc.			
doc\pdf2pdf_doc.php and pdftoolsenums_doc.php					Doc.
include\pdf2pdfapi_c.h				Req.	
include*.*				Opt.	
jar\CNVA.jar		Req.			
lib\‹platform›\Pdf2PdfAPI.lib				Req.	
samples*.*	Doc.	Doc.	Doc.	Doc.	Doc.

The purpose of the most important distributed files of is described in table File Description.

File Description

Name	Description
bin\‹platform›\Pdf2PdfAPI.dll	This is the DLL that contains the main functionality (required).
bin*NET.dll	The .NET assemblies are required when using the .NET interface. The files bin*NET.xml contain the corresponding XML documentation for MS Visual Studio.

File Description

`bin\‹platform›\*.ocr`	These are OCR interface DLLs that are used in combination with the 3-Heights™ OCR Enterprise Add-On which can be purchased as a separate product.[1]
`doc\*.*`	Various documentations.
`include\*.*`	Contains files to include in your C / C++ project.
`lib\‹platform›\Pdf2PdfAPI.lib`	The object file library needs to be linked to the C/C++ project.
`jar\CNVA.jar`	The Java API archive.
`bin\‹platform›\php*_pdftools.dll`	The `PdfTools` PHP extension must be added to the PHP extension directory.
`samples\*.*`	Contains sample programs in different programming languages.

2.3.2 Deployment

For the deployment of the software only a subset of the files are required. Which files are required (Req.), optional (Opt.) or not used (empty field) for the five different interfaces is shown in the table below.

Files for Deployment

Name	.NET	Java	COM	C	PHP
`bin\‹platform›\Pdf2PdfAPI.dll`	Req.	Req.	Req.	Req.	Req.
`bin\*NET.dll`	Req.				
`bin\‹platform›\*.ocr`	Opt.	Opt.	Opt.	Opt.	Opt.
`jar\CNVA.jar`		Req.			
`bin\‹platform›\php*_pdftools.dll`					Req.

The deployment of an application works as described below:

1. Identify the required files from your developed application (this may also include color profiles).
2. Identify all files that are required by your developed application.
3. Include all these files into an installation routine such as an MSI file or simple batch script.
4. Perform any interface-specific actions (e.g. registering when using the COM interface).

Example: This is a very simple example of how a COM application written in Visual Basic 6 could be deployed.

1. The developed and compiled application consists of the file `convert.exe`. Color profiles are not used.
2. The application uses the COM interface and is distributed on Windows only.
   - The main DLL `Pdf2PdfAPI.dll` must be distributed.

[1] These files must reside in the same directory as Pdf2PdfAPI.dll.

- All documents used by the application have their fonts embedded (e.g. because they are compliant to PDF/A), therefore the font related files are not distributed.

3. All files are copied to the target location using a batch script. This script contains the following commands:

```
copy convert.exe %targetlocation%\.
copy Pdf2PdfAPI.dll %targetlocation%\.
```

4. For COM, the main DLL needs to be registered in silent mode (/s) on the target system. This step requires Power-User privileges and is added to the batch script.

```
regsvr32 /s %targetlocation%\Pdf2PdfAPI.dll.
```

2.4 Interface Specific Installation Steps

2.4.1 COM Interface

Registration Before you can use the 3-Heights™ PDF to PDF/A Converter API component in your COM application program you have to register the component using the `regsvr32.exe` program that is provided with the Windows operating system. The following command shows the registration of Pdf2PdfAPI.dll. Note that in Windows Vista and later, the command needs to be executed from an administrator shell.

```
regsvr32 "C:\Program Files\PDF Tools AG\bin\‹platform›\Pdf2PdfAPI.dll"
```

Where `‹platform›` is `Win32` for the 32-bit and `x64` for the 64-bit version.

If you are using a 64-bit operating system and would like to register the 32-bit version of the 3-Heights™ PDF to PDF/A Converter API, you need to use the `regsvr32` from the directory `%SystemRoot%\SysWOW64` instead of `%SystemRoot%\System32`.[2]

If the registration process succeeds, a corresponding dialog window is displayed. The registration can also be done silently (e.g. for deployment) using the switch `/s`.

Other Files The other DLLs do not need to be registered, but for simplicity it is suggested that they reside in the same directory as the `Pdf2PdfAPI.dll`.

2.4.2 Java Interface

The 3-Heights™ PDF to PDF/A Converter API requires Java version 6 or higher.

For compilation and execution When using the Java interface, the Java wrapper `jar\CNVA.jar` needs to be on the CLASSPATH. This can be done by either adding it to the environment variable CLASSPATH, or by specifying it using the switch `-classpath`:

```
javac -classpath ".;C:\Program Files\PDF Tools AG\jar\CNVA.jar" sample.java
```

[2] Otherwise you get the following message: `LoadLibrary("Pdf2PdfAPI.dll") failed - The specified module could not be found.`

For execution Additionally the library Pdf2PdfAPI.dll needs be in one of the system's library directories[3] or added to the Java system property java.library.path. This can be achieved by either adding it dynamically at program startup before using the API, or by specifying it using the switch -Djava.library.path when starting the Java VM. Choose the correct subdirectory x64 or Win32 depending on the platform of the Java VM[4].

```
java -classpath ".;C:\Program Files\PDF Tools AG\CNVA.jar" ^
 -Djava.library.path=C:\Program Files\PDF Tools AG\bin\x64 sample
```

Note that on Unix-type systems, the path separator usually is a colon and hence the above changes to something like:

```
... -classpath ".:/path/to/CNVA.jar" ...
```

2.4.3 .NET Interface

The 3-Heights™ PDF to PDF/A Converter API does not provide a pure .NET solution. Instead, it consists of .NET assemblies, which are added to the project and a native DLL, which is called by the .NET assemblies. This has to be accounted for when installing and deploying the tool.

The .NET assemblies (*NET.dll) are to be added as references to the project. They are required at compilation time.

Pdf2PdfAPI.dll is not a .NET assembly, but a native DLL. It is not to be added as a reference in the project.

The native DLL Pdf2PdfAPI.dll is called by the .NET assembly Pdf2PdfNET.dll.

Pdf2PdfAPI.dll must be found at execution time by the Windows operating system. The common way to do this is adding Pdf2PdfAPI.dll as an existing item to the project and set its property "Copy to output directory" to "Copy if newer".

Alternatively the directory where Pdf2PdfAPI.dll resides can be added to the environment variable %Path% or it can simply be copied manually to the output directory.

2.4.4 C Interface

- The header file pdf2pdfapi_c.h needs to be included in the C/C++ program.
- The library Pdf2PdfAPI.lib needs to be linked to the project.
- The dynamic link library Pdf2PdfAPI.dll needs to be in a path of executables (e.g. on the environment variable %PATH%).

2.4.5 PHP Interface

Note: The descriptions below are valid for Unix-type systems. On a Windows system the libraries have a file extension dll instead of so.

The PHP interfaces for all 3-Heights™ products are contained in a sole "PdfTools" PHP extension. If multiple 3-Heights™ products are used, this extension is needed only once. Supported PHP versions are PHP 5.6 and 7.0 (both non thread-safe). The corresponding PHP extension libraries are php56_pdftools.so and php70_pdftools.so, henceforth summarized as php‹xy›_pdftools.so.

[3] On Windows defined by the environment variable PATH and e.g. on Linux defined by LD_LIBRARY_PATH.

[4] If the wrong data model is used, there is an error message similar to this: Can't load IA 32-bit .dll on a AMD 64-bit platform

General Steps

- Copy the library php‹xy›_pdftools.so to the PHP extensions directory. This directory is configured in the PHP section of your PHP configuration file php.ini in the key extension_dir.
- Add the following line to the PHP section of your PHP configuration file php.ini:

```
extension=php‹xy›_pdftools.so
```

- Make sure that the native library libPdf2PdfAPI.so is located in one of the system's library directories[3].

Additional Remarks for Command Line Use of PHP

- You can print out the current PHP configuration as configured in php.ini on the command line with:

```
php -i
```

- You can check whether PHP loads the PdfTools extension with:

```
php -m
```

Additional Remarks for Use in a Web Server

- You can locate the currently active PHP configuration file php.ini and report loaded modules with the following test PHP script:

```
<?php
phpinfo();
?>
```

- For an Apache web server to successfully locate and load the native library libPdf2PdfAPI.so follow these steps:
  a. Create a file /etc/ld.so.conf.d/pdf-tools.conf that contains the full path to the directory where libPdf2PdfAPI.so resides.
  b. Execute the command:

  ```
  sudo ldconfig
  ```

  c. Restart the web server.
  d. Reload the test PHP script and check whether there is an entry for the PdfTools extension.

2.5 Uninstall, Install a New Version

If you have used the ZIP file for the installation: In order to uninstall the product, undo all the steps done during installation, e.g. un-register using regsvr32.exe /u, delete all files, etc.

Installing a new version does not require to previously uninstall the old version. The files of the old version can directly be overwritten with the new version.

2.6 Note about the Evaluation License

With the evaluation license the 3-Heights™ PDF to PDF/A Converter API automatically adds a watermark to the output files.

2.7 Special Directories

2.7.1 Directory for temporary files

This directory for temporary files is used for data specific to one instance of a program. The data is not shared between different invocations and deleted after termination of the program.

The directory is determined as follows. The product checks for the existence of environment variables in the following order and uses the first path found:

Windows

1. The path specified by the `%TMP%` environment variable.
2. The path specified by the `%TEMP%` environment variable.
3. The path specified by the `%USERPROFILE%` environment variable.
4. The Windows directory.

Unix

1. The path specified by the `$PDFTMPDIR` environment variable.
2. The path specified by the `$TMP` environment variable.
3. The `/tmp` directory.

2.7.2 Cache Directory

The cache directory is used for data that is persisted and shared between different invocations of a program. The actual caches are created in subdirectories. The content of this directory can safely be deleted to clean all caches.

This directory should be writable by the application, otherwise caches cannot be created or updated and performance will degrade significantly.

Windows

- If the user has a profile:
  `%LOCAL_APPDATA%\PDF Tools AG\Caches`
- If the user has no profile:
  `<TempDirectory>\PDF Tools AG\Caches`

Linux, macOS and other Unixes

- If the user has a home directory:
  `~/.pdf-tools/Caches`
- If the user has no home directory:
  `<TempDirectory>/pdf-tools/Caches`

where `<TempDirectory>` refers to the Directory for temporary files.

2.7.3 Font Directories

The location of the font directories depends on the operating system. Font directories are traversed recursively in the order as specified below.

If two fonts with the same name are found, the latter one takes precedence, i.e. user fonts will always take precedence over system fonts.

Windows

1. `%SystemRoot%\Fonts`
2. directory `Fonts`, which must be a direct sub-directory of where `Pdf2PdfAPI.dll` resides.

macOS

1. `/System/Library/Fonts`
2. `/Library/Fonts`

Linux and other Unixes

1. `/usr/share/fonts`
2. `/usr/local/share/fonts`
3. `~/.fonts`
4. `$PDFFONTDIR` or `/usr/lib/X11/fonts/Type1`

3 License Management

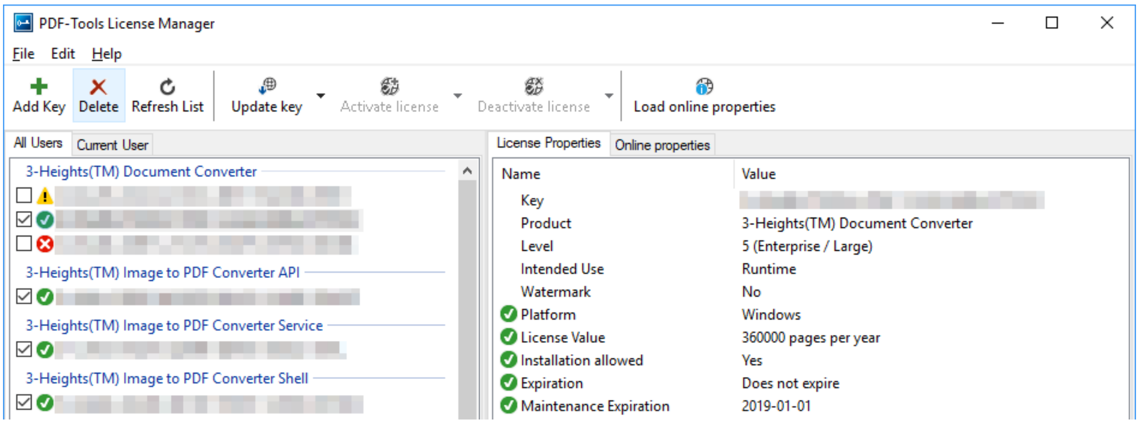
3.1 License Installation and Management

There are three possibilities to pass the license key to the application:

1. The license key is installed using the GUI tool (graphical user interface). This is the easiest way if the licenses are managed manually. It is only available on Windows.
2. The license key is installed using the shell tool. This is the preferred solution for all non-Windows systems and for automated license management.
3. The license key is passed to the application at run-time via the `SetLicenseKey` method. This is the preferred solution for OEM scenarios.

3.1.1 Graphical License Manager Tool

The GUI tool `LicenseManager.exe` is located in the `bin` directory of the product kit (Windows only).



3-Heights(TM) Document Converter

☐ ⚠ [redacted]

☑ ✓ [redacted]

☐ ✗ [redacted]

3-Heights(TM) Image to PDF Converter API

☑ ✓ [redacted]

3-Heights(TM) Image to PDF Converter Service

☑ ✓ [redacted]

3-Heights(TM) Image to PDF Converter Shell

☑ ✓ [redacted]

Name	Value
Key	[redacted]
Product	3-Heights(TM) Document Converter
Level	5 (Enterprise / Large)
Intended Use	Runtime
Watermark	No
✓ Platform	Windows
✓ License Value	360000 pages per year
✓ Installation allowed	Yes
✓ Expiration	Does not expire
✓ Maintenance Expiration	2019-01-01

List all installed license keys

The license manager always shows a list of all installed license keys in the left pane of the window. This includes licenses of other PDF Tools products. The user can choose between:

- Licenses available for all users. Administrator rights are needed for modifications.
- Licenses available for the current user only.

Add and delete license keys

License keys can be added or deleted with the “Add Key” and “Delete” buttons in the toolbar.

- The “Add key” button installs the license key into the currently selected list.
- The “Delete” button deletes the currently selected license keys.

Display the properties of a license

If a license is selected in the license list, its properties are displayed in the right pane of the window.

3.1.2 Command Line License Manager Tool

The command line license manager tool `licmgr` is available in the `bin\x86` and `bin\x64` directory.

A complete description of all commands and options can be obtained by running the program without parameters:

```
licmgr
```

List all installed license keys:

```
licmgr list
```

The currently active license for a specific product is marked with a star '*' on the left side.

Add and delete license keys:

Install new license key:

```
licmgr store 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

Delete old license key:

```
licmgr delete 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

Both commands have the optional argument `-s` that defines the scope of the action:

g For all users

u Current user

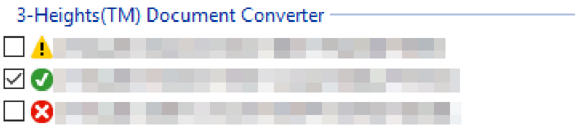
3.2 License Selection and Precedence

3.2.1 Selection

If multiple keys for the same product are installed in the same scope, only one of them can be active at the same time.

Installed keys that are not selected are not considered by the software!

In the Grahical User Interface use the check box on the left side of the license key to mark a license as selected.



With the Command Line Interface use the `select` subcommand:

```
licmgr select 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

3.2.2 Precedence

License keys are considered in the following order:

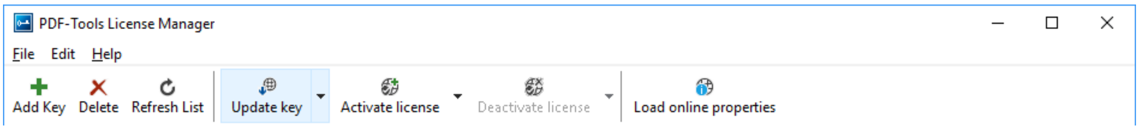
1. License key passed at runtime.
2. License selected for the current user
3. License selected for the current user (legacy key format)
4. License selected for all users
5. License selected for all users (legacy key format)

The first matching license is used, regardless whether it is valid or not.

3.3 Key Update

If a license property like the maintenance expiration date changes, the key can be update directly in the license manager.

In the Grahical User Interface select the license and press the button "Update Key" in the toolbar:



With the Command Line Interface use the `update` subcommand:

```
licmgr update 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

3.4 License activation

New licenses keys have to be activated (except for OEM licenses). These keys have to be installed in the license manager and may not be passed to the component at runtime.

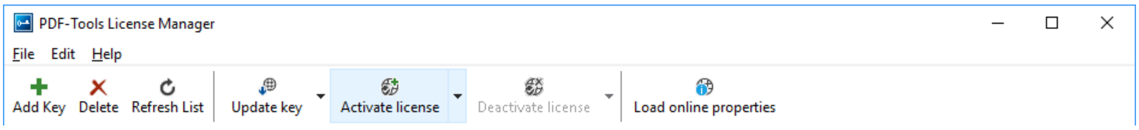
The license activation is tied to a specific computer. If the license is installed at user scope, the activation is also tied to that specific user. The same license key can be activated multiple times, if the license quantity is larger than 1.

Every license key includes a date, after which the license has to be activated, which is typically 10 days after the issuing date of the key. Prior to this date, the key can be used without activation and without any restrictions.

3.4.1 Activation

The License can be activated directly within the license manager. Every activation increases the activation count of the license by 1.

In the Grahical User Interface select the license and press the button "Activate license" in the toolbar:



With the Command Line Interface use the `activate` subcommand:

```
licmgr activate 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

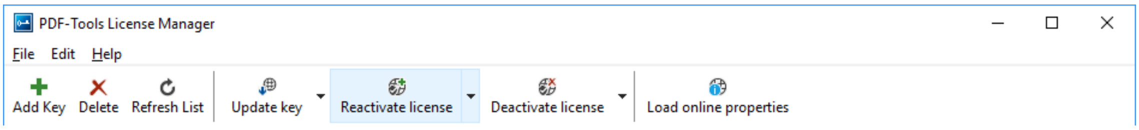
Note that the key has to be installed first.

3.4.2 Reactivation

The activation is tied to specific properties of the computer like the MAC address or host name. If one of these properties changes, the activation becomes invalid and the license has to be reactivated. A reactivation does **not** increase the activation count on the license.

The process for reactivation is the same as for the activation.

In the Grahical User Interface the button "Activate license" changes to "Reactivate license":



With the Command Line Interface the subcommand `reactivate` is used instead of `activate`:

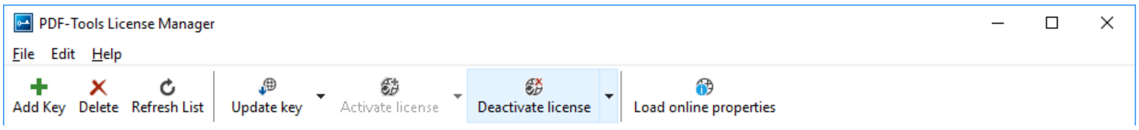
```
licmgr reactivate 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

3.4.3 Deactivation

To move a license to a different computer, it has to be deactivated first. Deactivation decreases the activation count of the license by 1.

The process for deactivation is similar to the activation process.

In the Grahical User Interface select the license and press the button "Deactivate license" in the toolbar:



With the Command Line Interface use the `deactivate` subcommand:

```
licmgr deactivate 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

3.5 Offline Usage

The following actions in the license manager need access to the internet:

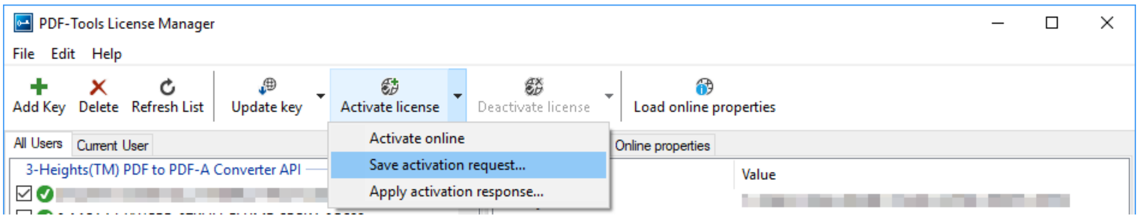
- License Activation
- License Reactivation

- License Deactivation
- Key Update

On systems wihout internet access, a three step process can be used instead, using a form on the PDF Tools website.

3.5.1 First Step: Create a Request File

In the Grahical User Interface select the license and use the dropdown menu on the right side of the button in the toolbar:



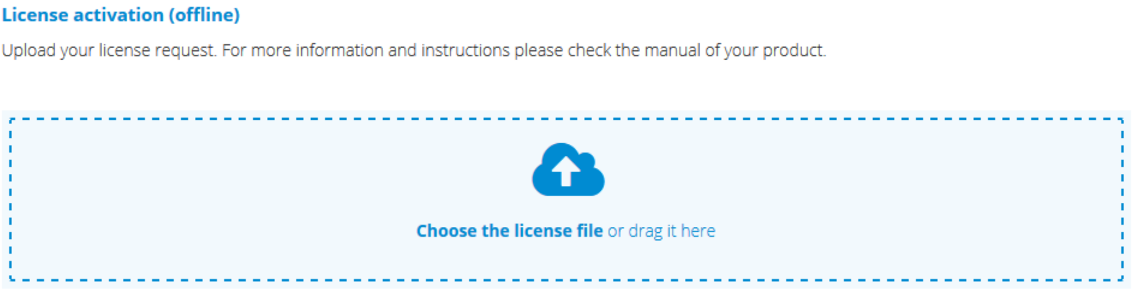
With the Command Line Interface use the `-fs` option to specify the destination path of the request file:

```
licmgr activate -fs activation_request.bin 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

> **License Deactivation:** When saving the deactivation request file, the license is **deactivated immediately** and cannot be used any further. It can however only be activated again after completing the deactivation on the website.

