User Manual

3-Heights™ PDF to PDF/A Converter Shell

Version 4.3

PDF-TOOLS.COM
Premium PDF Technology

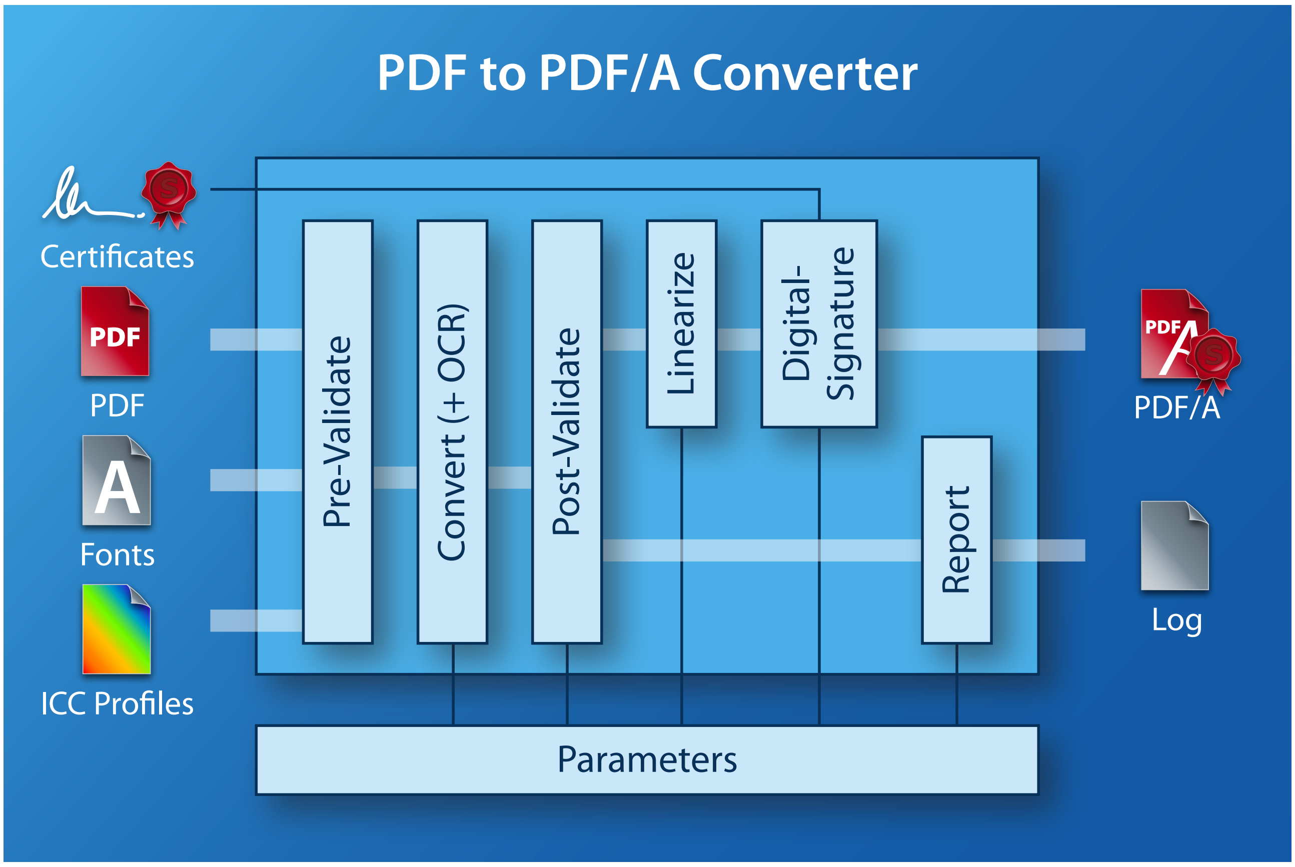
Contents

1 Introduction

1.1 Description

The 3-Heights™ PDF to PDF/A Converter Shell 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 Shell accepts files from many different applications and automatically converts them into PDF/A. The level of conformity can be set to Level A or Level 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.

Features

- Conversion (PDF/A-1, PDF/A-2, PDF/A-3)
- Selectable level of conformity
- Embedding ICC color profiles for device-dependent color spaces
- Replace and subset fonts

- Validation
- File analysis and repair
- Conversion reporting
- Digital signatures, PDF/A-compliant
- Configure the virtual appearance of the signature (page, size, color, position, text, background image, etc.)
- Write the application log in a log file or in the event log of the operating system (with Windows Service)
- Enforce conversion even if the file is unconvertible
- Metadata management
- Read encrypted input files
- Encryption with access authorizations (not for PDF/A)
- Linearization (fast web display)
- JBIG2 compression
- JPEG2000 compression
- Conversion of embedded and attached files (PDF/A-2 and later)
- Colorants management (PDF/A-2 and later)
- OCR (optional)
- List OCR plug-Ins
- Set the OCR language
- Add embedded files (PDF/A-2) and associated files (PDF/A-3)
- Embedded XML invoice data conforming to the ZUGFeRD specification (PDF/A-3).