3.5.2 Second Step: Use Form on Website

Open the following website in a web browser: `http://www.pdf-tools.com/pdf20/en/mypdftools/licenses-kits/license-activation/` Upload the request by dragging it onto the marked area:

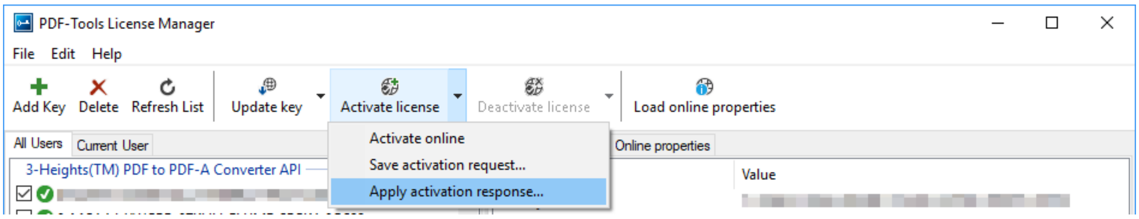

License activation (offline)

Upload your license request. For more information and instructions please check the manual of your product.

Upon success, the response will be downloaded automatically if necessary.

3.5.3 Third Step: Apply the Response File

In the Grahical User Interface select the license and use the dropdown menu on right side of the button in the toolbar:



With the Command Line Interface use the `-fl` option to specify the source path of the response file:

```
licmgr activate -fl activation_response.bin 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

3.6 License Key Versions

As of 2018 all new keys will have the format `1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX`. Legacy keys with the old format `0-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX` are still accepted for a limited time period.

For compatibility reasons, old and new version keys can be installed side by side and one key of each version can be selected at the same time. In that case, the software always uses the new version.

3.7 License Key Storage

Depending on the platform the license management system uses different stores for the license keys.

3.7.1 Windows

The license keys are stored in the registry:

- "`HKLM\Software\PDF Tools AG`" (for all users)
- "`HKCU\Software\PDF Tools AG`" (for the current user)

3.7.2 macOS

The license keys are stored in the file system:

- `/Library/Application Support/PDF Tools AG` (for all users)
- `~/Library/Application Support/PDF Tools AG` (for the current user)

3.7.3 Unix/Linux

The license keys are stored in the file system:

- `/etc/opt/pdf-tools` (for all users)
- `~/.pdf-tools` (for the current user)

Note: The user, group and permissions of those directories are set solely by the license manager tool. It may be necessary to change permissions to make the licenses readable for all users. Example:

```
chmod -R go+rx /etc/opt/pdf-tools
```

3.8 Troubleshooting

3.8.1 License key cannot be installed

The license key cannot be installed in the license manager application. The error message is: `"Invalid license format."`

Possible causes:

- The license manager application is an older version that only supports the legacy key format.

Solution

Use a current version of the license manager application or use a license key in the legacy key format if available.

3.8.2 License is not visible in license manager

The license key was successfully installed previously but is not visible in the license manager anymore. The software is still working correctly.

Possible causes:

- The license manager application is an older version that only supports the legacy key format.

Solution

Use a current version of the license manager application.

3.8.3 License is not found at runtime

The license is not found at runtime by the software. The error message is: `"No license key was set."`

Possible causes:

- The license key is actually missing (not installed).
- The license key is installed but not selected in the license manager.
- The application is an older version that only supports the legacy key format, while the license key has the new license format.

Solution

Install and select a valid license key that is compatible with the installed version of the software or use a newer version of the software. The new license key format is supported starting with version 4.10.26.1

For compatibility reasons, one license key of each format can be selected at the same time.

3.8.4 Eval watermark is displayed where it should not

The software prints an evaluation watermark onto the output document, even if the installed license is a productive one.

Possible causes:

- There is an evaluation license key selected for the **current user**, that takes precedence over the key for **all users**.

> **Note:** The software might be run under a different user than the license manager application.

- There is an evaluation license key selected with a newer license format that takes precedence over the key in the older format.
- The software was not restarted after changing the license key from an evaluation key to a productive one.

Solution

Disable or remove all evaluation license in all scopes and restart the software.

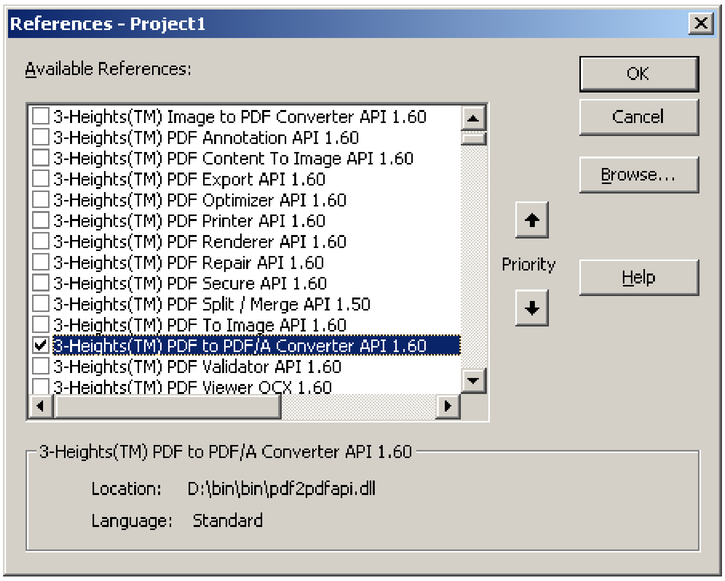
4 Programming Interfaces

4.1 Visual Basic 6

After installing the 3-Heights™ PDF to PDF/A Converter API and registering the COM interface (see Windows), you find a Visual Basic 6 example with file extension `.vpb` in the directory `samples/VB/`. You can either use this sample as a base for an application, or you can start from scratch.

If you start from scratch, here is a quick start guide:

1. First create a new Standard-Exe Visual Basic 6 project. Then include the 3-Heights™ PDF to PDF/A Converter API component to your project.



□ 3-Heights(TM) Image to PDF Converter API 1.60
□ 3-Heights(TM) PDF Annotation API 1.60
□ 3-Heights(TM) PDF Content To Image API 1.60
□ 3-Heights(TM) PDF Export API 1.60
□ 3-Heights(TM) PDF Optimizer API 1.60
□ 3-Heights(TM) PDF Printer API 1.60
□ 3-Heights(TM) PDF Renderer API 1.60
□ 3-Heights(TM) PDF Repair API 1.60
□ 3-Heights(TM) PDF Secure API 1.60
□ 3-Heights(TM) PDF Split / Merge API 1.50
□ 3-Heights(TM) PDF To Image API 1.60
☑ 3-Heights(TM) PDF to PDF/A Converter API 1.60
□ 3-Heights(TM) PDF Validator API 1.60
□ 3-Heights(TM) PDF Viewer OCX 1.60

3-Heights(TM) PDF to PDF/A Converter API 1.60

Location: D:\bin\bin\pdf2pdfapi.dll

Language: Standard

2. Draw a new Command Button and optionally rename it if you like.
3. Double-click the command button and insert the few lines of code below. All that you need to change is the path of the file name.

```
Private Sub Command1_Click()
  Dim conv As New Pdf2PdfAPI.Pdf2Pdf
  Dim done As Boolean
  conv.Compliance = ePDFA1b
  done = conv.Convert("C:\in1.pdf", "", "C:\out1.pdf", "C:\temp\log1.txt")
  Set conv = Nothing
End Sub
```

4.2 .NET

There should be at least one .NET sample for MS Visual Studio available in the ZIP archive of the Windows version of the 3-Heights™ PDF to PDF/A Converter API. The easiest for a quick start is to refer to this sample.

In order to create a new project from scratch, do the following steps:

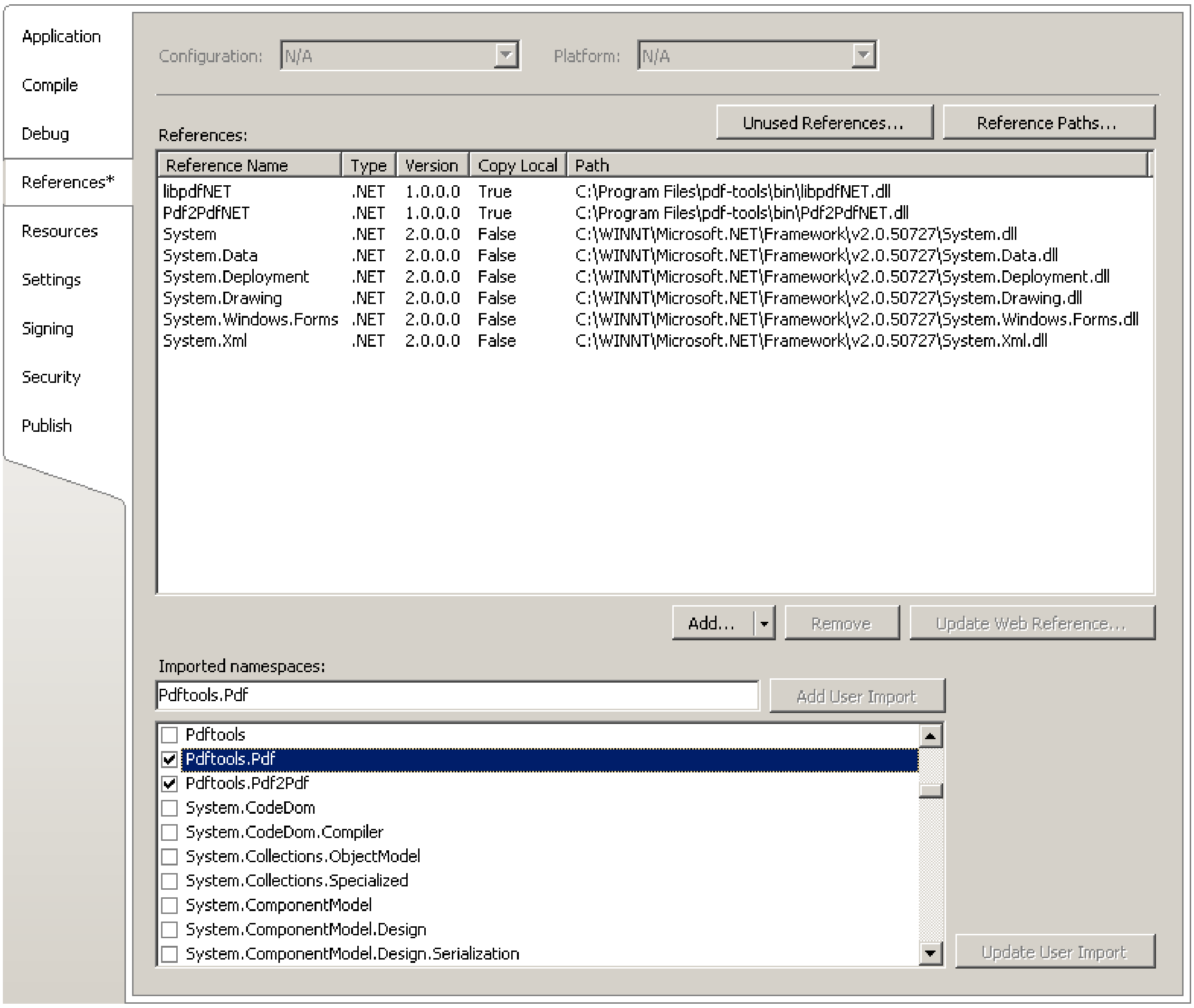
1. Start Visual Studio and create a new C# or VB project.
2. Add references to the .NET assemblies.
   To do so, in the "Solution Explorer" right-click your project and select "Add Reference...". The "Add Reference" dialog will appear. In the tab "Browse", browse for the .NET assemblies `libpdfNET.dll` and `Pdf2PdfNET.dll`.

3. Import namespaces (Note: This step is optional, but useful.)
4. Write your code.

Steps 3 and 4 are shown separately for C# and Visual Basic.

4.2.1 Visual Basic

3. Double-click “My Project” to view its properties. On the left hand side, select the menu “References”. The .NET assemblies you added before should show up in the upper window. In the lower window import the namespaces `Pdftools.Pdf`, and `Pdftools.Pdf2Pdf`.
   You should now have settings similar as in the screenshot below:



Configuration: N/A   Platform: N/A

References:

Reference Name	Type	Version	Copy Local	Path
libpdfNET	.NET	1.0.0.0	True	C:\Program Files\pdf-tools\bin\libpdfNET.dll
Pdf2PdfNET	.NET	1.0.0.0	True	C:\Program Files\pdf-tools\bin\Pdf2PdfNET.dll
System	.NET	2.0.0.0	False	C:\WINNT\Microsoft.NET\Framework\v2.0.50727\System.dll
System.Data	.NET	2.0.0.0	False	C:\WINNT\Microsoft.NET\Framework\v2.0.50727\System.Data.dll
System.Deployment	.NET	2.0.0.0	False	C:\WINNT\Microsoft.NET\Framework\v2.0.50727\System.Deployment.dll
System.Drawing	.NET	2.0.0.0	False	C:\WINNT\Microsoft.NET\Framework\v2.0.50727\System.Drawing.dll
System.Windows.Forms	.NET	2.0.0.0	False	C:\WINNT\Microsoft.NET\Framework\v2.0.50727\System.Windows.Forms.dll
System.Xml	.NET	2.0.0.0	False	C:\WINNT\Microsoft.NET\Framework\v2.0.50727\System.Xml.dll

Imported namespaces:

Pdftools.Pdf

☐ Pdftools
☑ Pdftools.Pdf
☑ Pdftools.Pdf2Pdf
☐ System.CodeDom
☐ System.CodeDom.Compiler
☐ System.Collections.ObjectModel
☐ System.Collections.Specialized
☐ System.ComponentModel
☐ System.ComponentModel.Design
☐ System.ComponentModel.Design.Serialization

4. The .NET interface can now be used as shown below:

Example:

```
Dim converter As New Pdftools.Pdf2Pdf.Pdf2Pdf()
converter.Compliance = PDFCompliance.ePDFA1b
...
converter.Convert(...)
```

4.2.2 C#

3. Add the following namespaces:

Example:

```
using Pdftools.Pdf;
using Pdftools.Pdf2Pdf;
```

4. The .NET interface can now be used as shown below:

Example:

```
using (Pdf2Pdf converter = new Pdf2Pdf())
{
    converter.Compliance = PDFCompliance.ePDFA1b;
    ...
    converter.Convert(...);
}
```

4.2.3 Deployment

This is a guideline on how to distribute a .NET project that uses the 3-Heights™ PDF to PDF/A Converter API:

1. The project must be compiled using Microsoft Visual Studio. Hereby it is crucial that depending on the solution platform (x86 or x64) the matching native DLL `Pdf2PdfAPI.dll` (from the directory `bin\Win32` or `bin\x64`) is copied to the output directory.
2. The executable is created in the directory `bin\Release`.
3. For deployment, the executable and all .NET assemblies must be copied into the same folder on the target computer. The .NET assemblies of the 3-Heights™ PDF to PDF/A Converter API have the file name `bin\*NET.dll`.
4. At runtime, the native DLL `Pdf2PdfAPI.dll` must be found on the target computer by the DLL search sequence. To ensure this, the DLL must either be copied to the folder containing the executable or to a directory on the environment variable `Path` (e.g. `%SystemRoot%\system32`).
5. If required by the application, optional DLLs must be copied to the same folder. See Deployment for a list and description of optional DLLs.

4.2.4 Troubleshooting: TypeInitializationException

The most common issue when using the .NET interface is that the correct native DLL `Pdf2PdfAPI.dll` is not found at execution time. This normally manifests when the constructor is called for the first time and an exception of type `System.TypeInitializationException` is thrown.

This exception can have two possible causes, distinguishable by the inner exception (property `InnerException`):

`System.DllNotFoundException` Unable to load DLL `Pdf2PdfAPI.dll`: The specified module could not be found.

`System.BadImageFormatException` An attempt was made to load a program with an incorrect format.

The following sections describe in more detail, how to resolve the respective issue.

Troubleshooting: DllNotFoundException

This means, that the native DLL `Pdf2PdfAPI.dll` could not be found at execution time.

Resolve this by either:

- adding `Pdf2PdfAPI.dll` as an existing item to your project and set its property “Copy to output directory” to “Copy if newer”, or
- adding the directory where `Pdf2PdfAPI.dll` resides to the environment variable `%Path%`, or
- copying `Pdf2PdfAPI.dll` to the output directory of your project.

Troubleshooting: BadImageFormatException

The exception means, that the native DLL `Pdf2PdfAPI.dll` has the wrong “bitness” (i.e. platform 32 vs. 64 bit). There are two versions of `Pdf2PdfAPI.dll` available: one is 32-bit (directory `bin\Win32`) and the other 64-bit (directory `bin\x64`). It is crucial, that the platform of the native DLL matches the platform of the application’s process.

The platform of the application’s process is defined by the project’s platform configuration for which there are 3 possibilities:

AnyCPU This means, that the application will run as a 32-bit process on 32-bit Windows and as 64-bit process on 64-bit Windows. When using AnyCPU one has to use a different native DLL, depending on the platform of Windows. This can be ensured either when installing the application (by installing the matching native DLL) or at application start-up (by determining the application’s platform and ensuring the matching native DLL is loaded).

x86 This means, that the application will always run as 32-bit process, regardless of the platform of the Windows installation. The 32-bit DLL runs on all systems, which makes this the simplest configuration. Hence, if an application needs to be portable and does not require any specific 64-bit features, it is recommended to use this setting.

x64 This means, that the application will always run as 64-bit process. As a consequence the application will not run on a 32-bit Windows system.

4.3 ASP

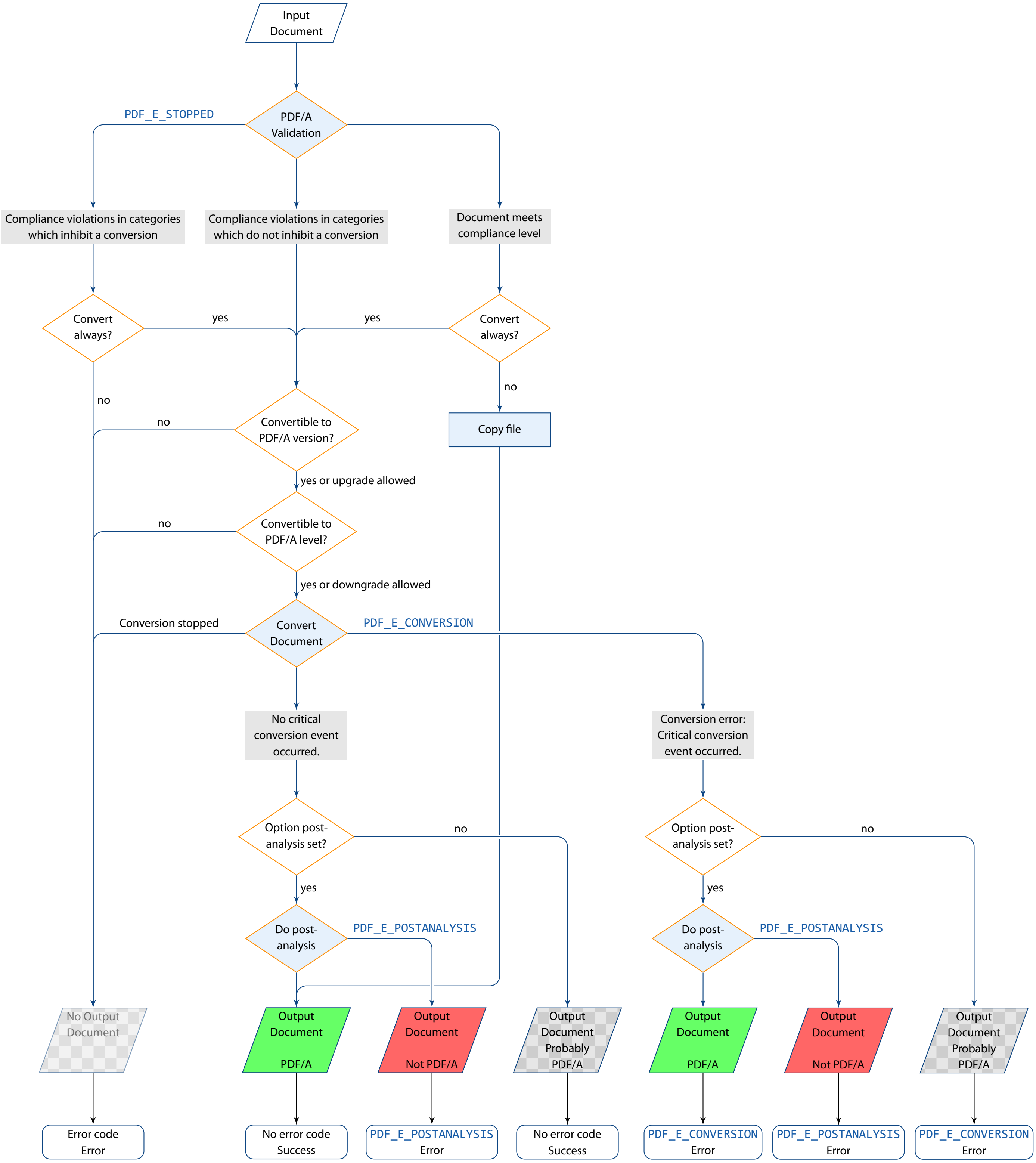
The COM name of the class, for example used in ASP or PHP, of the PDF to PDF/A Converter API is: `PDF2PDFAPI.Pdf2Pdf`.