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

Compliance

- Standards: ISO 19005-1 (PDF/A-1), ISO 19005-2 (PDF/A-2), ISO 19005-3 (PDF/A-3), ISO 32000 (PDF 1.7), PAdES Part 2
- Quality assurance: Isartor test suite

1.3 Operating Systems

- Windows 2000, XP, Vista, 7, - 32 and 64 bit
- Windows Server 2003, 2008, 2008-R2 - 32 and 64 bit
- FreeBSD 4.7 for Intel
- HP-UX 11.0 - 32 bit and Itanium
- IBM AIX (4.3: 32 Bit, 5.1: 64 bit)
- Linux (SuSE and Red Hat on Intel)
- Mac OS X
- Sun Solaris (2.7 and higher)

2 Installation

2.1 Windows

The retail version of the 3-Heights™ PDF to PDF/A Converter Shell comes as a ZIP archive containing various files including runtime binary executable code, files required for the developer, documentation and license terms.

1. Download the ZIP archive of the product from your download account at www.pdf-tools.com.
2. Unzip the file using a tool like WinZip available from WinZip Computing, Inc. at http://www.winzip.com to a directory on your hard disk where your program files reside (e.g. *C:\program files\pdf-tools*).
3. Check the appropriate option to preserve file paths (folder names). The unzip process now creates the following subdirectories:

bin:	Contains the runtime executable binary code.
bin\fonts:	Contains two required standard fonts and the font mapping file.
bin\icc:	Contains the two color profiles “USWebCoatedSWOP.icc” and “sRGB Color Space Profile.icm”.
doc:	Contains documentation files.

   For Windows there is the option download the software as MSI file, which makes the installation easier.
4. To easily use the 3-Heights™ PDF to PDF/A Converter Shell from a shell, the directory needs to be included in the “Path” environment variable.
5. Make sure your platform meets the requirements regarding color spaces and fonts described in chapters Color Profiles and Fonts respectively.

How to set the Environment Variable “Path”

To set the environment variable “Path” on Windows 2000, go to Start ->Settings ->Control Panel ->System ->Advanced ->Environment Variables

Windows XP, go to Start ->Control Panel (classic view) ->System ->Advanced ->Environment Variables.

Select “Path” and Edit, then add the directory where *pdf2pdf.exe* is located to the “Path”. If the environment variable “Path” does not exist, create it.

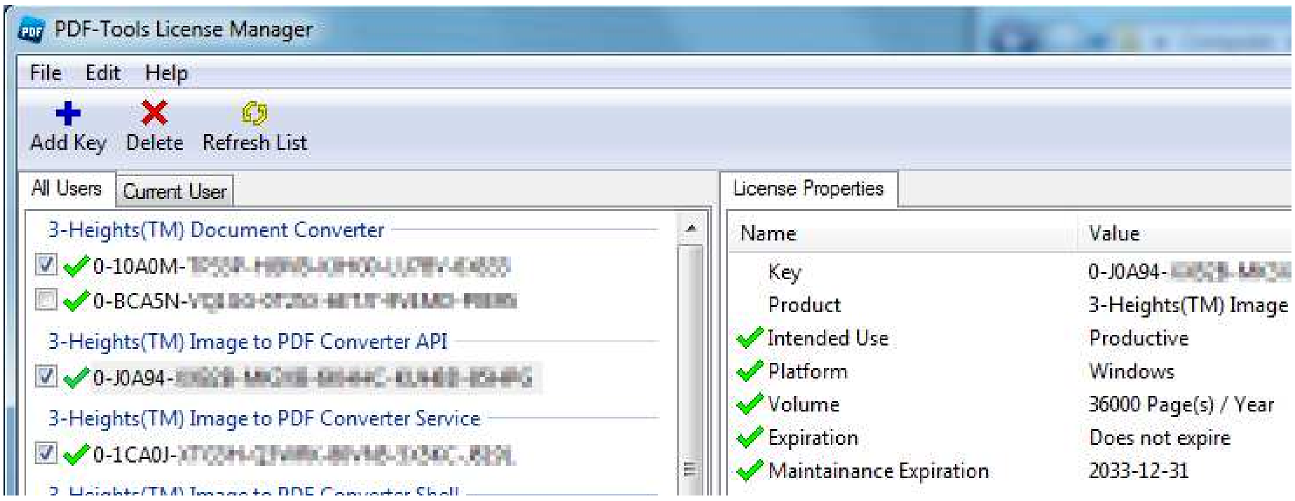
3 License Management

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 runtime via the switch `-lk`. This is the preferred solution for OEM scenarios.

3.1 Graphical License Manager Tool

The GUI tool *LicenseManager.exe* is located in the *bin* directory of the product kit.



3-Heights(TM) Document Converter
- ☑ ✓ 0-10A0M-[redacted]
- ☐ ✓ 0-BCA5N-[redacted]

3-Heights(TM) Image to PDF Converter API
- ☑ ✓ 0-J0A94-[redacted]

3-Heights(TM) Image to PDF Converter Service
- ☑ ✓ 0-1CA0J-[redacted]

3-Heights(TM) Image to PDF Converter Shell

Name	Value
Key	0-J0A94-[redacted]
Product	3-Heights(TM) Image
✓ Intended Use	Productive
✓ Platform	Windows
✓ Volume	36000 Page(s) / Year
✓ Expiration	Does not expire
✓ Maintainance Expiration	2033-12-31

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.

Select between different license keys for a single product

More than one license key can be installed for a specific product. The checkbox on the left side in the license list marks the currently active license key.

3.2 Command Line License Manager Tool

The command line license manager tool `licmgr` is available in the bin directory for all platforms except Windows.