```
<%@ Language=VBScript %>
<%
  option explicit
  dim conv
  dim fileNameIn, fileNameOut, logName

  set conv = Server. CreateObject("PDF2PDFAPI.Pdf2Pdf")
  fileNameIn = "C:\PDF-Tools\doc\license.pdf"
  fileNameOut = "C:\temp\output.pdf"
  logName = "C:\temp\output.log"

  conv.ReportSummary = True
  if not conv.Convert(fileNameIn, "", fileNameOut, logName) then
    Response.Write "<p>"
    Response.Write "Error converting file: " & conv.ErrorMessage & " <br>"
  else
    Response.Write "<p>"
    Response.Write "Output file created successfully. <br>"
end if

Response.Write "<p>"
Response.Write "Output File (PDF/A-1b) : <a href=" & fileNameOut &
               ">" & fileNameOut & "</a><br>"
Response.Write "Log File : <a href=" & logName & ">" & logName &
               "</a><br>"
%>
```

5 User's Guide

5.1 Process Description

The workflow of the PDF to PDF/A Conversion is outlined in the graphic below.



1. **License Check**: The license is checked.
2. **Pre-Analysis**: The input document is analyzed. If the document is already compliant to the requested standard

it is copied.
If the required PDF/A level (e.g. level U or A) cannot be met, the conversion is aborted with an error[5].
If the target standard is PDF/A-1 and a file contains transparency or other elements that cannot be converted to PDF/A-1, the target standard is upgraded to PDF/A-2 if the property `AllowUpgrade` is set to `True`.
If the input document contains non-convertible elements the conversion is stopped, except if convert-always is enabled.

3. **Conversion**: The actual conversion is performed.
   The conversion is stopped, e.g. if an OCR error occurs, a required font is not found in the installed font directories, or linearization fails. In this case, no meaningful output document is created.
   If actions had to be taken that might have altered the visual appearance of the file or crucial data had to be removed, a conversion error is generated (see chapter Conversion Errors below).
4. **Post-Analysis**: Finally, the resulting PDF document is validated[6]. If the resulting document does not meet the requested standard a post-analysis error is raised.

5.1.1 Conversion Steps

The goal of the conversion is to create a document which is conforming to the PDF/A ISO standard.

If the analysis of the document indicates a conversion to the requested standard is possible, the following steps are performed:

- Embed and subset non-embedded font programs
- Replace device specific color spaces with CIE-based color spaces
- Add a GTS_PDFA output intent
- Remove prohibited entries
- Remove entries with a default value
- Remove entries with unknown values
- Add mandatory entries
- Add XMP metadata if missing or fix inconsistent XMP metadata
- Apply implicit optimization functions (e.g. replace and subset embedded fonts)
- Apply implicit repair functions (to conform with ISO19005-1 chapter 6.1)

If the analysis indicates a conversion is not possible, a “best effort” conversion can be forced. In this case the output may or may not be PDF/A conformant. Use the post analysis feature in order to detect, whether or not the output is conformant. It is also possible that the output file looks visually different to the input file due to the forced conversion.

5.1.2 Conversion Errors

The conversion error (`ErrorCode` is `PDF_E_CONVERSION` see `TPDFErrorCode`) indicates that during conversion, actions had to be taken that might have altered the visual appearance of the file or crucial data had to be removed. Use the property `ConversionErrorMask` to define what is crucial to your process and should therefore lead to a conversion error.

> **Note:** The resulting document is PDF/A compliant nonetheless.

The following issues may result in a conversion error:

- Optional content removed
- FFilter or FDecodeParms removed

[5] Automatic downgrades can be deactivated using the property `AllowDowngrade`.
[6] Post-analysis can be deactivated using the property `PostAnalyze`

- Prohibited annotation type converted to text annotation
- Prohibited action removed
- Embedded files removed
- Annotation without appearance stream
- Transparency removed
- Character from show string removed because glyph missing in font
- Unconvertible metadata

For a complete list of conversion events that can lead to a conversion error see property `ConversionErrorMask`.

Some of these conversion errors, such as transparency or optional content may be resolved by creating PDF/A-2 or PDF/A-3 instead of PDF/A-1.

5.1.3 Post Analysis

The post analysis step checks, whether or not the output file created conforms to the requested standard. A post analysis error (`ErrorCode` is `PDF_E_POSTANALYSIS` see `TPDFErrorCode`) indicates that the output file is not PDF/A. In case of a post analysis error you can repeat the conversion with the `ReportDetails` property set and look at the log file in order to see why the post analysis failed.

5.2 What is PDF/A?

PDF/A is an ISO Standard for using PDF format for the long-term archiving of electronic documents. This chapter provides a brief overview, for additional information please visit: `http://www.pdf-tools.com/pdf20/en/resources/pdf-iso-standards/`.

5.2.1 PDF/A-1

The PDF/A-1 format is described in the international standard ISO-19005-1. It bases on the PDF 1.4 reference and has some additional requirements. Best is to have a general understanding of PDF/A. Here is a brief overview of how to create a PDF/A document from a non-PDF/A document.

1. A PDF/A has requirements about meta data and the structure of the file. The PDF to PDF/A Converter takes care of this and the user does not have to apply any settings. However he can provide the XMP meta data himself if desired.
2. In PDF/A, colors (including grayscale and black/white) must not be represented in a device color space (DeviceRGB, DeviceCMYK, DeviceGray). Suitable default color space profiles to substitute the device color spaces, one for RGB, CMYK and grayscale respectively can be provided by the user. In addition, or alternatively, one color space profile can be embedded as output intent. In this latter case, device colors are automatically managed by the output intent if the color can be represented in the space given by the color space profile in the output intent.
   If the converter encounters unmanaged colors, e.g. because no color space profile was set, then a calibrated color space is generated automatically, one RGB and one grayscale, for RGB and grayscale colors respectively. If unmanaged CMYK colors are encountered, a default CMYK output intent is embedded.
3. Fonts used in visible text must be embedded. This is automatically done by the Converter.
4. For PDF/A 1a: The original document structure information will be retained when converting the file to PDF/A. However, new tags will not be added and the structure will not be changed. To create a PDF/A-1a compliant file, the original file must have been created with the required structure and tagging. Otherwise, a PDF/A-1b file will be produced.

5.2.2 What is the difference between PDF/A-1b and PDF/A-1a?

PDF/A-1a has additional specifications on top of PDF/A-1b. These are:

1. The encoding of fonts must meet additional requirements, e.g. include a ToUnicode mapping (ISO 19005-1, chapter 6.3.8)
2. The document must contain a logical structure (ISO 19005-1, chapter 6.8)

The idea of the PDF/A-1a requirements is mainly to provide support for disabled people, i.e. by providing the required information needed for applications that support the read out loud feature.

The logical structure of the document is a description of the content of the pages. This description has to be provided by the creator of the document. It consists of a fine granular hierarchical tagging that distinguishes between the actual content and artifacts (such as page numbers, footers, layout artifacts, etc.). The tagging provides a meaningful description. Examples are "This is a Header", "This color image shows a small sailing boat at sunset", etc. One can easily understand this information cannot be generated automatically, it needs to be provided. This is one of the reasons why not every PDF document can be converted to PDF/A-1a.

5.2.3 PDF/A-2

PDF/A-2 is described in ISO 19005-2. It is based on ISO 32000-1, the standard for PDF 1.7. PDF/A-2 is meant as an extension to PDF/A-1. The second part shall complement the first part and not replace it. The most important differences between PDF/A-1 and PDF/A-2 are:

- The list of compression types has been extended by JPEG2000
- Transparent contents produced by graphic programs are allowed
- Optional contents (also known as layers) can be made visible or invisible
- Multiple PDF/A files can be bundled in one file (collection, package)
- The additional conformity level U (Unicode) allows for creating searchable files without having to fulfill the strict requirements of the conformity level A (accessibility)
- File size can be reduced using compressed object and XRef streams

Documents that contain features described above, in particular layers or transparency, should therefore be converted to PDF/A-2 rather than PDF/A-1.

5.2.4 PDF/A-3

PDF/A-3 is described in ISO 19005-3. It is based on ISO 32000-1, the standard for PDF 1.7. PDF/A-3 is an extension to PDF/A-2. The third part shall complement the second part and not replace it. The only two differences between PDF/A-2 and PDF/A-3 are:

- Files of any format and compliance may be embedded. Embedded files need not be suitable for long-term archiving.
- Embed files can be associated with any part of the PDF/A-3 file.

5.3 Color Spaces

5.3.1 Colors in PDF

The PDF format supports a range of color spaces:

Device Color Spaces (DeviceGray, DeviceRGB, and DeviceCMYK) These are also referred to as uncalibrated color spaces, because they cannot be used to specify color values such that colors are reproducible in a predictable way on multiple output devices.

CIE-based Color Spaces (CalGray, CalRGB, Lab, ICCBased) These are also referred to as device-independent color spaces, because they are inherently capable of specifying colors which can be reliably reproduced on multiple output devices.

Special Color Spaces (Separation and DeviceN) These require an alternate color space from one of the previous two groups to allow the PDF consumer to simulate the color on devices which do not support the special color space.

Colors can occur in the following objects of a PDF/A document:

- Raster images (also inline images)
- Text and Vector objects such as lines and curves
- Annotations
- Shading patterns
- Transparency blending (PDF/A-2 and later)

ICC Color Profiles

An ICC (International Color Consortium) profile is a file format which can be used to describe the color characteristics of a particular device. For example for the correct color reproduction when an image from a scanner or camera is displayed on a device, such as a monitor or printer. Color profiles are usually provided with the operating system (OS), on a Windows System, they can be found at the following location:

`%SystemRoot%\system32\spool\drivers\color`

Alternatively, additional profiles can be found here:

- `http://www.pdf-tools.com/public/downloads/resources/colorprofiles.zip`
- `http://www.color.org/srgbprofiles.html`
- `https://www.adobe.com/support/downloads/iccprofiles/iccprofiles_win.html`

Please note that most color profiles are copyrighted, therefore you should read the license agreements on the above links before using the color profiles. The PDF to PDF/A Converter will try to locate color profiles automatically in the `%SystemRoot%\system32\spool\drivers\` color folder as needed. On Unix platforms, you can store the color profiles contained in the `colorprofiles.zip` download in a folder of your choice, and set the environment variable PDF_ICC_PATH to point to that folder.

PDF/A Requirements

In PDF/A the usage of uncalibrated color spaces (DeviceGray, DeviceRGB, and DeviceCMYK) is prohibited because colors that are specified in this way cannot be reproduced reliably on multiple output devices. Therefore, when converting to PDF/A, all device color spaces should be replaced by CIE-based color spaces. There is one exception to this rule: An uncalibrated color is tolerated if the output intent holds an ICC color profile with which this color can be represented. (E.g. a grayscale color can be represented in an RGB color profile, but a CMYK color cannot.)

The 3-Heights™ PDF to PDF/A Converter API uses the following strategy:

- For each device color space (DeviceGray, DeviceRGB, and DeviceCMYK) an ICC color profile can be specified to be used as substitute for the respective device color space.
- One ICC color profile can be set to be used in the output intent.
- During conversion, if a device color space is encountered then the following is done:
  - If an output intent was set that is capable of managing this color, no action is needed.
  - Otherwise, if an ICC color profile is set to substitute this device color space then this color profile is used.

- Otherwise, for DeviceRGB and DeviceGray color spaces: A calibrated color space (CalRGB[7] and CalGray respectively) is generated and used as a substitute.
- Otherwise, for DeviceCMYK color spaces:
  - If the output intent is not set, then a default CMYK ICC color profile is used for the output intent.
  - If the output intent holds a non-CMYK ICC color profile, then a default CMYK ICC color profile is generated and used as a substitute for DeviceCMYK.

The above strategy is motivated by the fact that CalRGB and CalGray color spaces occupy very little memory in comparison to ICC color profiles. Also note that the primary purpose of the output intent in a PDF document is to describe the characteristics of the device on which a document is intended to be rendered. Traditionally, the target device is a printer, which motivates CMYK output intents. The default CMYK color profile `USWebCoatedSWOP.icc` is provided in the sub-directory `bin\icc`.

5.4 Fonts

The PDF/A standard requires all fonts to be embedded in the PDF file. This ensures that the future rendering of the textual content of a conforming file matches, on a glyph by glyph basis, the appearance of the file as originally created.

Hence, if non-embedded fonts in a PDF are used, the font must be embedded. For this, a matching font has to be found in the Font Directories. The method `AddFontDirectory` should be used to define additional directories. The default font directories are listed in the chapter Font Directories.

It is important that the Font Directories contain all fonts that are used for the input files.

Fonts should be added to one of the Font Directories, if the post analysis returns validation errors like the following:

```
"output.pdf", 9, 20, 0x00418704, "The font ShinGo must be embedded.", 1
```

5.4.1 Font Cache

A cache of all fonts in all Font Directories is created. If fonts are added or removed from the font directories, the cache is updated automatically.

In order to achieve optimal performance, make sure that the cache directory is writable for the 3-Heights™ PDF to PDF/A Converter API. Otherwise the font cache cannot be updated and the font directories have to be scanned on each program startup.

The font cache is created in the subdirectory `<CacheDirectory>/Installed Fonts` of the Cache Directory.

5.4.2 Microsoft Core Fonts on Unix

Many PDF documents use Microsoft core fonts like Arial, Times New Roman and other fonts commonly used on Windows. Therefore, it is recommended to install these fonts to your default font directories. Many Linux distributions offer an installable package for these “Microsoft TrueType core fonts”. For instance, on Debian based systems the package is called `ttf-mscorefonts-installer`.

Alternatively you can download the fonts from here:

`http://corefonts.sourceforge.net/`

Microsoft has an FAQ on the subject, that covers licensing related questions as well:

`http://www.microsoft.com/typography/faq/faq8.htm`

[7] The generated CalRGB color space is an approximation to the ICC color profile `sRGB Color Space Profile.icm`.

5.4.3 Font Configuration File fonts.ini

The font configuration file is optional. It can be used to control the embedding of fonts.

The file `fonts.ini` must reside at the following location , which is platform dependent:

Windows: In a directory named `Fonts`, which must be a direct sub-directory of where `Pdf2PdfAPI.dll` resides.

Unix: The `fonts.ini` file is searched in the following locations

1. If the environment variable `PDFFONTDIR` is defined: `$PDFFONTDIR/fonts.ini`
2. `~/.pdf-tools/fonts/fonts.ini`
3. `/etc/opt/pdf-tools/fonts/fonts.ini`

`fonts.ini` uses the INI file format and has two sections. The section `[fonts]` is ignored by the 3-Heights™ PDF to PDF/A Converter API, so you may remove it. In the section `[replace]` font replacement rules of the form `key=value` can be defined. The key specifies the font that is to be replaced. The key should match the name of the font mentioned in the pre-analysis of the 3-Heights™ PDF to PDF/A Converter API, e.g. `"ShingGo"` for:

```
"file.pdf", 9, 20, 0x00418704, "The font ShinGo must be embedded.", 1
```

The value should match the true type name of an installed font. Do not replace any standard fonts (Helvetica, Arial, Times, TimesNewRoman, Courier, CourierNew, Symbol, and ZapfDingbats).

Please note that this feature should be used with care. Replacing a font with another might change the visual appearance of the file because of different glyph shapes, metrics or glyphs that are not available in the replacement font. Embedding another font might also have legal implications.

Example: Replace MS-Mincyo with MS-Mincho

```
[replace]
MS-Mincyo=MS-Mincho
```

This rule defines, that in order to embed a font program for font MS-Mincyo the font MS-Mincho should be used. This rule is useful, because both names are possible transliterations of the same Japanese font. However, the official transliteration used by the actual font is MS-Mincho.

5.5 Cryptographic Provider

In order to use the 3-Heights™ PDF to PDF/A Converter API's cryptographic functions such as creating digital signatures, a cryptographic provider is required. The cryptographic provider manages certificates, their private keys and implements cryptographic algorithms.

The 3-Heights™ PDF to PDF/A Converter API can use various different cryptographic providers. The following list shows, for which type of signing certificate which provider can be used.

USB Token or Smart Card These devices typically offer a PKCS#11 interface, which is the recommended way to use the certificate →PKCS#11 Provider.

On Windows, the certificate is usually also available in the Windows Cryptographic Provider.

If you need to sign documents on a non-Windows system with an USB token that does not come with middleware for your platform, you can use the 3-Heights™ Signature Creation and Validation Service.

If you need to sign documents on Windows in a non-interactive or locked session[8], use the 3-Heights™ Signature Creation and Validation Service.

Hardware Security Module (HSM) HSMs always offer very good PKCS#11 support →PKCS#11 Provider

For more information and installation instructions consult the separate document `TechNotePKCS11.pdf`.

Soft Certificate Soft certificates are typically PKCS#12 files that have the extension `.pfx` or `.p12` and contain the signing certificate as well as the private key and trust chain (issuer certificates). Soft certificate files cannot be used directly. Instead, they must be imported into the certificate store of a cryptographic provider.

- *All Platforms*: The recommended way of using soft certificates is to import them into a store that offers a PKCS#11 interface and use the PKCS#11 Provider. For example:
  - A HSM
  - openCryptoki on Linux
  - PKCS#11 softtoken on Solaris

  For more information and installation instructions of the above stores consult the separate document `TechNotePKCS11.pdf`.
- *Windows*: If no PKCS#11 provider is available, soft certificates can be imported into Windows certificate store, which can then be used as cryptographic provider →Windows Cryptographic Provider

Signature Service Signature services are a convenient alternative to storing certificates and key material locally. The 3-Heights™ PDF to PDF/A Converter API can use various different services whose configuration is explained in the following sections of this documentation:

- 3-Heights™ Signature Creation and Validation Service
- SwissSign Digital Signing Service
- SwissSign SuisseID Signing Service
- QuoVadis sealsign
- Swisscom All-in Signing Service

5.5.1 PKCS#11 Provider

PKCS#11 is a standard interface offered by most cryptographic devices such as HSMs, USB Tokens or sometimes even soft stores (e.g. openCryptoki).

More information on and installation instructions of the PKCS#11 provider of various cryptographic devices can be found in the separate document `TechNotePKCS11.pdf`.

Configuration

Provider Property `Provider` or argument of `BeginSession`

The provider configuration string has the following syntax:

```
"‹PathToDll›;‹SlotId›;‹Pin›"
```

`‹PathToDll›` is the path to driver library filename, which is provided by the manufacturer of the HSM, UBS token or smart card. Examples:

- The SuisseID USB Tokens use `cvP11.dll`
- The CardOS API from Atos (Siemens) uses `siecap11.dll`
- The IBM 4758 cryptographic coprocessor uses `cryptoki.dll`
- Devices from Aladdin Ltd. use `etpkcs11.dll`

[8] See the description of the 3-Heights™ Signature Creation and Validation Service for more details on this topic.

‹SlotId› is optional, if it is not defined, it is searched for the first slot that contains a running token.

‹Pin› is optional, if it is not defined, the submission for the pin is activated via the pad of the token.

If this is not supported by the token, the following error message is raised when signing: "Private key not available."

Example:

```
Provider = "C:\Windows\system32\siecap11.dll;4;123456"
```

Note: Some PKCS#11 drivers require the `Terminate` method to be called. Otherwise your application might crash upon termination.

The chapter Guidelines for Mass Signing contains important information to optimize performance when signing multiple documents.

Interoperability Support

The following cryptographic token interface (PKCS#11) products have been successfully tested:

- SafeNet Protect Server
- SafeNet Luna
- SafeNet Authentication Client
- IBM OpenCrypTokI
- CryptoVision
- Siemens CardOS
- Utimaco SafeGuard CryptoServer

Selecting a Certificate for Signing

The 3-Heights™ PDF to PDF/A Converter API offers different ways to select a certificate. The product tries the first of the following selection strategies, for which the required values have been specified by the user.

1. **Certificate fingerprint**
   Property `SignerFingerprint`
   - SHA1 fingerprint of the certificate. The fingerprint is 20 bytes long and can be specified in hexadecimal string representation, e.g. "b5 e4 5c 98 5a 7e 05 ff f4 c6 a3 45 13 48 0b c6 9d e4 5d f5". In Windows certificate store this is called "Thumbprint", if "Thumbprint algorithm" is "sha1".
2. **Certificate Issuer and SerialNumber**
   Properties `Issuer` and `SerialNumber`
   - Certificate Issuer (e.g. "QV Schweiz CA"), in Windows certificate store this is called "Issued By".
   - Serial number of the certificate (hexadecimal string representation, e.g. "4c 05 58 fb"). This is a unique number assigned to the certificate by its issuer. In Windows certificate store this is the field called "Serial number" in the certificate's "Details" tab.
3. **Certificate Name and optionally Issuer**
   Properties `Name` and `Issuer`
   - Common Name of the certificate (e.g. "PDF Tools AG"), in Windows certificate store this is called "Issued To".
   - Optional: Certificate Issuer (e.g. "QV Schweiz CA"), in Windows certificate store this is called "Issued By".

Using PKCS#11 stores with missing issuer certificates

Some PKCS#11 devices contain the signing certificate only. However, in order to embed revocation information it is important, that the issuer certificates, i.e. the whole trust chain, is available as well.

On Windows, missing issuer certificates can be loaded from the Windows certificate store. So the missing certificates can be installed as follows:

1. Get the certificates of the trust chain. You can download them from the website of your certificate provider or do the following:
   a. Sign a document and open the output in Adobe Acrobat
   b. Go to "Signature Properties" and then view the signer's certificate
   c. Select a certificate of the trust chain
   d. Export the certificate as "Certificate File" (extension `.cer`)
   e. Do this for all certificates of the trust chain
2. Open the exported files by double clicking on them in the Windows Explorer
3. Click button "Install Certificate..."
4. Select "automatically select the certificate store based on the type of certificate" and finish import

Cryptographic Suites

Message Digest Algorithm

The default hash algorithm to create the message digest is `SHA-256`. Other algorithms can be chosen by setting the provider session property `MessageDigestAlgorithm`, for which supported values are:

SHA-1 This algorithm is considered broken and therefore strongly discouraged by the cryptographic community.

SHA-256 (default)

SHA-384

SHA-512

RIPEMD-160

Signing Algorithm

The signing algorithm can be configured by setting the provider session property `SigAlgo`. Supported values are:

RSA_RSA (default) This is the RSA PKCS#1v1.5 algorithm which is widely supported by cryptographic providers.

RSA_SSA_PSS This algorithm is sometimes also called RSA-PSS.

Signing will fail if the algorithm is not supported by the cryptographic hardware. The device must support either the signing algorithm `CKM_RSA_PKCS_PSS` (i.e. RSA_SSA_PSS) or `CKM_RSA_X_509` (i.e. raw RSA).

> **Note:** Setting the signing algorithm only has an effect on signatures created by the cryptographic provider itself. All signed data acquired from external sources might use other signing algorithms, specifically the issuer signatures of the trust chain, the time-stamp's signature, or those used for the revocation information (CRL, OCSP). It is recommended to verify, that the algorithms of all signatures provide a similar level of security.

5.5.2 Windows Cryptographic Provider

This provider uses Windows infrastructure to access certificates and to supply cryptographic algorithms. Microsoft Windows offers two different APIs, the Microsoft CryptoAPI and Cryptography API Next Generation (CNG).

Microsoft CryptoAPI Provides functionality for using cryptographic algorithms and for accessing certificates stored in the Windows certificate store and other devices, such as USB tokens, with Windows integration.

Microsoft CryptoAPI does not support some new cryptographic algorithms, such as SHA-256.

Cryptography API: Next Generation (CNG) CNG is an update to CryptoAPI. It extends the variety of available cryptographic algorithms, e.g. by the SHA-256 hashing algorithms. If possible the 3-Heights™ PDF to PDF/A Converter API performs cryptographic calculations with CNG instead of CryptoAPI.

CNG is available only if:

- The operating system is at least Windows Vista or Windows Server 2008.
- The provider of the signing certificate's private key, e.g. the USB Token or SmartCard, supports CNG.

If CNG is not available, the CryptoAPI's cryptographic algorithms are used. In any case, CryptoAPI is used for the certificate accessing functionalities.

CNG Support of SuisseID: SuisseID supports CNG starting with middleware version 3.6.2. When using an older middleware version, an upgrade is highly recommended.

Default Message Digest Algorithm: Since version 4.6.12.0 of the 3-Heights™ PDF to PDF/A Converter API, the default message digest algorithm is SHA-256. As a result, signing will fail if CNG is not available (error message "Private key not available."). To use SHA-1, the provider session property `MessageDigestAlgorithm` can be used. Note that the use of SHA-1 is strongly discouraged by the cryptographic community.

Configuration

Provider Property `Provider` or argument of `BeginSession`

The provider configuration string has the following syntax:

`"[‹ProviderType›:]‹Provider›[;‹PIN›]"`

The `‹ProviderType›` and `‹PIN›` are optional. The corresponding drivers must be installed on Windows. If CNG is available, `‹ProviderType›` and `‹Provider›` are obsolete and can be omitted.

Optionally, when using an advanced certificate, the pin code (password) can be passed as an additional, semicolumn separated parameter `‹PIN›`. This does not work with qualified certificates, because they always require the pin code to be entered manually and every time.

If `‹Provider›` is omitted, the default provider is used. The default provider is suitable for all systems where CNG is available.

Examples: Use the default provider with no pin.