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
```

Add and delete license keys

Install new license key:

```
licmgr store X-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

Delete old license key:

```
licmgr delete X-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

Select between different license keys for a single product

```
licmgr select X-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

3.3 License Key Storage

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

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)

Mac OS X

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)

Unix/Linux

The license keys are stored in the file system:

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

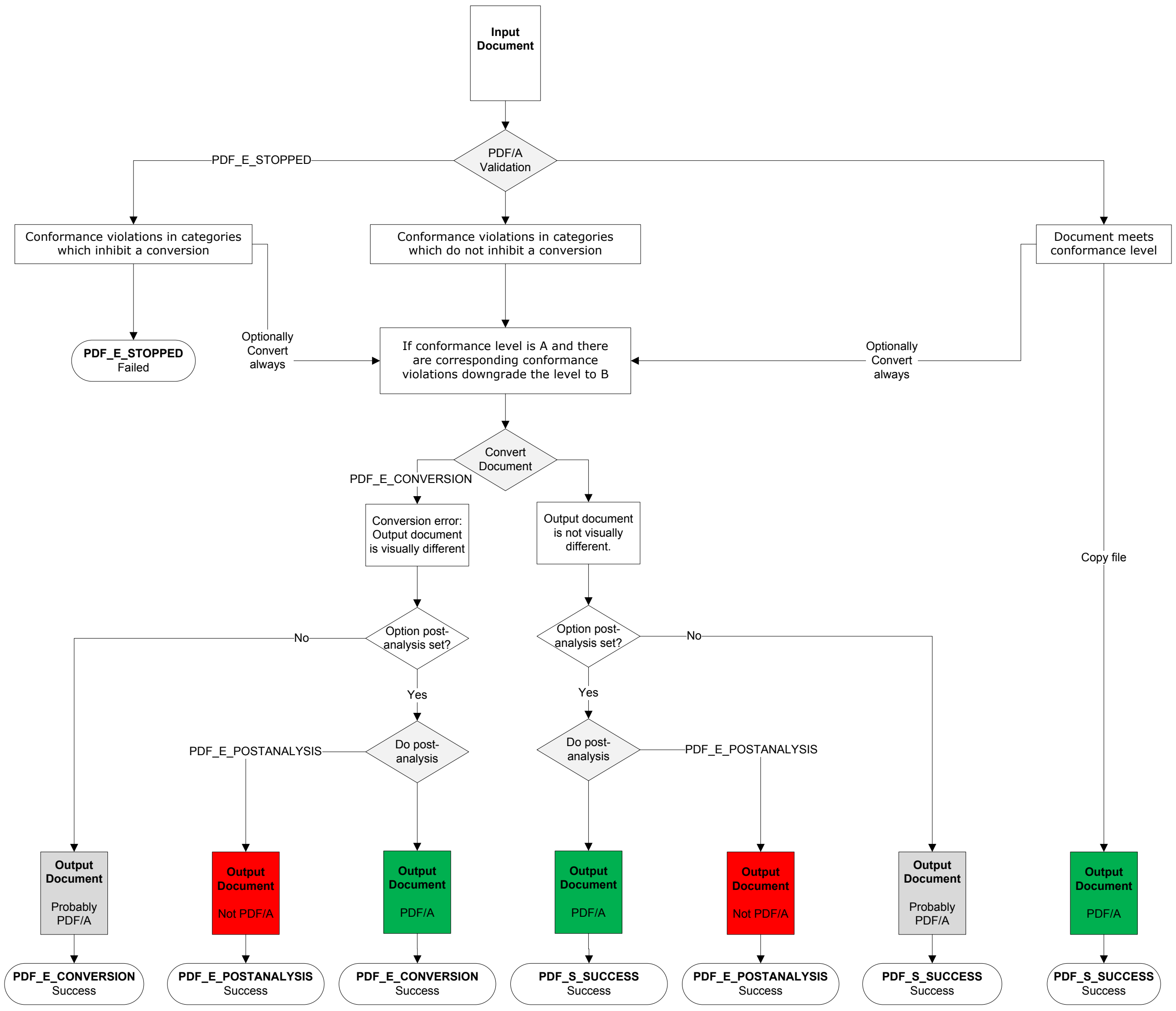
Note: The user, group and permissions of those directories are set explicitly by the license manager tool. It may be necessary to change permissions to make the licenses readable for all users. Example:

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

4 User's Guide

4.1 Process Description

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


Input Document
PDF/A Validation
PDF_E_STOPPED
Conformance violations in categories which inhibit a conversion
Conformance violations in categories which do not inhibit a conversion
Document meets conformance level
PDF_E_STOPPED Failed
Optionally Convert always
If conformance level is A and there are corresponding conformance violations downgrade the level to B
Optionally Convert always
Convert Document
PDF_E_CONVERSION
Conversion error: Output document is visually different
Output document is not visually different.
Copy file
Option post-analysis set?
No
Option post-analysis set?
No
Yes
Yes
PDF_E_POSTANALYSIS
Do post-analysis
Do post-analysis
PDF_E_POSTANALYSIS
Output Document Probably PDF/A
Output Document Not PDF/A
Output Document PDF/A
Output Document PDF/A
Output Document Not PDF/A
Output Document Probably PDF/A
Output Document PDF/A
PDF_E_CONVERSION Success
PDF_E_POSTANALYSIS Success
PDF_E_CONVERSION Success
PDF_S_SUCCESS Success
PDF_E_POSTANALYSIS Success
PDF_S_SUCCESS Success
PDF_S_SUCCESS Success

1. The license is checked.
2. The input document is analyzed. If the document is already compliant to the requested standard it is copied. If the required standard cannot be met, but a lower standard can, the target standard is downgraded, e.g. from PDF/A-1a to PDF/A-1b. If it contains non-convertible elements the conversion is stopped. If convert-always is enabled, the conversion is always executed.
3. The actual conversion is applied. A failure indicates a case where no output file is created. Possible causes of that are: input file does not exist, output file cannot be written, conversion was aborted.
   Success indicates a correct execution of the function. However it does not imply there were no problems during the process. Conversion or other errors can be retrieved after the conversion (API: property Error-Code, Shell: return value, Service: log)
4. If the conversion process detects elements which may result in an information loss by the conversion (e.g. transparency in the content or not convertible metadata), a conversion error is raised. The conformance of the resulting output document is unrelated to conversion errors.
5. If Post-Analysis is enabled, the resulting PDF document is validated. If the resulting document does not meet the requested standard a post-analysis error is raised.