```
Provider = ""
```

Examples: "123456" being the pin code.

```
Provider = ";123456"
```

```
Provider = "Microsoft Base Cryptographic Provider v1.0;123456"
```

```
Provider = "PROV_RSA_AES:Microsoft Enhanced RSA and AES Cryptographic" _
  + "Provider;123456"
```

Certificate Store Property `Store`

The value for the certificate store depends on the OS. Supported values are: "CA", "MY" and "ROOT". For signature creation the default store "MY" is usually the right choice.

Store Location Property `StoreLocation`

Either of the following store locations

- "Local Machine"
- "Current User" (default)

Usually personal certificates are stored in the "Current User" location and company-wide certificates are stored under "Local Machine".

The "Current User"'s store is only available, if the user profile has been loaded. This may not be the case in certain environments such as within an IIS web application or COM+ applications. Use the store of the Local Machine, if the user profile cannot be loaded. For other services it is sufficient to log it on as the user. Note that some cryptographic hardware (such as smart cards or USB Tokens) require an interactive environment. As a result, the private key might not be available in the service session, unless the 3-Heights™ PDF to PDF/A Converter API is run interactively.

Certificates in the store "Local Machine" are available to all users. However, in order to sign a document, you need access to the signing certificate's private key. The private key is protected by Windows ACLs and typically readable for Administrators only. Use the Microsoft Management Console (`mmc.exe`) in order to grant access to the private key for other users as follows: Add the Certificates Snap-in for the certificates on Local Machine. Right-click on the signing certificate, click on "All Tasks" and then "Manage Private Keys..." where you can set the permissions.

Selecting a Certificate for Signing

Within the certificate store selected by Store Location and Certificate Store the selection of the signing certificate works the same as with the PKCS#11 provider, which is described here: Selecting a Certificate for Signing

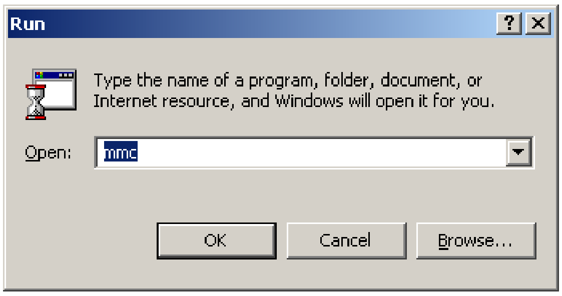
Certificates

In order to sign a PDF document, a valid, existing certificate name must be provided and its private key must be available.

There are various ways to create or obtain a certificate. How this is done is not described in this document. This document describes the requirements for, and how to use the certificate.

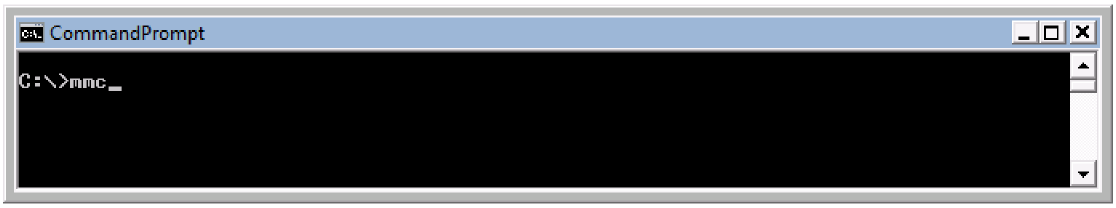
On the Windows operating system certificates can be listed by the Microsoft Management Console (MMC), which is provided by Windows. In order to see the certificates available on the system, do the following steps:

1. To launch the MMC, go to Start → Run. . .→ type "mmc", or start a Command Prompt and type "mmc".



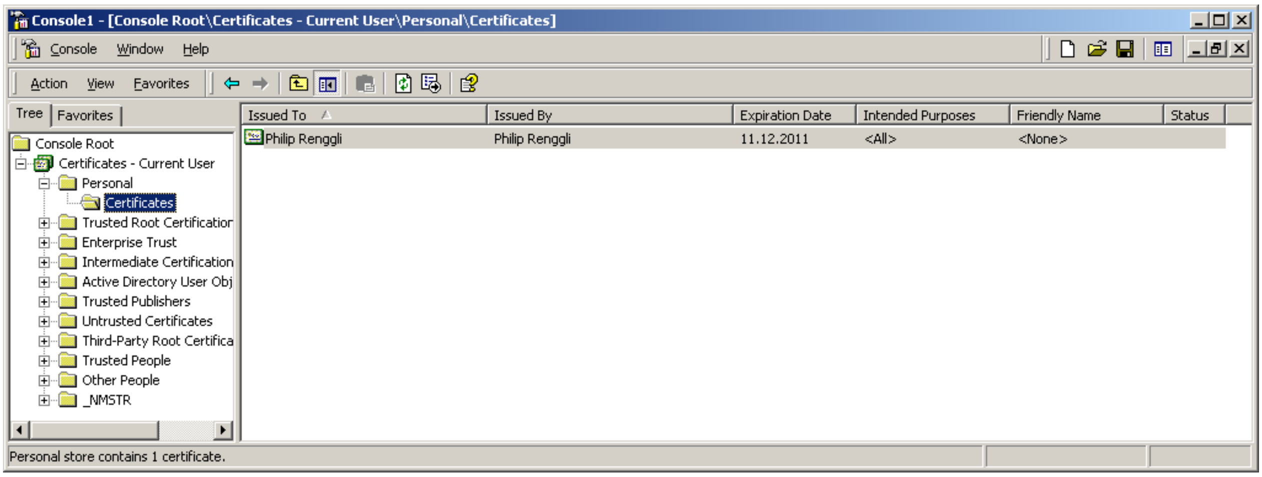
Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.

Open: mmc



```
C:\>mmc_
```

2. Under “File” →“Add/Remove Snap-in”
3. Choose “Certificates” and click the “Add” button
4. In the next window choose to manage certificates for “My user account”
5. Click “Finish”
6. The certificate must be listed under the root “Certificates - Current User”, for example as shown in the screenshot below:

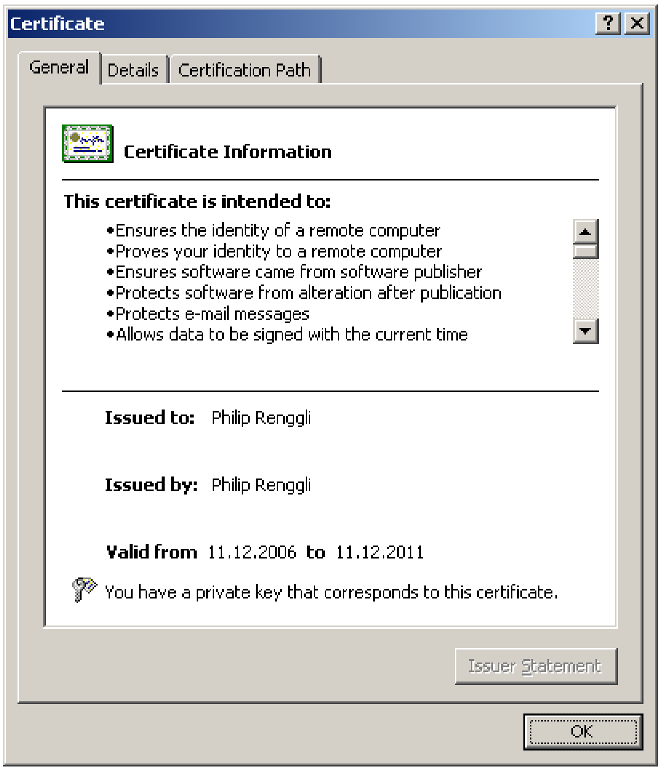


Console1 - [Console Root\Certificates - Current User\Personal\Certificates]
Console
Window
Help
Action
View
Favorites
Tree
Favorites
Console Root
Certificates - Current User
Personal
Certificates
Trusted Root Certification
Enterprise Trust
Intermediate Certification
Active Directory User Obj
Trusted Publishers
Untrusted Certificates
Third-Party Root Certifica
Trusted People
Other People
_NMSTR

Issued To	Issued By	Expiration Date	Intended Purposes	Friendly Name	Status
Philip Renggli	Philip Renggli	11.12.2011	<All>	<None>	

Personal store contains 1 certificate.

7. Double-click the certificate to open. The certificate name corresponds to the value “Issued to:”.



Certificate Information

This certificate is intended to:

- Ensures the identity of a remote computer
- Proves your identity to a remote computer
- Ensures software came from software publisher
- Protects software from alteration after publication
- Protects e-mail messages
- Allows data to be signed with the current time

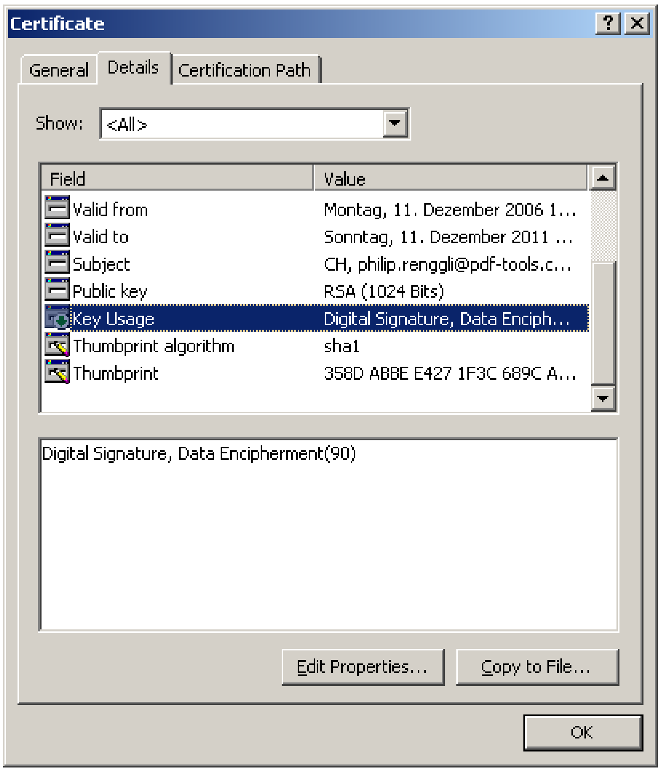
Issued to: Philip Renggli

Issued by: Philip Renggli

Valid from 11.12.2006 **to** 11.12.2011

You have a private key that corresponds to this certificate.

8. In the tab Detail of the certificate, there is a field named “Key Usage”. This field must contain the value “Digital Signature”. Additional values are optional, see also screenshot.
   You must have the private key that corresponds to this certificate.



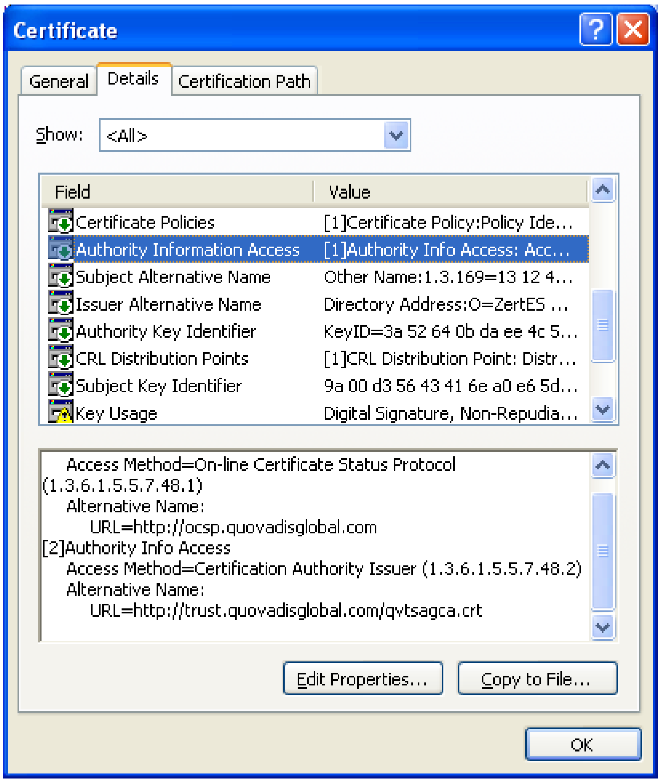
Show: <All>

Field	Value
Valid from	Montag, 11. Dezember 2006 1...
Valid to	Sonntag, 11. Dezember 2011 ...
Subject	CH, philip.renggli@pdf-tools.c...
Public key	RSA (1024 Bits)
Key Usage	Digital Signature, Data Enciph...
Thumbprint algorithm	sha1
Thumbprint	358D ABBE E427 1F3C 689C A...

Digital Signature, Data Encipherment(90)

Qualified Certificates

A qualified certificate can be obtained from a certificate authority (CA). Besides the requirements listed in the previous chapter it has the additional requirement to contain the key “Authority Information Access” which contains the information about the OCSP server.



Show: <All>

Field	Value
Certificate Policies	[1]Certificate Policy:Policy Ide...
Authority Information Access	[1]Authority Info Access: Acc...
Subject Alternative Name	Other Name:1.3.169=13 12 4...
Issuer Alternative Name	Directory Address:O=ZertES ...
Authority Key Identifier	KeyID=3a 52 64 0b da ee 4c 5...
CRL Distribution Points	[1]CRL Distribution Point: Distr...
Subject Key Identifier	9a 00 d3 56 43 41 6e a0 e6 5d...
Key Usage	Digital Signature, Non-Repudia...

```
    Access Method=On-line Certificate Status Protocol
(1.3.6.1.5.5.7.48.1)
    Alternative Name:
        URL=http://ocsp.quovadisglobal.com
[2]Authority Info Access
    Access Method=Certification Authority Issuer (1.3.6.1.5.5.7.48.2)
    Alternative Name:
        URL=http://trust.quovadisglobal.com/qvtsagca.crt
```

Cryptographic Suites

The message digest algorithm as well as the signing algorithm can be chosen as described for the PKCS#11 provider in Cryptographic Suites.

The `MessageDigestAlgorithm` can only be set to a value other than `SHA-1` if the private key’s provider supports CNG.

The `SigAlgo` can only be set to `RSA_SSA_PSS` if the private key’s provider supports CNG.

5.5.3 3-Heights™ Signature Creation and Validation Service

The 3-Heights™ Signature Creation and Validation Service provides HTTP protocol based remote access to cryptographic providers such as smartcards, USB tokens, and other cryptographic infrastructure such as HSMs.

Use of the 3-Heights™ Signature Creation and Validation Service provides the following advantages:

1. By means of this service the tokens can be hosted centrally and used by any client computer which has access to the service.
2. Cryptographic devices that can be used on Windows only can be made accessible to siging processes running on Non-Windows systems.
3. Cryptographic devices can be made accessible to processes running in non-interactive sessions. Many cryptographic devices must always be used in an interactive session for two reasons.
   First, the middleware requires the user to enter the pin interactively to create a qualified electronic signature.

Second, USB tokens and smart cards are managed by Windows such that the device is available only to the user currently using the computer's console. Therefore, services, remotely logged in users and applications running in locked sessions have no access to the device.

> **Note:** that this is a separate product and this chapter describes its usage with the 3-Heights™ PDF to PDF/A Converter API only.

For more information on the 3-Heights™ Signature Creation and Validation Service and installation instructions, please refer to its separate user manual.

Configuration

Provider Property `Provider` or argument of `BeginSession`

The provider configuration string has the following syntax:

`"http://server.mydomain.com:‹port›/‹token›;‹password›"`

Where:

- `server.mydomain.com` is the hostname of the server
- `‹port›` is optional, port of the server.
- `‹token›` the ID of the token.
- `‹password›` password of the token.

Example:

```
Provider = "http://server.mydomain.com:8080/0001;pass01"
```

A more detailed description can be found in the user manual of the 3-Heights™ Signature Creation and Validation Service.

Selecting a Certificate for Signing

Selection of the signing certificate works the same as if the token was used directly: Selecting a Certificate for Signing.

Cryptographic Suites

The message digest algorithm as well as the signing algorithm can be chosen as described for the PKCS#11 provider in Cryptographic Suites.

The `MessageDigestAlgorithm` must be set by the client.

The `SigAlgo` must be configured in the server's token configuration file `TokenConfig.xml`.

5.5.4 SwissSign Digital Signing Service

Provider Property `Provider` or argument of `BeginSession`

The provider configuration string contains the URL to the service endpoint.

Provider Configuration The provider can be configured using provider session properties.

There are two types of properties:

- "String" Properties:
  String properties are set using method SetSessionProperty.
- "File" Properties:
  File properties are set using method SetSessionProperty with a file name parameter. Alternatively the file can be passed in-memory as byte array using the method SetSessionProperty.

Name	Type	Required	Value
Identity	String	required	The identity of your signing certificate. Example: `My Company:Signing Cert 1`
DSSProfile	String	required	Must be set to `http://dss.swisssign.net/dss/profile/pades/1.0`
SSLClientCertificate	File	required	SSL client certificate in PKCS#12 Format (`.p12`, `.pfx`). File must contain the certificate itself, all certificates of the trust chain and the private key.
SSLClientCertificatePassword	String	optional	Password to decrypt the private key of the SSL client certificate.
SSLServerCertificate	File	recommended	Certificate of the server or its issuer (CA) certificate (`.crt`). The certificate may be in either PEM (ASCII text) or DER (binary) form. Note: If this property is not set, the server certificate's trustworthiness cannot be determined. As a result, the connection is not guaranteed to be secure.
RequestID	String	recommended	Any string that can be used to track the request. Example: An UUID like `AE57F021-C0EB-4AE0-8E5E-67FB93E5BC7F`

Signature Configuration The signature can be customized using standard properties of the 3-Heights™ PDF to PDF/A Converter API.

Description	Required	Value	Setting
Common Name	required	The name of the signer must be set[9].	Property Name.

Time-stamp	optional	Use the value `urn:ietf:rfc:3161` to embed a time-stamp.	Property `TimeStampURL`
Revocation Info	recommended	To embed OCSP responses or CRL.	Property `EmbedRevocationInfo`
Visual Appearance	optional	See separate chapter How to Create a Visual Appearance of a Signature.	

Proxy Configuration If a proxy is used for the connection to the service, see chapter How to Use a Proxy for more information.

5.5.5 SwissSign SuisseID Signing Service

In order to use the SuisseID Signing Service, please contact Swiss Post Solutions AG (`suisseid@post.ch`) to obtain access credentials. Prior to invoking the SuisseID Signing Service, user authentication via the SuisseID Identity Provider (IDP) is a pre-requisite. So the calling application must integrate via SAML (e.g. SuisseID SDK) with the SuisseID Identity Provider. The IDP issues SAML tokens upon successful user authentication.

> **Note:** The name of the signature should be the signer's name (e.g. "`‹given-name› ‹surname›`"). The signer's name can be retrieved for the SAML token as the IDP provides this as qualified attributes (yellowid verified).

Provider Property `Provider` or argument of `BeginSession`

The provider configuration string contains the URL to the service endpoint.

Provider Configuration The provider can be configured using provider session properties.

There are two types of properties:

- "String" Properties:
  String properties are set using method `SetSessionProperty`.
- "File" Properties:
  File properties are set using method `SetSessionProperty` with a file name parameter. Alternatively the file can be passed in-memory as byte array using the method `SetSessionProperty`.

Name	Type	Required	Value

[9] This parameter is not used for certificate selection, but for the signature appearance and signature description in the PDF only.

SAMLToken	File	required	SAML token issued by the SuisseID Identity Provider (IDP). Example: `C:\temp\my-saml.xml` Note: The SAML token received from the IDP is a signed XML. It must be treated as binary data and not be modified in any way. For example, the token should not be read into a string or XML object and re-serialized.
SSLClientCertificate	File	required	SSL client certificate in PKCS#12 Format (`.p12`, `.pfx`). File must contain the certificate itself, all certificates of the trust chain and the private key.
SSLClientCertificatePassword	String	optional	Password to decrypt the private key of the SSL client certificate.
SSLServerCertificate	File	recommended	Certificate of the server or its issuer (CA) certificate (`.crt`). The certificate may be in either PEM (ASCII text) or DER (binary) form. Note: If this property is not set, the server certificate's trustworthiness cannot be determined. As a result, the connection is not guaranteed to be secure.

Signature Configuration The signature can be customized using standard properties.

Description	Required	Value	Setting
Common Name	required	The name of the signer must be set[10].	Property Name.
Time-stamp	recommended	Use the value `http://tsa.swisssign.net` to embed a time-stamp.	Property `TimeStampURL`
Revocation Info	recommended	To embed OCSP responses or CRL.	Property `EmbedRevocationInfo`
Visual Appearance	optional	See separate chapter How to Create a Visual Appearance of a Signature.	

Proxy Configuration If a proxy is used for the connection to the service, see chapter How to Use a Proxy for more information.

[10] This parameter is not used for certificate selection, but for the signature appearance and signature description in the PDF only.

5.5.6 QuoVadis sealsign

Provider Property `Provider` or argument of `BeginSession`

The provider configuration string contains the URL to the QuoVadis sealsign service.

- Demo service:
  `https://services.sealsignportal.com/sealsign/ws/BrokerClient`
- Productive service:
  `https://qvchsvsws.quovadisglobal.com/sealsign/ws/BrokerClient`

Provider Configuration The provider can be configured using provider session properties that can be set using the method `SetSessionProperty`.

Name	Type	Required	Value
Identity	String	required	The account ID is the unique name of the account specified on the server. Example: `Rigora`
Profile	String	required	The profile identifies the signature specifications by a unique name. Example: `Default`
secret	String	required	The secret is the password which secures the access to the account. Example: `NeE=EKEd33FeCk70`
clientId	String	required	A client ID can be used to help separating access and creating better statistics. If specified in the account configuration it is necessary to provide this value. Example: `3949-4929-3179-2818`
pin	String	required	The PIN code is required to activate the signing key. Example: `123456`
MessageDigestAlgorithm	String	optional	The message digest algorithm to use. Default: `SHA-256` Alternatives: `SHA-1`, `SHA-384`, `SHA-512`, `RIPEMD-160`, `RIPEMD-256`

Signature Configuration The signature can be customized using standard properties.

Description	Required	Value	Setting
Common Name	required	The name of the signer must be set[11].	Property `Name`.
Time-stamp	-	Not available.	

Revocation Info	recommended	To embed OCSP responses or CRL.	Property `EmbedRevocationInfo`
Visual Appearance	optional	See separate chapter How to Create a Visual Appearance of a Signature.	

Proxy Configuration If a proxy is used for the connection to the service, see chapter How to Use a Proxy for more information.

5.5.7 Swisscom All-in Signing Service

General Properties

To use the signature service, the following general properties have to be set:

Description	Required	Value	Setting
Common Name	required	Name of the signer[12].	Property `Name`
Provider	required	The service endpoint URL of the REST service. Example: `https://ais.swisscom.com/AIS-Server/rs/v1.0/sign`	Property `Provider`
Time-stamp	optional	Use the value `urn:ietf:rfc:3161` to embed a time-stamp.	Property `TimeStampURL`
Revocation Info	optional	To embed OCSP responses	Property `EmbedRevocationInfo`

If a proxy is used for the connection to the service, see chapter How to Use a Proxy for more information.

Provider Session Properties

In addition to the general properties, a few provider specific session properties have to be set.

There are two types of properties:

- "String" Properties:
  String properties are set using method `SetSessionProperty`.
- "File" Properties:
  File properties are set using method `SetSessionProperty` with a file name parameter. Alternatively the file can be passed in-memory as byte array using the method `SetSessionProperty`.

[11] This parameter is not used for certificate selection, but for the signature appearance and signature description in the PDF only.

[12] This parameter is not used for certificate selection, but for the signature appearance and signature description in the PDF only.

Name	Type	Required	Value
DSSProfile	String	required	Must be set to `http://ais.swisscom.ch/1.0`
SSLClientCertificate	File	required	SSL client certificate in PKCS#12 Format (`.p12`, `.pfx`). File must contain the certificate itself, all certificates of the trust chain and the private key.
SSLClientCertificatePassword	String	optional	Password to decrypt the private key of the SSL client certificate.
SSLServerCertificate	File	recommended	Certificate of the server or its issuer (CA) certificate (`.crt`). The certificate may be in either PEM (ASCII text) or DER (binary) form. Note: If this property is not set, the server certificate's trustworthiness cannot be determined. As a result, the connection is not guaranteed to be secure.
Identity	String	required	The Claimed Identity string as provided by Swisscom: `‹customer name›:‹key identity›`
RequestID	String	recommended	Any string that can be used to track the request. Example: An UUID like `AE57F021-C0EB-4AE0-8E5E-67FB93E5BC7F`

On-Demand Certificates

To request an on-demand certificate, the following additional property has to be set:

Name	Type	Required	Value
SwisscomAllInOnDemandDN	String	required	The requested distinguished name. Example: `cn=Hans Muster,o=ACME,c=CH`

Step-Up Authorization using Mobile-ID

To use the step-up authorization, the following additional properties have to be set:

Name	Type	Required	Value
SwisscomAllInMSISDN	String	required	Mobile phone number. Example: `+41798765432`

SwisscomAllInMessage	String	required	The message to be displayed on the mobile phone. Example: `Pipapo halolu`.
SwisscomAllInLanguage	String	required	The language of the message. Example: `DE`

Those properties have to comply with the Swisscom Mobile-ID specification.

5.5.8 GlobalSign Digital Signing Service

Provider Property `Provider` or argument of `BeginSession`

The provider configuration string contains the URL to the service endpoint.

- Productive: `https://emea.api.dss.globalsign.com:8443/v1.0`
- Test: `https://stg-emea.api.hvca.globalsign.com:8443` (IP `185.140.80.190`)

Provider Configuration The provider can be configured using provider session properties.

There are two types of properties:

- "String" Properties:
  String properties are set using method `SetSessionProperty`.
- "File" Properties:
  File properties are set using method `SetSessionProperty` with a file name parameter. Alternatively the file can be passed in-memory as byte array using the method `SetSessionProperty`.

Name	Type	Required	Value
api_key	String	required	Your account credentials' key parameter for the login request.
api_secret	String	required	Your account credentials' secret parameter for the login request.
Identity	String	required	Parameter to create the signing certificate. Example for an account with a static identity: `{}` Example for an account with a dynamic identity: `{ "subject_dn": { "common_name": "John Doe" } }`
SSLClientCertificate	File	required	SSL client certificate in PKCS#12 Format (`.p12`, `.pfx`). File must contain the certificate itself, all certificates of the trust chain and the private key.
SSLClientCertificatePassword	String	optional	Password to decrypt the private key of the SSL client certificate.

SSLServerCertificate	File	recommended	Certificate of the server or its issuer (CA) certificate (`.crt`). The certificate may be in either PEM (ASCII text) or DER (binary) form. Note: If this property is not set, the server certificate's trustworthiness cannot be determined. As a result, the connection is not guaranteed to be secure.

Signature Configuration The signature can be customized using standard properties of the 3-Heights™ PDF to PDF/A Converter API.

Description	Required	Value	Setting
Common Name	required	The name of the signer must be set[13].	Property `Name`.
Time-stamp	recommended	Use the value `urn:ietf:rfc:3161` to embed a time-stamp.	Property `TimeStampURL`
Revocation Info	recommended	To embed OCSP responses or CRL.	Property `EmbedRevocationInfo`
Visual Appearance	optional	See separate chapter How to Create a Visual Appearance of a Signature.	

Proxy Configuration If a proxy is used for the connection to the service, see chapter How to Use a Proxy for more information.

How to create the SSL client certificate

When creating a new account, GlobalSign will issue an SSL client certificate `clientcert.crt`. The following command creates a PKCS#12 file `certificate.p12` that can be used for the `SSLClientCertificate`:

```
openssl pkcs12 -export -out certificate.p12 -inkey privateKey.key -in clientcert.crt
```

How to get the SSL server certificate

The SSL server certificate can either be found in the technical documentation of the "Digital Signing Service" or downloaded from the server itself:

1. Get the server's SSL certificate:

```
openssl s_client -showcerts -connect emea.api.dss.globalsign.com:8443 ^
```

[13] This parameter is not used for certificate selection, but for the signature appearance and signature description in the PDF only.

```
-cert clientcert.crt -key privateKey.key
```

2. The certificate is the text starting with "-----BEGIN CERTIFICATE-----" and ending with "-----END CERTIFICATE-----". Use the text to create a text file and save it as server.crt.
3. Use server.crt or one of its CA certificates for the SSLServerCertificate.

Advice on using the service

Whenever a new session is created using BeginSession a login is performed. In this session signatures can be created using different identities, i.e. signing certificates, which are created as they are needed. Both signing sessions and signing certificates expire after 10 minutes.

Note that there are rate limits for both creating new identities and for signing operations. So, if multiple documents must be signed at once, it is advisable to re-use the same session (and hence its signing certificates) for signing.

Due to the short-lived nature of the signing certificates, it is important to embed revocation information immediately. For example by using AddValidationInformation() of the 3-Heights™ PDF Security API or EmbedRevocationInfo. Furthermore it is highly recommended to embed a time-stamp in order to prove that the signature was created during the certificate's validity period.

5.6 How to Create Digital Signatures

This chapter describes the steps that are required to create different types of digital signatures. A good introductory example can be found in the chapter How to Create Electronic Signatures.

5.6.1 How to Create a PAdES Signature

The PAdES European Norm recommends to use one of the following four baseline signature levels.

PAdES-B-B A digital signature.

PAdES-B-T A digital signature with a time-stamp token.

PAdES-B-LT A digital signature with a time-stamp token and signature validation data.

PAdES-B-LTA A digital signature with a time-stamp token and signature validation data protected by a document time-stamp.

The lifecycle of digital signatures in general and usage these signature levels in particular are described in more detail in chapter 8.11.6 "Digital signatures lifecycle" of ETSI TR 119 100.

Requirements

For general requirements and preparation steps see chapter How to Create Electronic Signatures.

Requirements

Level	Signing Certificate	Time-stamp	Product
B-B	any	no	3-Heights™ PDF to PDF/A Converter API
B-T	any	required	3-Heights™ PDF to PDF/A Converter API

Requirements

B-LT	advanced or qualified certificate	required	**3-Heights™ PDF Security**
B-LTA	advanced or qualified certificate	required	**3-Heights™ PDF Security**

Make sure the trust store of your cryptographic provider contains all certificates of the trust chain, including the root certificate. Also include the trust chain of the time-stamp signature, if your TSA server does not include them in the time-stamp.

A proper error handling is crucial in order to ensure the creation of correctly signed documents. The output document was signed successfully, if and only if the method `Convert` returns true.

Note on linearization: Because signature levels PAdES-B-LT and PAdES-B-LTA must be created in a two-step process, the files cannot be linearized. When creating signature levels PAdES-B-B or PAdES-B-T that might later be augmented, linearization should not be used.

PAdES vs. CAdES: CAdES is an ETSI standard for the format of digital signatures. The format used in PAdES is based on CAdES, which is why the format is called `ETSI.CAdES.detached` (see `SubFilter`). Because PAdES defines additional requirements suitable for PDF signatures, mere CAdES compliance is not sufficient.

Create a PAdES-B-B Signature

Input Document Any PDF document.

Cryptographic Provider A cryptographic provider that supports the creation of PAdES signatures.

```
using (Pdf2Pdf doc = new Pdf2Pdf())
{
  if (!doc.BeginSession(@"myPKCS11.dll;0;pin"))
    throw new Exception("Error connecting to provider: " + doc.ErrorMessage);

  using (Signature signature = new Signature())
  {
    signature.Name = "My Signing Certificate";
    signature.SubFilter = "ETSI.CAdES.detached";
    doc.AddSignature(signature);
  }

  if (!doc.Convert("input.pdf", "", "pades-b-b.pdf", "log.txt"))
    throw new Exception("Error saving pades-b-b.pdf: " + doc.ErrorMessage);
}
```

Create a PAdES-B-T Signature

Input Document Any PDF document.

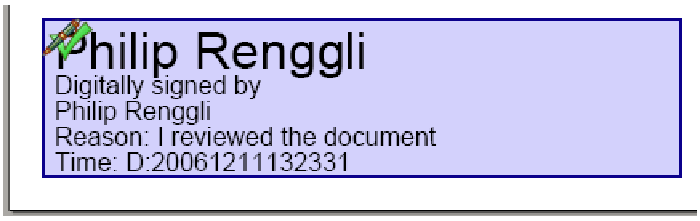
Cryptographic Provider A cryptographic provider that supports the creation of PAdES signatures.

```
using (Pdf2Pdf doc = new Pdf2Pdf())
{
  if (!doc.BeginSession(@"myPKCS11.dll;0;pin"))
    throw new Exception("Error connecting to provider: " + doc.ErrorMessage);

  using (Signature signature = new Signature())
  {
    signature.Name = "My Signing Certificate";
    signature.SubFilter = "ETSI.CAdES.detached";
    signature.TimeStampURL = "http://server.mydomain.com/tsa";
    doc.AddSignature(signature);
  }

  if (!doc.Convert("input.pdf", "", "pades-b-t.pdf", "log.txt"))
    throw new Exception("Error converting pades-b-t.pdf: " + doc.ErrorMessage);
}
```

5.6.2 How to Create a Visual Appearance of a Signature

Each signature may have a visual appearance on a page of the document. The visual appearance is optional and has no effect on the validity of the signature. Because of this and because a visual appearance may cover important content of the page, the 3-Heights™ PDF to PDF/A Converter API creates invisible signatures by default.

In order to create a visual appearance, a non-empty signature rectangle must be set. For example, by setting the property Rect to [10, 10, 210, 60] the following appearance is created:



Philip Renggli
Digitally signed by
Philip Renggli
Reason: I reviewed the document
Time: D:20061211132331

Different properties of the visual appearance can be specified.

Page and Position See properties PageNo and Rect.

Color See properties FillColor and StrokeColor.

Line Width The line width of the background rectangle, see property LineWidth.

Text Two text fragments can be set using two different fonts and font sizes, see properties Text1, Text2, FontName1, FontName2, FontSize1, and FontSize2.

Background image See property ImageFileName.

5.6.3 Guidelines for Mass Signing

This section provides some guidelines for mass signing using the 3-Heights™ PDF to PDF/A Converter API.

Keep the session to the security device open for multiple sign operations

Creating and ending the session to the security device is a complex operation. By re-using the session for multiple sign operations, performance can be improved:

1. Create a `Pdf2Pdf` object.
2. Open the session to the provider using `BeginSession`.
3. Use the `Pdf2Pdf` object to sign multiple documents.
4. Close the session to the provider using `EndSession`.
5. Dispose of the `Pdf2Pdf` object.

Signing concurrently using multiple threads

The 3-Heights™ PDF to PDF/A Converter API is thread-safe. Each `Pdf2Pdf` object should be used in one thread at the time only. It is recommended that each thread has a separate `Pdf2Pdf` object.

The performance improvement when signing concurrently using multiple threads depends mainly on the security device used. Typically the improvement is large for HSMs and small for USB Tokens.

Thread safety with a PKCS#11 provider

The PKCS#11 standard specifies, that "an application can specify that it will be accessing the library concurrently from multiple threads, and the library must [...] ensure proper thread-safe behavior." However, some PKCS#11 provider (middleware) implementations are not thread-safe. For this reason, the 3-Heights™ PDF to PDF/A Converter API synchronizes all access to the same provider (middleware and slot id).

If your middleware is thread-safe, you can enable full parallel usage of the cryptographic device by setting the session property `"LOCKING_OK"` to the value `"True"` using the method `SetSessionProperty`.

Example: Enable parallel access to the cryptographic device.

```
doc.SetSessionPropertyString("LOCKING_OK", "true");
```

5.6.4 Miscellaneous

Caching of CRLs, OCSP, and Time-stamp Reponses

In order to improve the speed when mass signing, the 3-Heights™ PDF to PDF/A Converter API provides a caching algorithm to store CRL (Certificate Revocation List), OCSP (Online Certificate Status Protocol), TSP (Time-stamp Protocol) and data from signature services. This data is usually valid over period of time that is defined by the protocol, which is normally at least 24 hours. Caching improves the speed, because there are situations when the server does not need to be contacted for every digital signature.

The following caches are stored automatically by the 3-Heights™ PDF to PDF/A Converter API at the indicated locations within the Cache Directory:

OCSP responses	`<CacheDirectory>/OCSP Responses/server-hash.der`
CRL	`<CacheDirectory>/CLRs/server.der`
Time stamp responses[14]	`<CacheDirectory>/Time Stamps/server.der`
Service data	`<CacheDirectory>/Signature Sizes/hash.bin`

The caches can be cleared by deleting the files. Usage of the caches can be deactivated by setting the NoCache flag. The files are automatically updated if the current date and time exceeds the "next update" field in the OCSP or CRL response respectively or the cached data was downloaded more than 24 hours ago.

How to Use a Proxy

The 3-Heights™ PDF to PDF/A Converter API can use a proxy server for all communication to remote servers, e.g. to download CRL or for communication to a signature service. The proxy server can be configured using the provider session property `Proxy`. The property's value must be a string with the following syntax:

`http[s]://[‹user›[:‹password›]@‹host›[:‹port›]`

Where:

- `http` / `https`: Protocol for connection to proxy.
- `‹user›:‹password›` (optional): Credentials for connection to proxy (basic authorization).
- `‹host›`: Hostname of proxy.
- `‹port›`: Port for connection to proxy.

For SSL connections, e.g. to a signature service, the proxy must allow the HTTP CONNECT request to the signature service.

Example: Configuration of a proxy server that is called "myproxy" and accepts HTTP connections on port 8080.