The above graphic includes PDF/A related errors only. Errors with digital signatures are not reflected in this workflow chart.

4.2 Conversion Steps

The goal of the conversion is to create a PDF/A document which is conforming to the international standard ISO19005-1.

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
- 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. It is also possible the output file looks visually different from the input file due to the forced conversion.

Conversion Errors

A conversion error means the input document contains an element that does not exist in PDF/A, i.e. can only be converted in a way that the result may have visual or other differences. However the resulting document is PDF/A compliant. The following issues result in a conversion error, depending on the setting of the property ConversionErrorMask:

- Optional content removed
- FFilter or FDecodeParms removed
- 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

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.

Post Analysis

The converted file is validated against the selected compliance level. If a document raises conversion errors, but the post analysis reports no violations, the output may have visual differences compared to the input, but it is PDF/A compliant. If a document raises no conversion errors, and the post analysis reports no violations, the conversion was successful.

4.3 What is PDF/A?

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.

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.

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)

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

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 conformance 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.

For additional information about PDF/A please visit: http://www.pdf-tools.com/pdf/pdfa-longterm-archiving-iso-19005-pdf.aspx.

4.4 Color Spaces

Colors in PDF

The PDF format supports a range of color spaces:

- *Device Color Spaces: DeviceGray, DeviceRGB, 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, profiles can be found here:

- www.pdf-tools.com/public/downloads/resources/colorprofiles.zip
- www.color.org/srgbprofiles.html
- www.adobe.com/support/downloads/iccprofiles/icc_eula_win_dist.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 Shell 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[1] 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*.

4.5 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 your font directories. The default font directories are listed in the documentation to the method AddFontDirectory.

It is important that the font directories contain all fonts that are used for the input files. In particular, the fonts ZapfDingbats and Symbol are widely used in PDF, but not available on most systems. Therefore, the product kit includes these fonts, which should be added to a font directory.

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`

Font Configuration File fonts.ini

The font configuration file 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 the main DLL or executable 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`

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

fonts.ini uses the ini file format and has two sections. The section “fonts” is ignored by the PDF to PDF/A Converter, 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 PDF to PDF/A Converter. 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 or glyphs that are not available in the replacement font. Embedding another font might also have legal consequences.

Example:

```
[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.

4.6 Digital Signatures

Overview

Digital signature is a large and slightly complex topic. This manual gives a brief, general overview about digital signatures and describes how the 3-Heights™ PDF to PDF/A Converter Shell is used to apply them. It does however not describe all the details that are involved when it comes to for example meet the prerequisites for applying a Qualified Electronic Signature.

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.

Table: 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
QES	Qualified Electronic Signature
TSA	Time Stamp Authority
TSP	Time Stamp Protocol

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

Digitally signing a document requires a certificate. How to view and access a certificate is described in the chapter Certificates.

The digital signature consists of two parts:

- A signature type related part: This part consists of the required objects for the selected signature, which vary 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 completely created by the 3-Heights™ PDF to PDF/A Converter Shell.
- A cryptographic part: A digital signature computes a hash value based on 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.

The 3-Heights™ PDF to PDF/A Converter Shell 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 signature can be applied. A signed document can be modified and saved by incremental update. 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; it must be the first in the document. Other document signatures may be present. Remark: Object digests (PDF 1.5) are no longer supported by Adobe.
- *Document Time Stamp Signature*: Establish the exact content of the file at the time indicated by the time stamp. One or more document time stamp signatures can be applied. A signed document can be modified and saved by incremental update.

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 country. 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. It is distinguished between three types of electronic signatures:

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

Applying Simple Electronic Signatures is supported since version 1.9.13.1 (Oct 2009). Applying advanced and Qualified Electronic Signatures is supported since version 1.91.6.0 (Mar 2010). All applied digital signatures are PDF/A compliant.

Simple Electronic Signature

A simple electronic signature requires any certificate that is intended to 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 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 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 hard token (USB stick, smart card).
- Only one signature can be applied at a time. This means for every signature it is required to enter the PIN code.
- It requires an online query of the status of the used certificate (OCSP/CRL). The response (valid, revoked, etc.) must be embedded in the signature.
- The certificate It may require a time stamp (TSP) that is acquired from a trusted time server (TSA).

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.
- Legal processes that require a QES are supported.

Note that a time stamp can be added to any type of signature. OCSP/CRL responses are also available for advanced certificates.

Selecting a Certificate for Signing

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

1. Certificate fingerprint
   - SHA1 fingerprint of the certificate. This is an array of 20 bytes.
2. Issuer and SerialNumber
   - Certificate Issuer (e.g. “QV Schweiz CA”), in Windows Certificate Store this is called “Issued By”
   - SerialNumber 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. Name and optionally 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”

Steps to Create an Advanced or Qualified Electronic Signature

1. Identify if an advanced or qualified signature is required. For most automated process an advanced signature suits best.
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. Besides the private key, the certificate contains the information for the OCSP Server, Authority Information Access [2].
3. Access a trusted time server (TSA) using the protocol HTTP (e.g. using the format: server.domain.com or server.domain.com:80/tsa) to acquire a time stamp (TSP).
4. In case the certificate resides on a USB token or a Smart Card, the required drives (e.g. CardOSAPI) need to be installed.
5. Apply the signature by providing the following information:
   - Values for signature selection as described in the section Possibilities to Select a Certificate for Signing.
   - Optional: Time Stamp URL (e.g. “server.mydomain.com:80/tsa”)
   - Optional: Time Stamp Credentials (e.g. username:password)
   - Optional: Embed OCSP Responses (default: true)
   - Optional: Cryptographic Provider (default: Microsoft Crypt API)
   - Optional: Certificate Store (e.g. “MY” (default), ROOT, CA, etc.)
   - Optional: Certificate Store Location (e.g. 0 (default), 0: Current User, 1: Local System)

Example: How to Create a simple Electronic Signature

In order to digitally sign a PDF document with the 3-Heights™ PDF to PDF/A Converter Shell, a certificate is required. What a certificate is and how they can be listed on a Windows system is described in the chapter Certificates.

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

1. Provide the certificate name (Subject)
2. Apply settings for the signature, such as the reason text, or the visual appearance (color, position, etc).
3. Process the PDF document by a user which has access to the selected certificate and thereby add the signature

The certificate name is provided with the switch -cn, the reason with the switch -cr. A sample command looks like this:

```
-cn "Philip Renggli"
-cr "I reviewed the document"
```

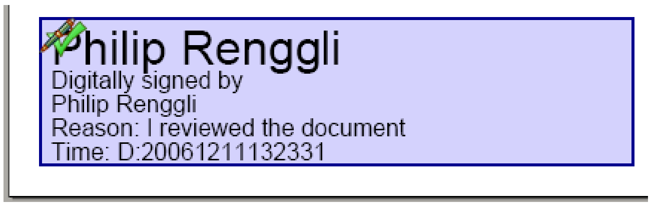
Example: How to Create a QES

In order to create a Qualified Electronic Signature a qualified certificate and additional settings are required.

The qualified certificate resides on a hardware which requires drivers and software provided by the manufacturer to be installed. At the time when the signature is applied, this software prompts a dialog where a pin must be entered.

```
-cn "Philip Renggli"
-ci "QV Schweiz ICA"
-tsu server.mydomain.com:80/tsa
-tsc username:password
-csn MY
-csl 0
```

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

4.7 Validation of a Qualified Electronic Signature

There are basically three items that need to be validated:

- Trust Chain
- Revocation
- Time Stamp

Validation can be in different ways, e.g. Adobe Acrobat, from which the screenshots below are taken. Before validating with Adobe Acrobat under Windows, the following setting must be applied:

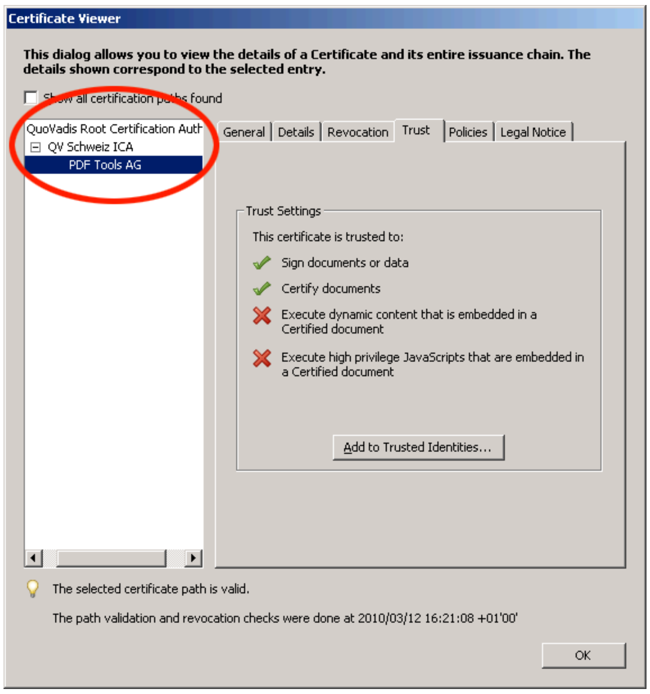
- Open Acrobat, from the menu "Edit", choose "Preferences"
- From Categories, select "Security"
- Click on "Advanced Preferences", select the tab "Windows Integration"
- Tick the checkboxes for:
  Enable import and use of identities from Windows Certificate Store
  Validating Signatures
  Validating Certified Documents

Trust Chain

The trust chain must contain at least two certificate subjects and their issuer. 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 its issuer 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".


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

QuoVadis Root Certification Auth
QV Schweiz ICA
PDF Tools AG

Trust Settings

This certificate is trusted to:

✓ Sign documents or data

✓ Certify documents

✗ Execute dynamic content that is embedded in a Certified document

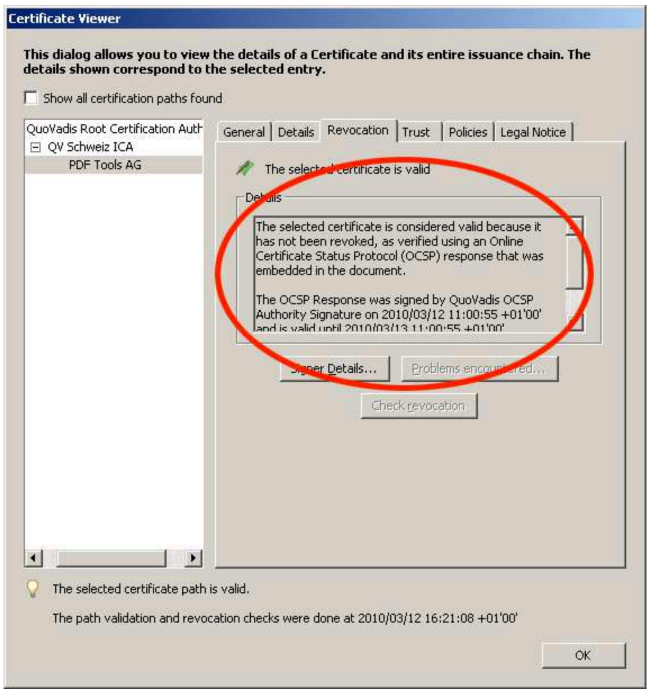
✗ Execute high privilege JavaScripts that are embedded in a Certified document

The selected certificate path is valid.

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

Revocation

An OCSP response must be embedded. This is shown in the tab “Revocation”.


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

QuoVadis Root Certification Auth
QV Schweiz ICA
PDF Tools AG

The selected certificate is valid

Details

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.

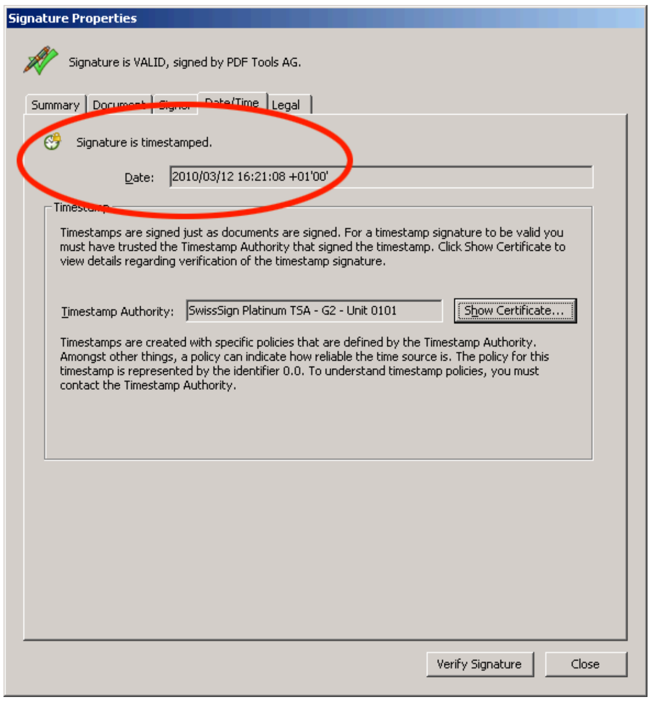
The OCSP Response was signed by QuoVadis OCSP Authority Signature on 2010/03/12 11:00:55 +01'00' and is valid until 2010/03/13 11:00:55 +01'00'

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 must be time-stamped. This is shown in the tab "Date/Time". The certificate of the time stamp server must be a trusted root certificate.



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.

4.8 Certificates

All Certificates

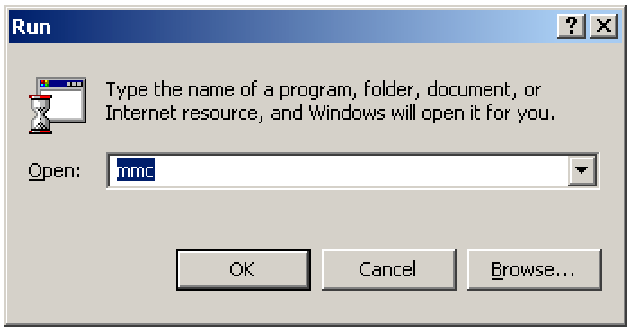
This chapter assumes the standard signature handler is used as described in the chapter Digital Signatures.

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.

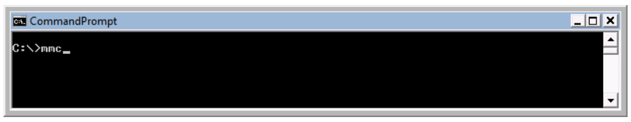
On the Windows operating system certificates can be listed by the Microsoft Management Console (MMC), which is provided by Windows. In order to see the certificates available on the system, do the following steps:

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



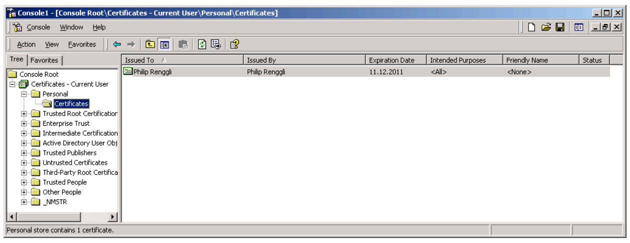
Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.

Open: mmc