```
conv.SetSessionPropertyString "Proxy" "http://myproxy:8080"
```

Configuration of Proxy Server and Firewall

For the application of a time-stamp or online verification of certificates, the signature software requires access to the server of the certificates' issuer (e.g. `http://ocsp.quovadisglobal.com` or `http://platinum-qualified-g2.ocsp.swisssign.net/`) via HTTP. The URL for verification is stored in the certificate; the URL for time-stamp services is provided by the issuer. In case these functions are not configured, no access is required.

In organizations where a web proxy is used, it must be ensured that the required MIME types are supported. These are:

OCSP

- `application/ocsp-request`
- `application/ocsp-response`

Time-stamp

- `application/timestamp-query`

[14] The sizes of the time-stamp responses are cached only. Cached Time stamp responses cannot be embedded but used for the computation of the signature length only.

- `application/timestamp-reply`

Signature services

- Signature service specific MIME types.

Setting the Signature Build Properties

In the signature build properties dictionary the name of the application that created the signature can be set using the provider session properties `Prop_Build.App.Name` and `Prop_Build.App.REx`. The default values are "3-Heights™ PDF to PDF/A Converter API" and its version.

5.7 How to Validate Digital Signatures

5.7.1 Validation of a Qualified Electronic Signature

There are basically three items that need to be validated:

1. Trust Chain
2. Revocation Information (optional)
3. Time-stamp (optional)

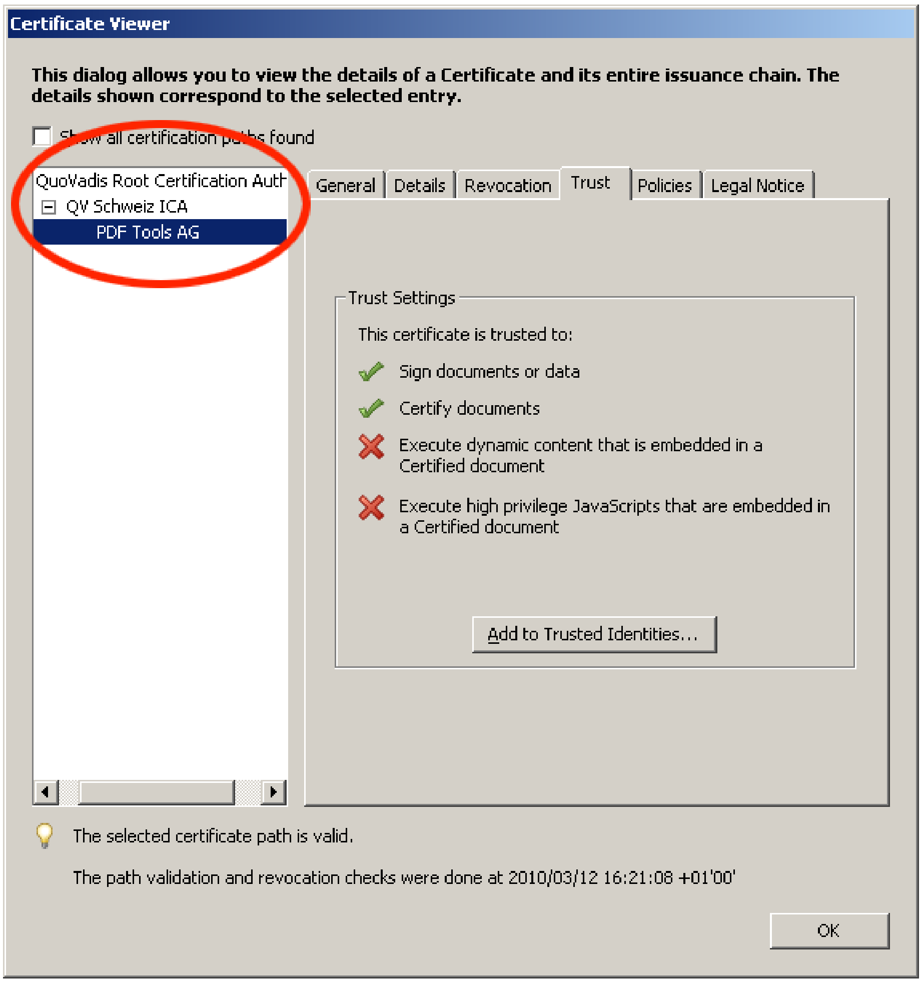
Validation can be in different ways, e.g. Adobe Acrobat, from which the screenshots below are taken.

Trust Chain

Before the trust chain can be validated, ensure the root certificate is trusted. There are different ways to add a certificate as trusted root certificate. The best way on Windows is this:

1. Retrieve a copy of the certificate containing a public key. This can be done be requesting it from the issuer (your CA) or by exporting it from an existing signature to a file (`CertExchange.cer`). Ensure you are not installing a malicious certificate!
2. Add the certificate to the trusted root certificates. If you have the certificate available as file, you can simply double-click it to install it.

After that you can validate the signature, e.g. by open the PDF document in Adobe Acrobat, right-click the signature and select "Validate", then select "Properties" and select the tab "Trust". There the certificate should be trusted to "sign documents or data".



Certificate Viewer

This dialog allows you to view the details of a Certificate and its entire issuance chain. The details shown correspond to the selected entry.

□ Show all certification paths found

Trust Settings

This certificate is trusted to:

- ✓ Sign documents or data
- ✓ Certify documents
- ✗ Execute dynamic content that is embedded in a Certified document
- ✗ Execute high privilege JavaScripts that are embedded in a Certified document

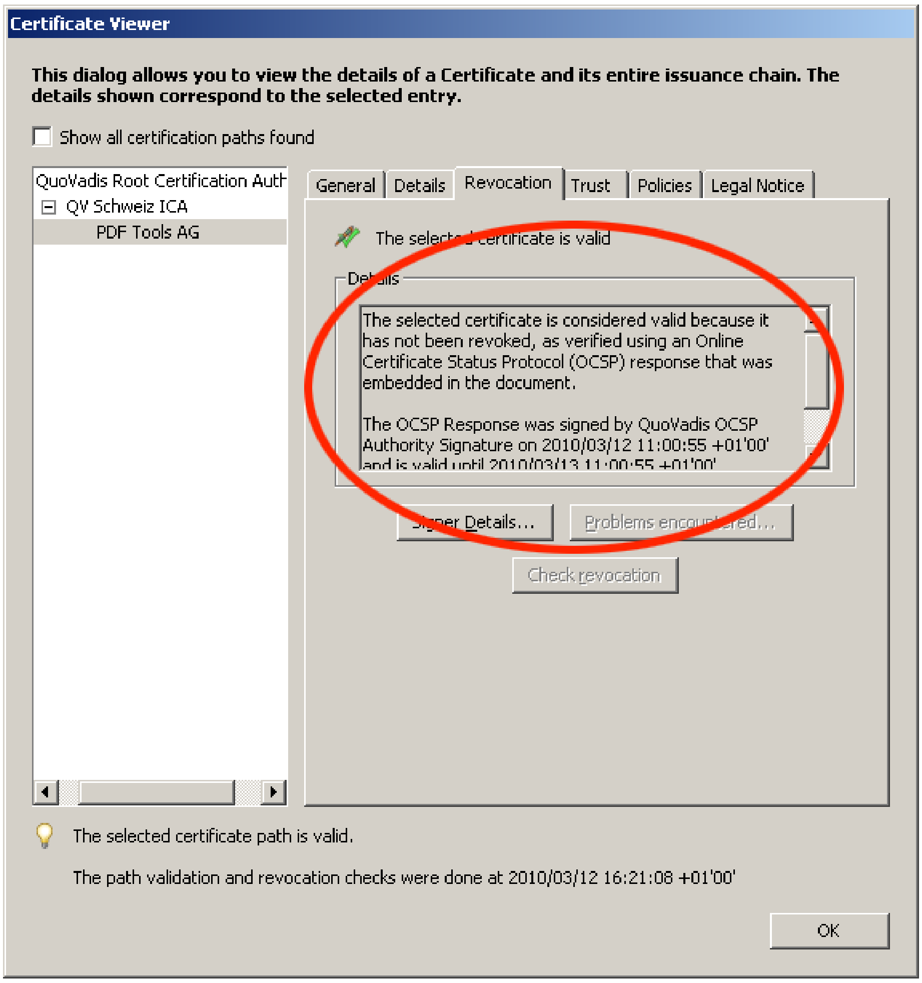
The selected certificate path is valid.

The path validation and revocation checks were done at 2010/03/12 16:21:08 +01'00'

Revocation Information

An OCSP response or CRL must be available. This is shown in the tab “Revocation”. The details should mention that “the certificate is considered *valid*”.

The presence of revocation information must be checked for the signing certificate and all certificates of its trust chain except for the root certificate.



This dialog allows you to view the details of a Certificate and its entire issuance chain. The details shown correspond to the selected entry.

The selected certificate is valid

The selected certificate is considered valid because it has not been revoked, as verified using an Online Certificate Status Protocol (OCSP) response that was embedded in the document.

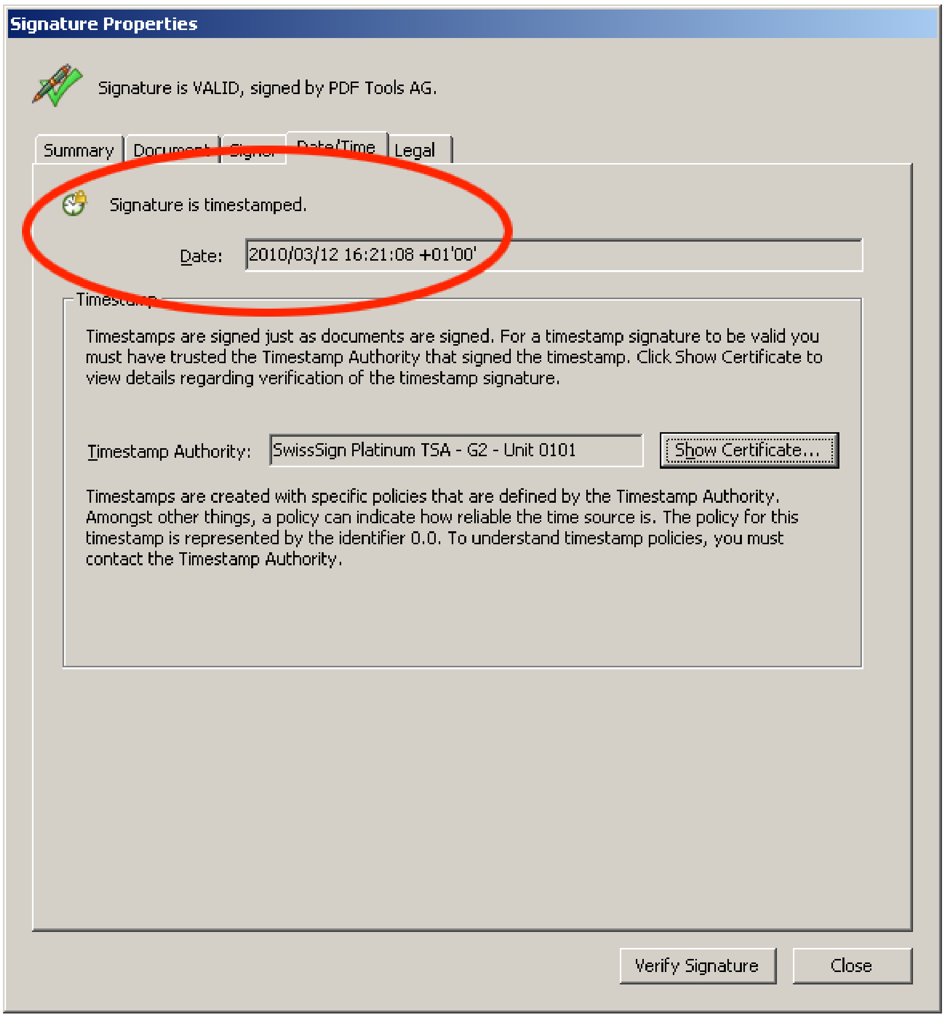
The OCSP Response was signed by QuoVadis OCSP Authority Signature on 2010/03/12 11:00:55 +01'00' and is valid until 2010/03/13 11:00:55 +01'00'

The selected certificate path is valid.

The path validation and revocation checks were done at 2010/03/12 16:21:08 +01'00'

Time-stamp

The signature can optionally contain a time-stamp. This is shown in the tab “Date/Time”. The certificate of the time-stamp server must also be trusted, i.e. its trust chain should be validated as described in the section Trust Chain above.



Signature is VALID, signed by PDF Tools AG.

Signature is timestamped.

Date: 2010/03/12 16:21:08 +01'00'

Timestamp

Timestamps are signed just as documents are signed. For a timestamp signature to be valid you must have trusted the Timestamp Authority that signed the timestamp. Click Show Certificate to view details regarding verification of the timestamp signature.

Timestamp Authority: SwissSign Platinum TSA - G2 - Unit 0101

Timestamps are created with specific policies that are defined by the Timestamp Authority. Amongst other things, a policy can indicate how reliable the time source is. The policy for this timestamp is represented by the identifier 0.0. To understand timestamp policies, you must contact the Timestamp Authority.

5.7.2 Validation of a PAdES LTV Signature

Verifying if a signature conforms to the PAdES LTV standard is similar to validating a Qualified Electronic Signature.

The following must be checked:

1. Trust Chain
2. Revocation information
3. Time-stamp
4. LTV expiration date
5. Other PAdES Requirements

Trust Chain

Trust chain validation works the same as for validating Qualified Electronic Signatures.

Revocation Information

Revocation information (OCPS response or CRL) must be valid and embedded into the signature. In the details, verify that the revocation check was performed using data that was “was *embedded in the signature* or *embedded in the document*”. Revocation information that “was contained in the *local cache*” or “was requested *online*” is not embedded into the signature and does not meet PAdES LTV requirements. If Adobe Acrobat claims that revocation information is contained in the local cache, even though it is embedded into the document, restart Adobe Acrobat and validate the signature again.

Time-stamp

A time-stamp must be embedded and validated as described for validating Qualified Electronic Signatures. If a document contains multiple time-stamps, all but the latest one must contain revocation information.

LTV Expiration Date

The long term validation ability expires with the expiration of the signing certificate of the latest time-stamp.

The life-time of the protection can be further extended beyond the life-of the last time-stamp applied by adding further DSS information to validate the previous last time-stamp along with a new time-stamp. This process is described in chapter How to Create a PAdES Signature.

Other PAdES Requirements

Certain other PAdES requirements, such as requirements on the PKCS#7 CMS, cannot be validated using Adobe Acrobat. For this, use the 3-Heights™ PDF Security API for validation.

5.8 Error Handling

Most methods of the 3-Heights™ PDF to PDF/A Converter API can either succeed or fail depending on user input, state of the PDF to PDF/A Converter API, or the state of the underlying system. It is important to detect and handle these errors, to get accurate information about the nature and source of the issue at hand.

Methods communicate their level of success or failure using their return value. Which return values have to be interpreted as failures is documented in the chapter Reference Manual. To identify the error on a programmatic level, check the property `ErrorCode`. The property `ErrorMessage` provides a human readable error message, describing the error.

Example:

```
public Boolean convert(string file, string password, string outfile, string logfile)
{
  using (Pdf2Pdf converter = new Pdf2Pdf())
  {
    [...]
    if (!converter.Convert(file, password, outfile, logfile))
    {
      if (converter.ErrorCode == PDFErrorCode.PDF_E_PASSWORD)
      {
        password = InputBox.Show("Password incorrect. Enter correct password:");
        return convert(file, password, outfile, logfile);
      }
      else if (converter.ErrorCode == PDFErrorCode.PDF_E_CONVERSION)
      {
        return MessageBox.Show(
          "Please check output file for critical differences.",
          "Conversion errors occurred.",
          MessageBoxButtons.YesNo
        ) == DialogResult.Yes;
      }
      else
      {
        MessageBox.Show(String.Format(
          "Failed to convert file: {0}", converter.ErrorMessage));
        return false;
      }
    }
    [...]
  }
}
```

6 Reference Manual

This chapter lists all available methods and properties of the 3-Heights™ PDF to PDF/A Converter API. The API provides four interfaces: C, Java, .NET and COM. The following documentation is based on the COM interface. The use of the other interfaces and the names of the functions in these interfaces correspond to the COM interface.

6.1 Pdf2Pdf Interface

6.1.1 AddAssociatedFile

Method: `Boolean AddAssociatedFile(String FileName, String Name, Integer Associate, String AFRelationship, String MimeType, String Description, DATE ModDate)`

Method: `Boolean AddAssociatedFileMem(Variant MemBlock, String Name, Integer Associate, String AFRelationship, String MimeType, String Description, DATE ModDate)`

Add a file to the document's embedded files in `Convert`. For PDF/A-3, the embedded file is associated with an object of the document, i.e. it is an associated file.

This method must be called before `Convert`. The file is embedded as-is. Embedding files is not allowed for PDF/A-1 and restricted to PDF/A compliant files for PDF/A-2.

Parameters:

`FileName` `[String]` The path (or URL) to the file to be embedded.

`MemBlock` `[Variant]` The memory buffer containing the file to embed.

`Name` `[String]` The name used for the embedded file. This name is presented to the user when viewing the list of embedded files. Default: `FileName` with the path removed.

`Associate` `[Integer]` The object to associate the embedded file with. `-1` for none, `0` for document, number greater than `0` for respective page. The default is `0` for PDF/A-3 and `-1` otherwise.

`AFRelationship` `[String]` (Default: `"Unspecified"`) The relationship of the embedded file to the object associate. (Ignored, if `Associate` is `-1`.) Allowed values are `"Source"`, `"Data"`, `"Alternative"`, `"Supplement"` and `"Unspecified"`.

`MimeType` `[String]` (Default: `"application/octet-stream"`) Mime-type of the embedded file. Common values other than the default are `"application/pdf"`, `"application/xml"` or `"application/msword"`.

`Description` `[String]` (Default: `""`) A description of the embedded file. This is presented to the user when viewing the list of embedded files.

`ModDate` `[DATE]` The modify date of the file. Default: The modify date of the file on the file system or current time, if not available.

Returns:

`True` The file was embedded successfully.

`False` Otherwise.

6.1.2 `AddEmbeddedFile`

Method: `Boolean AddEmbeddedFile(String FileName, String Name)`

This is a simplified call that is equal to `AddAssociatedFile` with default arguments. This is for convenience, for example when embedding files in a PDF/A-2 conforming document. When embedding files in PDF/A-3, use `AddAssociatedFile`.

6.1.3 `AddFontDirectory`

Method: `Boolean AddFontDirectory(String Directory)`

Fonts must be embedded in order to create a valid PDF/A. If the input file contains a font which is not embedded, the font directory is searched for a font with the same name. If such a font is found, the font is embedded. This method can be used to add (multiple) font directories to the search path for fonts.

Parameter:

`Directory` `[String]` The path to the font directory that is to be added to the search path.

Returns:

`True` The font directory was added successfully.

`False` Otherwise.

If no valid font directory is added, the default font directories are used.

See chapter Fonts for more information on the font directories and font handling of the 3-Heights™ PDF to PDF/A Converter API in general.

6.1.4 `AddSignature`

Method: `Boolean AddSignature(PdfSignature pSignature)`

Add a digital signature to the document. The signature is defined using a `PdfSignature` object. This method must be called prior to `Convert`. Do not dispose of the `PdfSignature` object until the associated document has been converted.

More information on applying digital signatures can be found in Chapter How to Create Electronic Signatures.

Parameter:

pSignature [PdfSignature] The digital signature that is to be added. The properties of the signature must be set before it is added.

Returns:

True Successfully added the signature to the document.

> **Note:** At this point it is not verified whether the certificate is valid or not. If an invalid certificate is provided the Convert function will fail later on.

False Otherwise.

6.1.5 AddZUGFeRDXml

Method: Boolean AddZUGFeRDXml(String FileName)

Method: Boolean AddZUGFeRDXmlMem(Variant MemBlock)

Add a ZUGFeRD XML invoice file. Note that this requires the compliance to be set to PDF/A-3. The ZUGFeRD Standard stipulates the invoice's name to be ZUGFeRD-invoice.xml, so it is always embedded using that name regardless of the name of the input file.

If the specified ZUGFeRD XML invoice file cannot be added during conversion, it is aborted with an error PDF_E_ZUGFERDXML.

Returns:

True The file was found.

False Otherwise.

6.1.6 AllowDowngrade

Property (get, set): Boolean AllowDowngrade
Default: False

If set to True, automatic downgrade of the PDF/A compliance level is allowed, e.g. from PDF/A-1a to PDF/A-1b.

If this property is set to True, the level is downgraded under the following conditions:

- Downgrade to level B: If a file contains text that is not extractable (i.e. missing ToUnicode information). Example: Downgrade PDF/A-2u to PDF/A-2b.
- Downgrade to level U (PDF/A-2 and PDF/A-3) or B (PDF/A-1): Level A requires logical structure information and "tagging" information, so if a file contains no such information, its level is downgraded.

Logical structure information in a PDF defines the structure of content, such as titles, paragraphs, figures, reading order, tables or articles. Logical structure elements can be "tagged" with descriptions or alternative text. "Tagging" allows the contents of an image to be described to the visually impaired.
It is not possible for the 3-Heights™ PDF to PDF/A Converter API to add meaningful tagging information. Adding tagging information without prior knowledge about the input file's structure and content is neither possible nor allowed by the PDF/A standard. For that reason, the compliance level is automatically downgraded to level B or U.
Example: Downgrade PDF/A-1a to PDF/A-1b.

If set to False and an input file cannot be converted to the requested standard, e.g. because of missing "tagging" information, the conversion is aborted and the ErrorCode set to PDF_E_DOWNGRADE.

6.1.7 AllowUpgrade

Property (get, set): Boolean AllowUpgrade
Default: False

If set to True, automatic upgrade of the PDF/A version is allowed. If the target standard is PDF/A-1 and a file contains elements that cannot be converted to PDF/A-1, the target standard is upgraded to PDF/A-2. This avoids significant visual differences in the output file.

For example, the following elements may lead to an automatic upgrade:

- Transpanrecy
- Optional content groups (OCG, layers)
- Real values that exceed the implementation limit of PDF/A-1
- Embedded OpenType font files
- Predefined CMap encodings in Type0 fonts

If set to False, the compliance is not upgraded. Depending on the value of the ConversionErrorMask the conversion this will fail with a conversion error PDF_E_CONVERSION.

6.1.8 AnalyzeOnly

Property (get, set): Boolean AnalyzeOnly
Default: False

When set to true, the method Convert analyzes the input file only, it does not create an output file. The results of the analysis are written to the corresponding log file. If Convert returns True, the file is compliant. If issues are found, False is returned and the ErrorCode is set to PDF_E_CONFORMANCE.

The analysis is similar to the analysis using the 3-Heights™ PDF Validator. However, the 3-Heights™ PDF to PDF/A Converter API is more strict in certain issues, especially concerning those corner cases of the PDF/A ISO Standard in which a conversion is strongly advised.

6.1.9 BeginSession

Method: Boolean BeginSession(String Provider)

The methods `BeginSession` and `EndSession` support bulk digital signing by keeping the session to the security device (HSM, Token or Cryptographic Provider) open. See the Section Guidelines for Mass Signing for more guidelines.

For backwards compatibility the use of these methods is optional. If used, the Provider property may not be set. If omitted, an individual session to the provider indicated by the property `Provider` is used for each signature operation.

Parameter:

`Provider` `[String]` See property `Provider`.

Returns:

`True` Session started successfully.

`False` Otherwise.

6.1.10 ColorSpaceProfile

Property (get, set): `String ColorSpaceProfile`
Default: `"%SystemRoot%\System32\spool\drivers\color\USWebCoatedSWOP.icc"` (Windows only)

This property is used to set and get ICC color profile file names. ICC profiles can be set prior to `Convert` and read after `Convert`.

Setting ICC profiles makes the converter substitute device color spaces with ICC based color spaces. At most three ICC profiles can be set, as substitutes for DeviceRGB, DeviceCMYK, and DeviceGray respectively. To set several ICC profiles, set this property several times. The matching device color space to be substituted is selected automatically. Note that it is not necessary to set ICC profiles for a successful conversion, see section Color Spaces.

When getting this property, only one ICC profile file name can be queried: If the output intent is set to an RGB profile (a CMYK profile) then the file name of any set CMYK profile (RGB profile respectively) results. Otherwise any set CMYK or RGB profile results with CMYK taking precedence.

If a required color space profile is not available, a default color space is generated.

C and Java interfaces only: If the provided path is not a valid profile, the method fails.

6.1.11 Compliance

Property (get, set): `TPDFCompliance Compliance`
Default: `ePDFA2b`

This property sets or gets the compliance level of the output PDF. Supported values for the enumeration `TPDFCompliance` are:

- `ePDFA1a`
- `ePDFA1b`
- `ePDFA2a`
- `ePDFA2b`

- ePDFA2u
- ePDFA3a
- ePDFA3b
- ePDFA3u

Other listed entries (e.g. ePDF10, ePDF11, ...ePDF17, ePDFUnk) are not supported as output compliance level by the 3-Heights™ PDF to PDF/A Converter API.

Some files cannot be converted to the compliance requested. The 3-Heights™ PDF to PDF/A Converter API can detect this and up- (AllowUpgrade) or downgrade (AllowDowngrade) the compliance automatically.

6.1.12 ConversionErrors

Property (get): Long ConversionErrors

Get conversion error events that occurred during conversion. This property should be queried after Convert or ConvertMem returned False and the property ErrorCode is set to PDF_E_CONVERSION.

See enumeration TPDFConversionError for a list of supported conversion error events.

6.1.13 ConversionErrorMask

Property (get, set): TPDFConversionError ConversionErrorMask
Default: ePDFConversionErrorVisualDiff + ePDFConversionErrorOCGRemoved + ePDFConversionErrorTranspRemoved + ePDFConversionErrorEFRemoved + ePDFConversionErrorXMPRemoved + ePDFConversionErrorCorrupt

Define which conversion operations shall result in a conversion error, i.e. Convert or ConvertMem return False and the property ErrorCode is set to PDF_E_CONVERSION. In the case of a conversion error, use the property ConversionErrors to retrieve the actual conversion error events that occurred during the conversion.

See enumeration TPDFConversionError for a list of supported conversion error events. In order to accept all conversion errors, set ConversionErrorMask to ePDFConversionErrorNone.

6.1.14 Convert

Method: Boolean Convert(String InputFileName, String Password, String OutputFileName, String LogFileName)

Open a PDF document from file, convert it to PDF/A and save the output document to a file.

An overview of the conversion process is provided in section Process Description.

Parameters:

InputFileName [String] The file name and optionally the file path, drive or server string according to the operating systems file name specification rules of the input file.

Password [String] (optional) The user or the owner password of the encrypted PDF document. If this parameter is left out an empty string is used as a default.

`OutputFileName` `[String]` The file name and optionally the file path, drive or server string according to the operating systems file name specification rules of the output file.

`LogFileName` `[String]` The file name and optionally the file path, drive or server string according to the operating systems file name specification rules of the log file.

Returns:

`True` If the function was executed successfully, i.e. could read and convert the input file.

`False` If no valid output document is written. Check `ErrorCode` and `ErrorMessage` to get the cause of the problem. Possible causes are:

- License is not set or invalid
- Input file does not exist
- Input file is protected by a user password and the provided password is incorrect
- Output file is not writable, e.g. locked
- Conversion was stopped
- The input file is not a PDF file or contains unrendered XFA fields.
- The post analysis detected an error.
- A conversion error occurred.

6.1.15 ConvertAlways

Property (get, set): `Boolean ConvertAlways`
Default: `False`

Setting the property `ConvertAlways` to true forces the conversion even if the input file already conforms to the requested standard.

6.1.16 ConvertMem

Method: `Boolean ConvertMem(Variant vin, String Password, Variant vout, Variant vlog)`

Open a PDF document from memory, convert it to PDF/A and write the output document to a byte array.

Parameters:

`vin` `[Variant]` A byte array containing the input PDF document.

`Password` `[String]` (optional) The user or the owner password of the encrypted PDF document. If this parameter is left out an empty string is used as a default.

`vout` `[Variant]` A byte array to which the output PDF/A document is written.

`vlog` `[Variant]` A byte array to which the log is written.

Returns:

Same as method Convert.

6.1.17 EmbedT1asCFF

Property (get, set): `Boolean EmbedT1asCFF`
Default: `False`

Convert Type1 (PostScript) fonts to Compact Font Format before embedding. This reduces the file size. This affects the embedding of fonts only, existing Type1 fonts of the input document will not be converted.

6.1.18 EndSession

Method: `Boolean EndSession()`

Ends the open session to the security device.

See BeginSession.

6.1.19 ErrorCode

Property (get): `TPDFErrorCode ErrorCode`

This property can be accessed to receive the latest error code. This value should only be read if a function call on the PDF to PDF/A Converter API has returned a value, which signales a failure of the function (see chapter Error Handling) . See also enumeration TPDFErrorCode. PDF-Tools error codes are listed in the header file `bseerror.h`. Please note that only few of them are relevant for the 3-Heights™ PDF to PDF/A Converter API.

6.1.20 ErrorMessage

Property (get): `String ErrorMessage`

Return the error message text associated with the last error (see property ErrorCode). This message can be used to inform the user about the error that has occurred. For correct usage, see chapter Error Handling.

Note: The property is `Nothing` if no message is available.

6.1.21 ExportText

Method: `Boolean ExportText(String FileName)`

Export the retrieved OCR text to a file. This function can only be used in combination with an OCR engine (see method SetOCREngine). When an OCR engine is set, the OCR text is always embedded in the resulting PDF document. If this method is used, it is in addition also extracted to a file.

The output format is a table, where rows are separated by a new line and columns are separated by a tabulator.

The table contains the following columns:

Columns	Description
Page	Page number
Image	PDF object number which contains the image
FontSize	Font size in points
FontName	Font name, for any barcode font the name is "Barcode". This value is only set if the font name is returned by the OCR engine.
FontFamily	**1** Serif **2** SansSerif **3** Monospaced This value is only set if provided by the OCR engine.
FontStyles	**1** Barcode **2** Bold **4** Italic **8** Underline **16** Strikeout This value is only set if provided by the OCR engine. Example: 6 = 2 + 4 = Bold + Italic
Baseline	Baseline of the text
Left, Top, Right, Bottom	Bounding box of the text in PDF coordinates
String	Recognized text

6.1.22 FlattenSignatures

Property (get, set): `Boolean FlattenSignatures`
Default: `False`

Remove all signed signature fields and add their appearances to the page's content. Note that the signatures themselves (the cryptographic parts) are removed and hence the bit `ePDFConversionErrorDocSigned` of the conversion error is set regardless of the value of the `FlattenSignatures` property.

Processing the PDF with 3-Heights™ PDF to PDF/A Converter API breaks existing signatures and their cryptographic parts need to be removed. In general, the visual appearances of signatures are regarded as worthless without the cryptographic part and are therefore removed by default as well. The visual appearances can be preserved by setting this property FlattenSignatures to True.

6.1.23 GetOCRPluginCount

Method: `Integer GetOCRPluginCount()`

OCR engines are accessed through the corresponding OCR interface DLLs. At present the following OCR engines are supported:

Abbyy FineReader 11 OCR Engine This engine is accessed by the OCR interface DLL `pdfocrpluginAbbyy11.ocr`.

Abbyy FineReader 10 OCR Engine This engine is accessed by the OCR interface DLL `pdfocrpluginAbbyy10.ocr`.

3-Heights™ OCR Service This service is accessed by the OCR interface DLL `pdfocrpluginService.ocr`. The service accesses the Abbyy FineReader 10 or 11 OCR Engine.

The OCR interface DLL is provided by the 3-Heights™ PDF to PDF/A Converter API.

The OCR engine is provided as a separate product: 3-Heights™ OCR Enterprise Add-On.

In order to make use of the OCR engine, the OCR interface DLL and the OCR engine must be installed. The property GetOCRPluginCount returns the number of available OCR interface DLLs. It does not verify the corresponding OCR engines are installed and can be initialized. The OCR engine is loaded with the method SetOCREngine.

Returns:

The number of available OCR engines (i.e. their corresponding OCR interface DLLs).

6.1.24 GetOCRPluginName

Method: `String GetOCRPluginName(Integer iOCREngine)`

An OCR engine is accessed through an OCR plug-in. Each plug-in corresponds to one OCR engine. The number of OCR plug-ins is retrieved using GetOCRPluginCount. The method call `GetOCRPluginName(n)` returns the name of the nth OCR Engine which corresponds to that OCR plug-in. At present there are three OCR engines available: `"abbyy11"`, `"abbyy10"` and `"service"`.

Parameter:

iOCREngine `[Integer]` The number of the OCR engine. The total number of engines is retrieved using GetOCRPluginCount.

Returns:

The name of the nth OCR engine. Nothing if it does not exist.

6.1.25 ImageQuality

Property (get, set): `Integer ImageQuality`
Default: `80`

Set or get the image quality index for images that use a prohibited lossy compression type and must be recompressed.

Supported values are `1` to `100`. A higher value means better visual quality at the cost of a larger file size. Recommended values range from `70` to `90`.

Example:

JPX (JPEG2000) is not allowed in PDF/A-1. If a PDF contains a JPX compressed image, its compression type must be altered. Thus the 3-Heights™ PDF to PDF/A Converter API converts it to an image with JPEG compression using the image quality defined by this property.

6.1.26 InfoEntry

Method: `String InfoEntry(String Key)`

Retrieve or add a key-value pair to the document info dictionary. Values of predefined keys are also stored in the XMP metadata package.

Popular entries specified in the PDF Reference 1.7 and accepted by most PDF viewers are `"Title"`, `"Author"`, `"Subject"`, `"Creator"` (sometimes referred to as Application) and `"Producer"` (sometimes referred to as PDF Creator).

Parameter:

`Key` `[String]` A key as string.

Returns:

The value as string.

Note: Note that the getter does not return values of the input document but merely those that have previously been set using `InfoEntry`.

Examples in Visual Basic 6:

Set the document title.