```
C:\>mmc_
```

2. Under "Console" ->"Add/Remove Snap-in" select "Add"
3. In the next window activate "Certificates" and chose "My user account"
4. Click "Finish"
5. The certificate must be listed under the root "Certificates - Current User", for example as shown in the screenshot below:

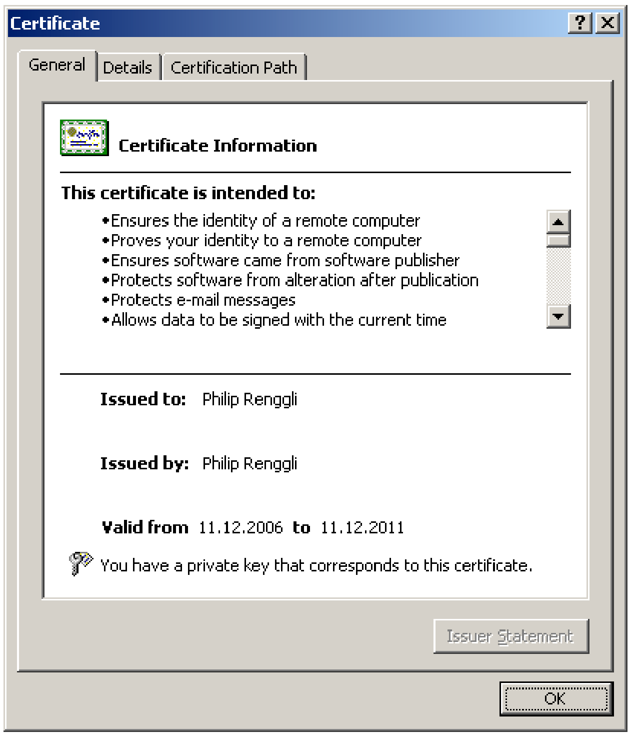

Console1 - [Console Root\Certificates - Current User\Personal\Certificates]

Console 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.

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


Certificate

General | Details | Certification Path

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

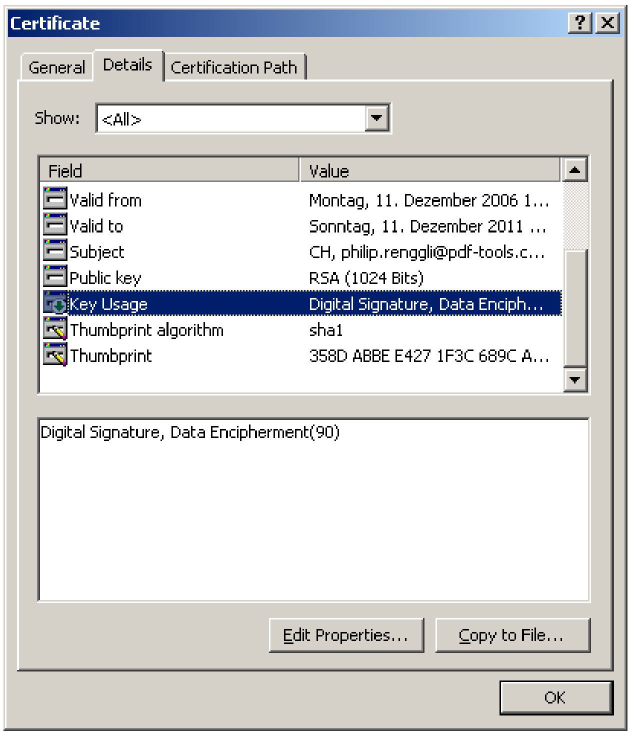
Issued to: Philip Renggli

Issued by: Philip Renggli

Valid from 11.12.2006 **to** 11.12.2011

You have a private key that corresponds to this certificate.

7. 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.


Certificate

General | Details | Certification Path

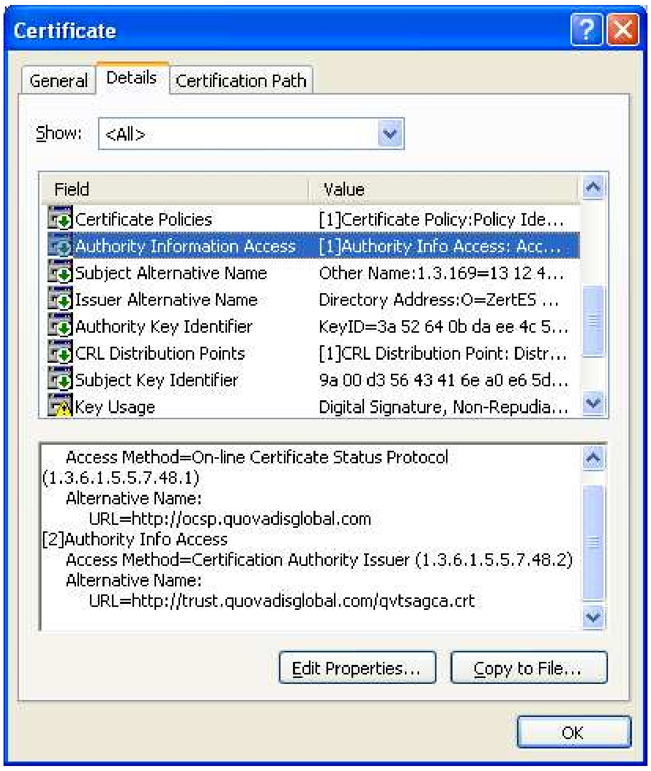
Show: <All>

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.



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
```

4.9 Caching of CRLs, OCSP and TSP Reponses

In order to improve the speed when mass signing, the 3-Heights™ PDF to PDF/A Converter Shell provides a caching algorithm to store CRL (Certificate Revocation List), OCSP (Online Certificate Status Protocol) and TSP (Time Stamp Protocol). This data is usually valid over period of time that is defined by the provider, which is normally at least 24 hours. Caching improves the speed, because there are situations when the server of the provider 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 Shell at the indicated locations within the directory for temporary files:

OCSP responses:	*ocsp/server-hash.der*
CRL:	*crl/server.der*
TSP responses[2]	*tsp/server.der*

The caches can be cleared by deleting the files. Usage of the caches can be deactivated by setting the option -nc. The files are 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.