```
conv.InfoEntry("Title") = "My Title"
```

Set the creation date to 13:55:33, April 5, 2010, UTC+2.

```
conv.InfoEntry("CreationDate") = "D:20100405135533 + 02'00'"
```

6.1.27 LicenseIsValid

Property (get): `Boolean LicenseIsValid`

Check if the license is valid.

6.1.28 Linearize

Property (get, set): `Boolean Linearize`
Default: `False`

Get or set whether to linearize the PDF output file, i.e. optimize file for fast web access.

A linearized document has a slightly larger file size than a non-linearized file and provides the following main features:

- When a document is opened in a PDF viewer of a web browser, the first page can be viewed without downloading the entire PDF file. In contrast, a non-linearized PDF file must be downloaded completely before the first page can be displayed.
- When another page is requested by the user, that page is displayed as quickly as possible and incrementally as data arrives, without downloading the entire PDF file.

The above applies only if the PDF viewer supports fast viewing of linearized PDFs.

The 3-Heights™ PDF to PDF/A Converter API cannot linearize signed files. So this property must be set to `False` if a digital signature is applied.

When enabling this option, then no PDF objects will be stored in object streams in the output PDF. For certain input documents this can lead to a significant increase of file size.

6.1.29 NoCache

Property (get, set): `Boolean NoCache`
Default: `False`

Get or set whether to disable the cache for CRL and OCSP responses.

Using the cache is safe, since the responses are cached as long as they are valid only. The option affects both signature creation and validation.

See section on Caching of CRLs, OCSP, and Time-stamp Reponses for more information on the caches.

6.1.30 OCRBitonalRecognition

Property (get, set): `Boolean OCRBitonalRecognition`
Default: `False`

Specify whether the images should be converted to bi-tonal (black and white) before OCR recognition.

Enabling this feature can improve the memory consumption of the OCR process.

Enabling this feature automatically re-embeds the original images in the output document. The setting of the property `OCRReembedImages` is therefore ignored.

6.1.31 OCRDeskewImage

Property (get, set): `Boolean OCRDeskewImage`
Default: `False`

Correct the skew angle of images.

This option set to `True` has only an effect if the required information is provided by the OCR engine, which depends on the type and settings of the engine.

This option set to `True` might change the appearance of the page and is only recommended for simple scanned documents that consist of a single image.

Using the option for digital-born documents may destroy the page layout.

6.1.32 OCREmbedBarcodes

Property (get, set): `Boolean OCREmbedBarcodes`
Default: `False`

This property specifies whether the recognized barcodes are embedded in the XMP metadata.

6.1.33 OCRReembedImages

Property (get, set): `Boolean OCRReembedImages`
Default: `False`

This option set to `True` currently requires the `OCRDeskewImage` to be also set to `True`.

The OCR engine de-skews and de-noises the input image before recognizing the characters. This option controls whether the 3-Heights™ PDF to PDF/A Converter API should use the preprocessed image or keep the original image.

Setting this option to `True` has only an effect if the preprocessed image is provided by the OCR engine, which depends on the type and settings of the engine.

If this option is set to `True`, the resulting image may have a different color space, compression and size.

Since this option currently requires `OCRDeskewImage`, it is recommended only for simple scanned documents.

6.1.34 OCRMode

Property (get, set): `Integer OCRMode`
Default: `1`

Specify behavior of the converter for files with existing OCR text. Available OCR modes are the following:

OCR mode	Description
1	Only perform OCR for images without existing OCR text (default).
2	If OCR engine is active, remove old OCR text and perform OCR for all images. Hence, existing OCR text is not removed, if OCR engine is not active.
3	Always remove old OCR text and, if OCR engine is active, perform OCR for all images. This can be used to strip existing, without adding new OCR text.
4	Only perform OCR if the input file contains no text.

6.1.35 OCRResolutionDPI

Property (get, set): `Single OCRResolutionDPI`
Default: `300`

Resample images to target resolution before they are sent to the OCR engine. The default is `300` DPI, which is the preferred resolution for most OCR engines.

6.1.36 OCRRotatePage

Property (get, set): `Boolean OCRRotatePage`
Default: `False`

This property specifies whether the page is rotated according to the recognized image rotation.

6.1.37 OCRThresholdDPI

Property (get, set): `Single OCRThresholdDPI`
Default: `400`

Only images with a higher resolution than the threshold are re-sampled before OCR. The default is `400` DPI. If set to `-1`, no re-sampling is applied.

6.1.38 OutputIntentProfile

Property (get, set): `String OutputIntentProfile`
Default: `"%SystemRoot%\System32\spool\drivers\color\USWebCoatedSWOP.icc"`
(Windows only)

Set or get the path to the ICC profile for the output intent. This property can be set prior to `Convert` and can be read after `Convert`. See section Color Spaces for the usage of the output intent.

If an invalid path is provided, `Convert` fails and writes a corresponding message to the log file.

The given profile is embedded only if the input file does not contain a PDF/A output intent already.

If during conversion an output intent was set automatically, then the path for this profile can be queried after conversion by getting this property.

C and Java interface only: If the provided path is not a valid profile, the method fails.

6.1.39 PostAnalyze

Property (get, set): `Boolean PostAnalyze`
Default: `True`

Analyze the created PDF output file and verify if it meets the specified compliance level. The result of this analysis is written to the log file. If the post analysis detects an error, `Convert` returns `False` and the `ErrorCode` is `PDF_E_POSTANALYSIS`.

The post analysis is executed only if an output file was created and the conversion was successful. The property PostAnalysis is ignored if the property `AnalyzeOnly` is true.

The post analysis can detect errors in the created output file that could not be predicted based on the analysis of the input file nor could they be detected during the conversion, because the conversion also depends on the input parameters (such as ICC profiles).

The post-analysis is equal to the analysis using the 3-Heights™ PDF Validator and validating against PDF/A.

6.1.40 ProductVersion

Property (get): `String ProductVersion`

Get the version of the 3-Heights™ PDF to PDF/A Converter API in the format "A.C.D.E".

6.1.41 RemoveSignature

[Deprecated] **Property (get, set):** `Boolean RemoveSignature`
Default: `True`

This property is deprecated, instead use `ePDFConversionErrorDocSigned`, see `ConversionErrorMask`.

6.1.42 ReportDetails

Property (get, set): `Boolean ReportDetails`
Default: `False`

Write a detailed list of errors and warnings from the analysis of the input file as well as the post-analysis of the output file to the log file.

Setting this property to true, the conversion step lists all violations per page. Each violation is listed with a page number (page `0` = document level), error number, a description and a counter of how many times the error occurs. The option provides more detailed information than ReportSummary. All errors are listed in the header file `bseerror.h`.

Examples of possible errors:

```
0, 0x80410604, "The key Metadata is required but missing.", 1
0, 0x80410604, "The key MarkInfo is required but missing.", 1
1, 0x00418704, "The font Arial-BoldMT must be embedded.", 1
1, 0x83410612, "The document does not conform to the requested standard.", 1
```

6.1.43 ReportSummary

Property (get, set): `Boolean ReportSummary`
Default: `False`

Write a summary of errors and warnings from the analysis of the input file as well as the post-analysis of the output file to the log file. If any of the following violations is detected at least once, it is reported (once). This report provides less detailed information than the detailed list per page provided by `ReportDetails`.

- The file format (header, trailer, objects, xref, streams) is corrupted.
- The document doesn't conform to the PDF reference (missing required entries, wrong value types, etc.).
- The file is encrypted and the password was not provided.
- The document contains device-specific color spaces.
- The document contains illegal rendering hints (unknown intents, interpolation, transfer and halftone functions)
- The document contains alternate information (images).
- The document contains embedded PostScript code.
- The document contains references to external content (reference XObjects, file attachments, OPI).
- The document contains fonts without embedded font programs or encoding information (CMAPs).
- The document contains fonts without appropriate character to Unicode mapping information (ToUnicode maps).
- The document contains transparency.
- The document contains unknown annotation types.
- The document contains multimedia annotations (sound, movies).
- The document contains hidden, invisible, non-viewable or non-printable annotations.
- The document contains annotations or form fields with ambiguous or without appropriate appearances.
- The document contains actions types other than for navigation (launch, JavaScript, ResetForm, etc.).
- The document's meta data is either missing or inconsistent or corrupt.
- The document doesn't provide appropriate logical structure information.
- The document contains optional content (layers).

6.1.44 SetLicenseKey

Method: `Boolean SetLicenseKey(String LicenseKey)`

Set the license key.

6.1.45 SetMetadata

Method: `Boolean SetMetadata(String FileName)`

Set the document's XMP metadata. The XMP metadata is inserted as is, which means it is not parsed and validated. If no XMP metadata is provided, the 3-Heights™ PDF to PDF/A Converter API generates it automatically.

Parameter:

`FileName [String]` The file name and optionally the file path, drive or server string according to the operating systems file name specification rules of the file containing the XMP metadata.

Returns:

`True` The XMP metadata file was set successfully.

`False` Otherwise.

6.1.46 SetOCREngine

Method: `Boolean SetOCREngine(String Engine)`

This method requires the 3-Heights™ OCR Add-On, which is a separate product, to be installed. See also documentation for the 3-Heights™ OCR Add-On.

Set the OCR engine that is used when OCR information shall be added during the conversion. If the engine's name is set to an empty string, OCR is not applied.

Parameter:

`Engine [String]` The name of the OCR engine (e.g. `"abbyy11"`). For every available OCR engine, there is a corresponding OCR interface DLL. The OCR interface DLLs (e.g. `pdfocrAbbyy11.ocr`) are distributed with the 3-Heights™ PDF to PDF/A Converter API and are required to communicate with the OCR engine. The names of all available OCR engines can be retrieved using the properties `GetOCRPluginCount` and `GetOCRPluginName`.

Returns:

`True` The OCR interface DLL was found, the OCR engine was found and the OCR engine was successfully initialized.

`False` Otherwise.

6.1.47 SetOCRLanguages

Method: `Boolean SetOCRLanguages(String Languages)`

This method requires the 3-Heights™ OCR Add-On, which is a separate product, to be installed. See also documentation for the 3-Heights™ OCR Add-On.

Setting languages helps the OCR engine to minimize errors by means of using dictionaries of the defined languages.

This method must be called after `SetOCREngine`.

If `SetOCRParams` is used, `SetOCRLanguages` must be called after `SetOCRParams`.

Parameter:

`Languages [String]` A string of one or multiple, comma-separated languages. The supported names depend on the OCR engine. The OCR engine will only use dictionaries of the set languages.

Returns:

`True` The language(s) were successfully set.

`False` Otherwise.

Example:

```
SetOCREngine("abbyy11")
SetOCRLanguages("English, German")
```

6.1.48 SetOCRParams

Method: `Boolean SetOCRParams(String Params)`

This method requires the 3-Heights™ OCR Add-On, which is a separate product, to be installed. See also documentation for the 3-Heights™ OCR Add-On.

By means of this method, OCR engine specific settings can be applied in the form of key-value pairs. These pairs depend on the OCR engine and are described in the corresponding manual.

Parameter:

`Params [String]` A list of comma-separated key value pairs. See example.

Returns:

`True` The OCR parameters were successfully set.

`False` Otherwise.

Example: Set a predefined profile for Abbyy 11.

```
SetOCREngine("abbyy11")
SetOCRParams("PredefinedProfile = DocumentArchiving_Accuracy")
```

6.1.49 SetSessionProperty

Method: `Boolean SetSessionPropertyString(String Name, String Value)`

Method: `Boolean SetSessionPropertyBytes(String Name, Variant Value)`

Provider-specific session configuration.

Properties have to be set before calling `BeginSession` and are deleted when calling `EndSession`.

Parameters:

`Name` `[String]` The name of the property. The names that are supported are specific to the provider used with `BeginSession`.

`Value` `[String]` The value of the property as string.

`Value` `[Variant]` The value of the property as byte array.

6.1.50 SetToUnicodeFile

Method: `Void SetToUnicodeFile(String FileName)`

Update the fonts' Unicodes as specified by file. The file must contain the mapping of character codes to Unicodes for specific fonts.

> **Note:** Note that the code to Unicode mapping depends on the exact font used, its version as well as the way it is embedded into the PDF. All of these parameters, including the name of the embedded font, can freely be chosen by the application that creates a PDF.
> One cannot assume that a mapping that is correct for one file is also correct for another. Therefore, the same ToUnicode mapping file can only be applied to files originating from the exact same process.

Example: The following file `unicodes.ini` maps the character code 262 to the ligature "fi" with the Unicode U+FB01.

```
[AppliedSansPro-Light]
262=0xFB01
```

A possible method to determine the ToUnicode mapping file is the following:

1. The conversion must be performed with `ReportDetails` set to `True`.
2. The Pre-Analysis will contain messages regarding missing Unicodes:

```
"input.pdf", 1, 38, 0x00418623, "The Unicode for cid 262 is unknown.", 1
```

This message indicates the cid (character code), the object number (in 3rd column) indicates the font, e.g. in this example cid 262 of font object 38.

3. The text of `input.pdf` can be extracted using the `pdtxt`, which is part of the product 3-Heights™ PDF Extract Shell:

   ```
   pdtxt -u -h -oo -o text.txt input.pdf
   ```

4. In `text.txt` it can be seen, that the name of the font with object number 38 is "ORCNOP+AppliedSansPro-Light":

   ```
   1,161,596,127,"ORCNOP+AppliedSansPro-Light",7.0,38,22,"the Asia-Paci•c Region"
   ```

   For the mapping in `unicodes.ini`, the subset prefix (six characters followed by "+") must be removed, which produces "AppliedSansPro-Light".

5. `text.txt` must be searched for text of the font "ORCNOP+AppliedSansPro-Light" that could not successfully be extracted, e.g. "Paci•c". It could be assumed, that cid 262 corresponds to the missing character "ﬁ", which corresponds the Unicode `U+FB01`.
6. The missing Unicode must be added to `unicodes.ini` and the conversion performed again. The text extracted from the converted file should now be correct. Otherwise above assumption was wrong and must be changed.
7. These steps must be repeated until all text can be extracted successfully and no more post-analysis errors occur.

6.1.51 SubsetFonts

Property (get, set): `Boolean SubsetFonts`
Default: `True`

By default, fonts that are embedded are automatically subset to minimize the file size. If for any reason, e.g. post-processing, fonts shall not be subset, set the property `SubsetFonts` to `False`. Whether fonts are subset or not is irrelevant with respect to the compliance with PDF/A. (Relevant is only that all used glyphs are contained in the font program.)

If this property is set to `False`, embedded fonts, that are subsetted, are replaced with non-subsetted fonts from the local system. This can lead to visual differences, if the system font does not match the embedded. Therefore setting `SubsetFonts` to `False` is not recommended, unless it can be guaranteed that all fonts match.

6.1.52 Terminate

Method: `Void Terminate()`

Terminate all open sessions, and finalize and unload all PKCS#11 drivers. Some drivers require Terminate to be called. Otherwise, your application might crash and/or your HSM, USB token or smart card might not be unlocked.

When using the C/C++ API, `Terminate` may not be called from the context of the destructor of a global or static object, an atexit() handler, nor the DllMain() entry point.

Make sure to end all open sessions and dispose of all Pdf2Pdf objects before calling `Terminate`. After calling `Terminate`, the process may not call any other methods of this class.

6.1.53 TestSession

Method: `Boolean TestSession()`

Test if the current session is still alive.

Returns:

`True` Subsequent calls to `Convert` and `ConvertMem` are likely to succeed.

`False` Subsequent calls to `Convert` and `ConvertMem` are unlikely to succeed. Error codes are the same as in `Convert` where applicable.

6.2 PdfSignature Interface

This interface allows creating a signature and setting its position and appearance. The visual part of the signature consists of two (multi-line) texts. The string of both texts are generated automatically based on the signature properties if not set manually.

6.2.1 ContactInfo

Property (get, set): `String ContactInfo`
Default: `""`

Add a descriptive text as signer contact info, e.g. a phone number. This enables a recipient to contact the signer to verify the signature. This is not required in order to create a valid signature.

If this property is set to an empty string, no entry is created.

6.2.2 EmbedRevocationInfo

Property (get, set): `Boolean EmbedRevocationInfo`
Default: `True`

Embed revocation information such as online certificate status response (OCSP - RFC 2560) and certificate revocation lists (CRL - RFC 3280).

Revocation information of a certificate is provided by a validation service at the time of signing and acts as proof that at the time of signing the certificate is valid. This is useful because even when the certificates expires or is revoked at a later time, the signature in the signed document remains valid.

Embedding revocation information is optional but suggested when applying advanced or qualified electronic signatures. Use this property for signatures of type `adbe.pkcs7.detached` (see `SubFilter`).

Revocation information is embedded for the signing certificate and all certificates of its trust chain. This implies that both OCSP responses and CRLs can be present in the same message. The downsides of embedding revocation information are the increase of the file size (normally by around 20 KB) and that it requires a web request to a validation service, which delays the process of signing. For mass signing it is suggested to use the caching mechanism, see chapter Caching of CRLs, OCSP, and Time-stamp Reponses.

Embedding revocation information requires an online connection to the CA that issues them. The firewall must be configured accordingly. In case a web proxy after `Convert` is `SIG_CREA_E_OCSP`.

6.2.3 `FillColor`

Property (get, set): `Long FillColor`
Default: `16761024 (red = 192, green = 192, blue = 255)`

This property represents the color of the signature's background as an RGB value.

In order to not set a color, i.e. keep the rectangle transparent, set the FillColor to `-1`. This is particularly useful in combination with adding an image to the signature.

6.2.4 `FontName1`

Property (get, set): `String FontName1`
Default: `"Arial"`

This property defines the font used in upper text, i.e. the text that is set by the property `Text1`. The font can either be specified as a path to the font file, e.g. `"C:\Windows\Fonts\arial.ttf"`, or as a font name, such as `"Times New Roman,Bold"`. When using a font name, the corresponding font must be present in one of the font directories described in chapter Fonts.

6.2.5 `FontName2`

Property (get, set): `String FontName2`
Default: `FontName1`

This property represents the path to the font name used in lower text, i.e. the text that is set by the property `Text2`. The property works analogously to `FontName1`.

6.2.6 `Font1Mem`

Property (set): `Variant Font1Mem`

Set the font used in upper text (see `FontName1`) by passing the font as a memory buffer.

6.2.7 `Font2Mem`

Property (set): `Variant Font2Mem`

Set the font used in lower text (see FontName2) by passing the font as a memory buffer.

6.2.8 FontSize1

Property (get, set): `Single FontSize1`
Default: `16`

Define the font size of the Text1.

6.2.9 FontSize2

Property (get, set): `Single FontSize2`
Default: `8`

Define the font size of the Text2.

6.2.10 ImageFileName

Property (get, set): `String ImageFileName`
Default: `""`

Define the path to an image file that is to be added to the signature. The image is centered and scaled down proportionally to fit into the given rectangle. If the path is `Nothing`, or the image does not exist, the appearance's background is a filled rectangle using the colors FillColor and StrokeColor.

If you want the appearance to contain the image only and no text, set the property Text2 to a space `" "`.

6.2.11 Issuer

Property (get, set): `String Issuer`
Default: `""`

Set the issuer of the certificate. The `"Issuer"` corresponds to the common name (CN) of the issuer. In the Windows' certificate store this corresponds to `"Issued by"`.

This property can be used to select the signer certificate for signing (see description of Cryptographic Provider).

6.2.12 LineWidth

Property (get, set): `Single LineWidth`
Default: `2`

This is the thickness of the line surrounding the visual appearance of the signature.

6.2.13 Location

Property (get, set): `String Location`
Default: `""`

This is the physical location where the signature was added, for example `"Zurich, Switzerland"`.

If this property is set to an empty string, no entry is created.

6.2.14 Name

Property (get, set): `String Name`
Default: `""`

In order to sign a PDF document, a valid, existing certificate name must be provided.

The “Name” corresponds to the common name (CN) of the subject.

In the Windows’ certificate store this corresponds to “Issued to”.

When using a Windows OS, the certificate must be available in the Windows certificate store. See also chapter Digital Signatures.

This property can be used to select the signer certificate for signing (see description of Cryptographic Provider in use).

6.2.15 PageNo

Property (get, set): `Long PageNo`
Default: `-1` (last page)

The numbers are counted starting from `1` for the first page.

6.2.16 Provider

Property (get, set): `String Provider`
Default: `(Windows only) "Microsoft Base Cryptographic Provider v1.0"`

This property specifies the cryptographic provider used to create and verify signatures.

For more information on the different providers available, see the description in the respective subsection of the section Cryptographic Provider.

- When using the Windows Cryptographic Provider, the value of this property is to be set to a string with the following syntax:

```
"[ProviderType:]Provider[;PIN]"
```

If the name of the provider is omitted, the default provider is used.

Example: "123456" being the pin code:

```
Provider = "Microsoft Base Cryptographic Provider v1.0;123456"
```

```
Provider = ";123456"
```

- When using the PKCS#11 Provider, the value of this property is to be set to a string with the following syntax:

```
"PathToDll;SloId;Pin"
```

Example:

```
Provider = "\WINDOWS\system32\siecap11.dll;4;123456"
```

- When using any of the service providers, such as the Swisscom All-in signing service, the value of this property is essentially the url of the service endpoint:

```
"http[s]://server.servicedomain.com:8080/url"
```

6.2.17 Reason

Property (get, set): `String Reason`
Default: `""`

Set or get the descriptive text for why the digital signature was added. It is not required in order to create a valid signature.

If this property is set to an empty string, no entry is created.

6.2.18 Rect

Property (get, set): `Variant Rect`
Default: `[0, 0, 0, 0]`

Set or get the position and size of the digital signature annotation. The default is an invisible signature.

The position is defined by the four values for the lower-left (x1, y1) and upper-right (x2, y2) corner of the rectangle. The units are PDF points (1 point = 1/72 inch, A4 = 595 x 842 points, Letter = 612 x 792 points) measured from the lower left corner of the page. If either the width or height is zero or negative, an invisible signature is created, i.e. no visible appearance is created for the signature. To create a signature in the lower left corner set the rectangle to `[10, 10, 210, 60]`.

Hint about using this property in programming language that do not support the type `Variant`: In order to find out what type you should use, create a `PdfSignature` object and look at the default value of the property in the debugger.

6.2.19 SerialNumber

Property (get, set): `String SerialNumber`

The serial number with the issuer can be used to select a certificate for signing.

This property is a hex string as displayed by the “Serial number” field in the Microsoft Management Console (MMC), e.g. `"49 cf 7d d1 6c a9"`.

This property can be used to select the signer certificate for signing (see description of Cryptographic Provider in use).

6.2.20 SignerFingerprint

Property (get, set): `Variant SignerFingerprint`

The sha1 fingerprint of the signer certificate. This property can be used to select the signer certificate for signing (see description of Cryptographic Provider). After validating a signature, this property contains the validated signature’s fingerprint.

6.2.21 SignerFingerprintStr

Property (get, set): `String SignerFingerprintStr`

The hex string representation of the signer certificate’s sha1 fingerprint. This property can be used to select the signer certificate for signing (see description of Cryptographic Provider).

All characters outside the ranges 0-9, a-f and A-F are ignored. In the Microsoft Management Console, the “Thumbprint” value can be used without conversion, if the “Thumbprint algorithm” is “sha1”. E.g. `b5 e4 5c 98 5a 7e 05 ff f4 c6 a3 45 13 48 0b c6 9d e4 5d f5`.

6.2.22 Store

Property (get, set): `String Store`
Default: `"MY"`

For the Windows Cryptographic Provider this defines the certificate store from where the signing certificate should be taken. This depends on the OS. The default is `MY`. Other supported values are: `CA` or `ROOT`.

6.2.23 StoreLocation

Property (get, set): `Integer StoreLocation`
Default: `1`

For the Windows Cryptographic Provider this defines the location of the certificate store from where the signing certificate should be taken. Supported are:

0 Local Machine

1 Current User (default)

For more information, see the detailed description of the Windows Cryptographic Provider.

6.2.24 StrokeColor

Property (get, set): `Long StrokeColor`
Default: `8405056 (red = 64, green = 64, blue = 128)`

This is the color of the signature's border line as an RGB value.

In order to not set a color, i.e. keep it transparent, set the `StrokeColor` to `-1`.

6.2.25 SubFilter

Property (get, set): `String SubFilter`

Indicates the encoding of the signature. This value can be set when creating new signatures with `AddSignature`. The following are common `SubFilter` values:

`adbe.pkcs7.detached` (PDF 1.6) Legacy PAdES (ETSI TS 103 172) signature used for document signatures (`AddSignature`).

`ETSI.CAdES.detached` (PDF 2.0) PAdES signature as specified by new European norm ETSI EN 319 142. This type is used for document signatures (`AddSignature`). See chapter How to Create a PAdES Signature for more information.

6.2.26 Text1

Property (get, set): `String Text1`
Default: `""`

This is the upper text that is added to the signature.

If this property is set to blank, the signature name is added to the upper text line of the visual signature.

In order to position text use the following syntax: `<tab><x>,<y><delimiter><text>`

‹tab›	tabulator
‹x›, ‹y›	integers
‹delimiter›	Single character such as space
‹text›	Any text string not containing a ‹tab›

Example: for Visual Basic .NET

```
Dim sig As New Pdf2PdfAPI.Signature
...
sig.Text1 = Microsoft.VisualBasic.vbTab & "5,50 Peter Pan"
sig.Text2 = Microsoft.VisualBasic.vbTab & "15,25 Signed this document"
```

6.2.27 Text2

Property (get, set): `String Text2`
Default: `""`

This is the lower text that is added to the signature. The text can be multi-lined by using linefeed ('\n', 0xA).

If this property is set to blank, a text three-line text is constructed that consists of:

- A statement who applied to signature
- The reason of the signature
- The date

See also property `Text1`. If you want the appearance to not contain any text, set this property to a space `" "`.

6.2.28 TimeStampCredentials

Property (get, set): `String TimeStampCredentials`
Default: `""`

If a time-stamp server requires authentication, use this property to provide the credentials. Credentials commonly have the syntax `"username:password"`.

6.2.29 TimeStampURL

Property (get, set): `String TimeStampURL`
Default: `""`

The URL of the trusted Time-stamp authority (TSA) from which a Time-stamp shall be acquired. This setting is suggested to be used when applying a Qualified Electronic Signature. Example: `"tsu.my-timeserver.org"`. Applying a Time-stamp requires an online connection to a time server; the firewall must be configured accordingly. In case a web proxy is used, it must be ensured the following MIME types are supported:

```
application/timestamp-query
application/timestamp-reply
```

If an invalid Time-stamp server address is provided or no connection can be made to the time server, the return code of Convert is false, and the property ErrorCode is set to SIG_CREA_E_TSP.

6.3 Enumerations

Note: Depending on the interface, enumerations may have "TPDF" as prefix (COM, C) or "PDF" as prefix (.NET) or no prefix at all (Java).

6.3.1 TPDFCompliance

TPDFCompliance Table

TPDFCompliance	
ePDFA1a	PDF/A 1a, ISO 19005-1, Level A compliance
ePDFA1b	PDF/A 1b, ISO 19005-1, Level B compliance
ePDFA2a	PDF/A 2a, ISO 19005-2, Level A compliance
ePDFA2b	PDF/A 2b, ISO 19005-2, Level B compliance
ePDFA2u	PDF/A 2u, ISO 19005-2, Level U compliance
ePDFA3a	PDF/A 3a, ISO 19005-3, Level A compliance
ePDFA3b	PDF/A 3b, ISO 19005-3, Level B compliance
ePDFA3u	PDF/A 3u, ISO 19005-3, Level U compliance

Note that only the values listed above are supported.

6.3.2 TPDFConversionError

TPDFConversionError

TPDFConversion Error	Description
ePDFConversionErrorNone	None
ePDFConversionErrorVisualDiff	Visual differences in output file.

TPDFConversionError

ePDFConversionErrorColorants	Resolve name collisions of colorants (PDF/A-2 and PDF/A-3 only).
ePDFConversionErrorOCGRemoved	Remove optional content groups (layers) (PDF/A-1 only).
ePDFConversionErrorTranspRemoved	Remove transparency (PDF/A-1 only).
ePDFConversionErrorEFRemoved	Remove embedded files.
ePDFConversionErrorXMPRemoved	Remove non convertible XMP metadata.
ePDFConversionErrorDocSigned	Conversion of signed document forced removal of signatures. The conversion of a file to PDF/A invalidates all signatures of the input file. For that reason, all signatures are removed and this conversion event is set. Optionally the visual appearances of the signatures can be preserved by setting the property FlattenSignatures to true.
ePDFConversionErrorCorrupt	The input document is corrupt and should be repaired. The errors encountered are printed to the log file. Some errors can be repaired, but it is crucial to review the output file and perform the post analysis.
ePDFConversionErrorFontSubst	Failed to find the same font for embedding, so a similar substitution font was used.
ePDFConversionErrorActionRemoved	Remove interactive elements such as actions or annotations.
ePDFConversionErrorStructureRemoved	Remove logical structure information.

6.3.3 TPDFErrorCode

All TPDFErrorCode enumerations start with a prefix, such as PDF_, followed by a single letter which is one of S, E, W or I, an underscore and a descriptive text.

The single letter gives an indication of the severity of the error. These are: Success, Error, Warning and Information. In general, an error is returned if an operation could not be completed, e.g. no valid output file was created. A warning is returned if the operation was completed, but problems occurred in the process.

A list of all error codes is available in the C API's header file bseerror.h, the javadoc documentation of com.pdftools.NativeLibrary.ERRORCODE and the .NET documentation of Pdftools.Pdf.PDFErrorCode. Note that only a few are relevant for the 3-Heights™ PDF to PDF/A Converter API, most of which are listed here:

TPDFErrorCode Table

TPDFErrorCode	Description
PDF_S_SUCCESS	The operation was completed successfully.
LIC_E_NOTSET, LIC_E_NOTFOUND, ...	Various license management related errors.
PDF_E_FILEOPEN	Failed to open the file.
PDF_E_FILECREATE	Failed to create the file.
PDF_E_PASSWORD	The authentication failed due to a wrong password.
PDF_E_UNKSECHANDLER	The file uses a proprietary security handler, e.g. for a proprietary digital rights management (DRM) system.
PDF_E_XFANEEDSRENDERING	The file contains unrendered XFA form fields, i.e. the file is an XFA and not a PDF file. The XFA (XML Forms Architecture) specification is referenced as an external document to ISO 32’000-1 (PDF 1.7) and has not yet been standardized by ISO. Technically spoken, an XFA form is included as a resource in a shell PDF. The PDF’s page content is generated dynamically from the XFA data, which is a complex, non-standardized process. For this reason, XFA is forbidden by the ISO Standards ISO 19’005-2 (PDF/A-2) and ISO 32’000-2 (PDF 2.0) and newer.
SIG_CREA_E_SESSION	Cannot create a session (or CSP).
SIG_CREA_E_STORE	Cannot open certificate store.
SIG_CREA_E_CERT	Certificate not found in store.
SIG_CREA_E_INVCERT	The signing certificate is invalid.
SIG_CREA_E_OCSP	Couldn’t get response from OCSP server.
SIG_CREA_E_CRL	Couldn’t get response from CRL server.
SIG_CREA_E_TSP	Couldn’t get response from time-stamp server.
SIG_CREA_E_PRIVKEY	Private key not available. This is usually because a pin is required and was not entered correctly. Also, this error might be returned because there is no private key available for the signing certificate or the key is no properly associated with the certificate. Finally, this error could be the result of choosing a message digest algorithm or signing algorithm which is not supported by the provider. See section Cryptographic Provider for more information.

TPDFErrorCode Table

SIG_CREA_E_SERVER	Server error.
SIG_CREA_E_ALGO	The cryptographic provider does not implement a required algorithm. See section Cryptographic Provider for more information.
SIG_CREA_E_FAILURE	Another failure occurred.
PDF_E_SIGLENGTH	Incorrect signature length. A PDF is signed in a two-step process. First, the output document is created with space reserved for the signature. Second, the actual cryptographic signature is created and written into the space reserved. If the space reserved is too small for the actual signature this error is returned. In general this error should not occur. If it does, the next signing attempt should be successful.
PDF_E_SIGABG	Unable to open signature background image.
PDF_E_CONFORMANCE	The document does not conform to the requested standard (pre analysis).
PDF_E_CONVERSION	Critical conversion errors occurred during conversion. For more information see section Conversion Errors.
PDF_E_POSTANALYSIS	Output file is not conformant (post analysis). For more information see section Post Analysis.
PDF_E_STOPPED	Cannot convert input file due to compliance problems. The input file is probably corrupt.
PDF_E_LINEARIZATION	Linearization error occurred.
PDF_E_ZUGFERDXML	Failed to add ZUGFeRD invoice file. E.g. because the file is not a valid ZUGFeRD XML invoice or the compliance is not set to PDF/A-3.
PDF_E_INVCOMPLIANCE	Invalid or unsupported compliance. Either the property `Compliance` has been set to an invalid value or the compliance of the input file is not supported.
PDF_E_OCR	Aborted conversion because of an ocr error.
PDF_E_MISSINGFONT	Unable to convert file to PDF/A because a font that must be embedded is not available in the font directories. See chapter Fonts for more information on resolving this issue.
PDF_E_NOPAGES	Input file contains no pages.
PDF_E_COLLECTION	Unable to convert file to PDF/A-1, because it is a collection (also called PDF Portfolio). Also see property `AllowUpgrade`.
PDF_E_DOWNGRADE	Input file cannot be converted to meet required compliance level. See property `AllowDowngrade`.

7 Log File

All steps in the diagram from chapter Process Description can write to the log file. There are three types of messages in the log file: `Warnings/Information`, `Errors` and `Reports`.

7.1 Warnings and Information

Describe the current process step. They do not inhibit the conversion. Prefix: `-`

Example:

```
- Opening file input.pdf
- Setting font directory to C:\WINNT\Fonts
- Analyzing input.pdf
- Conformance level A has been downgraded to level B
```

7.2 Errors

Inhibit a successful conversion. Prefix: `*`

Example:

```
* Cannot open file input.pdf.
Input file 001.pdf isn't convertible.
```

7.3 Reports

Reports are only created if the corresponding option (Details or Summary) is selected. In detailed reports, each violation is listed with a page number (page 0 = document level), error number, a description and a counter of how many times the error occurs. In a summary report, violations that are detected at least once are reported once. Prefix: none.

Example: Details

```
0, 0x80410604, "The key Metadata is required but missing.", 1
2, 0x00418704, "The font Verdana must be embedded.", 1
2, 0x83410614, "The document contains device-specific color spaces
                (Annotation C or IC).", 1
```

Example: Summary

```
The document contains fonts without embedded font programs or encoding
information (CMAPs).
The document's meta data is either missing or inconsistent or corrupt.
The document doesn't provide appropriate logical structure information.
```

8 Version History

Some of the documented changes below may be preceded by a marker that specifies the interface technologies the change applies to. E.g. [C, Java] applies to the C and the Java interface.

8.1 Changes in Version 4.10

- Improved conversion of transparent objects to PDF/A-1. E.g. filled paths that are transparent are converted to outlines in order to not cover underlying content when the transparency attribute is removed.
- Improved conversion of numbers that are larger than the implementation limit of PDF/A-1.
- Improved conversion of logical structure information (PDF/A level A).
- Lock OCGs (layers) that need to be added to user interface (PDF/A-2 and PDF/A-3).
- Digital Signatures
  - **New** support for the new European PAdES norm (ETSI EN 319 142). See chapter "How to Create a PAdES Signature" in the user manual for more information.
  - **New** support for the GlobalSign Digital Signing Service as cryptographic provider to create signatures and time-stamps.
  - **New** signature algorithm RSA with SSA-PSS (PKCS#1v2.1) can be chosen by setting the provider session property `SigAlgo`.
- **New** conversion event `ePDFConversionErrorStructureRemoved` (65536) when logical structure information is removed.
- Writing PDF objects into object streams is now supported. Most objects that are contained in object streams in the input document are now also stored in object streams in the output document. When enabling linearization, however, no objects are stored in object streams.
- Increased robustness against corrupt input PDF documents.
- Improved annotation appearance generation for polyline, squiggly, and stamp annotations.
- The font `ZapfDingbats.ttf` is not required anymore and has been removed from the product kit.
- [C] **Clarified** Error handling of `TPdfStreamDescriptor` functions.

Interface `Pdf2Pdf`

No functional changes.

Interface `PdfSignature`

- **New** property `SubFilter` to set signature format, e.g. for new European PAdES norm.

8.2 Changes in Version 4.9

- Various new conversion features, e.g. improved conversion of TrueType font programs, ICC color profiles, or creation of annotation appearances.
- Supports bold font simulation if only non-bold font is available in installed font directories.
- The pre-analysis is now more strict, especially in certain corner cases of the PDF/A ISO Standard for which a conversion is strongly advised.
- Improved conversion of .notdef character for PDF/A-2 and PDF/A-3.
- **New** generate conversion event `ePDFConversionErrorVisualDiff` (4):

    - When text in input file is ambiguous.
    - When XFA (XML Forms Architecture) form data is removed.
    - When visual appearance of annotation cannot be created.
- Improved support for and robustness against corrupt input PDF documents.
- Improved repair of embedded font programs that are corrupt.
- Support OpenType font collections in installed font collection.
- Improved metadata generation for standard PDF properties.
- [C] **Changed** return value `pfGetLength` of `TPDFStreamDescriptor` to `pos_t`[15].
- [PHP] **New** Interface for Windows and Linux. Supported versions are PHP 5.6 & 7.0 (Non Thread Safe). The `Pdf2PdfAPI` PHP Interface is contained in the 3-Heights™ PDF Tools PHP5.6 Extension and the 3-Heights™ PDF Tools PHP7.0 Extension.

8.3 Changes in Version 4.8

- Various new conversion features, e.g. improved conversion of corrupt data such as fonts, text, or form XObjects.
- **New** conversion event `ePDFConversionErrorActionRemoved` (32768) when interactive elements such as actions or annotations are removed.
- **New** bold font simulation used when substituting bold with non-bold font.
- The creation of annotation appearances has been optimized to use less memory and processing time.
- Added repair functionality for TrueType font programs whose glyphs are not ordered correctly.

Interface `Pdf2Pdf`

- [.NET, C, COM, Java] **Changed** method `ConvertMem` which now also returns the output file in case of `PDF_E_CONVERSION` and `PDF_E_POSTANALYSIS`.
- [.NET, C, COM, Java] **New** property `ProductVersion` to identify the product version.
- [.NET] **Deprecated** method `GetLicenseIsValid`.
- [.NET] **New** property `LicenseIsValid`.

[15] This has no effect on neither the .NET, Java, nor COM API

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