The directory for temporary files 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.

[2]The sizes of the TSP responses are cached only. Cached TSP responses cannot be embedded but used for the computation of the signature length only.

- *Unix:*
  1. The path specified by the *PDFTMPDIR* environment variable.
  2. The path specified by the *TMP* environment variable.
  3. The */tmp* directory.

5 Reference Manual

5.1 General Settings

-cl: Set Conformance

Set the PDF/A conformance level. Support parameters are: pdfa-1b, pdfa-1a, pdfa-2b, pdfa-2u, pdfa-2a, pdfa-3b, pdfa-3u, pdfa-3a. The default value is pdfa-2b. The following example will set the conformance level to PDF/A-2u:

Example:

```
-cl pdfa-2u
```

-cem: Mask Conversion Errors

The conversion error mask defines which operations and conditions are not allowed and consequently cause a conversion error (return value 5).

0	None (never return a conversion error)
1	Upgrade file's conformance to PDF/A-2, if necessary (PDF/A-1 only).
2	Downgrade file's conformance level, if necessary.
4	(default) Visual differences in output file.
8	Resolve name collisions of colorants (PDF/A-2 and PDF/A-3 only).
16	(default) Remove optional content groups (layers) (PDF/A-1 only).
32	(default) Remove transparency (PDF/A-1 only).
64	(default) Remove embedded files.
128	(default) Remove non convertible XMP metadata.
256	(default) Error during linearization of output file.
512	Conversion of signed document forced removal of signatures.
1024	(default) Failed to create signature.
2048	Failed to add OCSP or TSP to signature.
4096	(default) 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.
8192	(default) OCR error occurred.
16384	Font substituted.

Add up all operations are conditions to define the conversion mask. The default is 13812. In order to accept all conversion errors, set the mask to 0.

```
-cem 0
```

-fd: Set font directory

In order to create a valid PDF/A all fonts must be embedded. If the input file contains a font which is not embedded, the font folder is searched for a font with the same name. If such a font is found, the font is embedded. If no valid font directory is added, the default font directories are used. The location of these directories depends on the operating system:

- Windows: %SystemRoot%\Fonts and directory “Fonts”, which must be a direct sub-directory of where the main DLL or executable resides.
- Mac: /System/Library/Fonts and /Library/Fonts
- Unix: $PDFFONTDIR or /usr/lib/X11/fonts/Type1

The fonts of the default font directories and their properties are cached in a font cache, located in the files %TMP%\font-database*. It is recommended to clear the cache, if you add or remove fonts from these directories. If replacement fonts shall be taken from another location, this location can be set using the switch -fd:

```
-fd C:\MyFonts
```

-id: Set value in the document information dictionary

Set or get the value of an info entry key. Examples for keys are “Author”, “Subject”, “Title”, “Producer” or custom attributes.

-ma: Analyze the Input File

Analyze the input file and verify if it meets a certain compliance level. In order to get a report either the option -rs or -rd can be used in combination, otherwise only the return code it set.

```
pdf2pdf -ma -rs input.pdf output.pdf
The document contains fonts without embedded font programs or encoding information
(CMAPs). The documents meta data is either missing or inconsistent or corrupt.
```

An output file name must be provided, since the output name also specify the name of the log file which is generated. However no output PDF document is created. The analysis is equal to the analysis using the 3-Heights™ PDF Validator and validating against PDF/A.

-mc: Force Conversion even if there Are Analysis Errors

Setting this option forces the conversion even if there is a problem with the input file. A conversion to PDF/A can fail if the document stands in conflict with one of the following issues:

- Non-conformance with the PDF Reference
- Layers
- Transparency
- Missing or ambiguous annotation and form field appearances
- Unknown annotation types (optional)
- Multimedia annotations (optional)

Under the following circumstances the conversion is automatically downgraded to PDF/A-1b, (in case PDF/A-1a was selected).

- Missing Unicode information
- Missing logical structure

-mp: Post-Analyze the Result

Analyze the created output file directly after the conversion to verify it meets the required compliance level. In order to get a report either the option -rs or -rd can be used in combination, otherwise only the return code it set. The post analysis is only executed if the conversion was successful. This switch is ignored if the switch -ma (Analysis only) is set. 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).

```
-mp -rs
```

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

-p: Read an Encrypted PDF File

When the input PDF file is encrypted and has a user password set, (the password to open the PDF) the password can be provided with the option -p. If for example the user password were "userpwd", then the command would look like this:

```
-p userpwd
```

When a PDF is encrypted and the user password is not provided or is incorrect, pdf2pdf cannot decrypt and read the file. Instead it will generate the following error message:

```
0x80410112 - E - The authentication failed due to a wrong password.
Couldn't open input file input.pdf.
```

-ax: Add XMP Metadata

Add XMP meta data from a file. Providing a path that does not exist or an invalid XMP file results in return code 3.

```
-ax metadata.txt
```

-ow: Optimize for the Web

Add so called linearization tags to the document. A linearized document has a slightly larger file size than a non-linearized file, and provides the following features (among others):

- When a document is opened through a PDF viewing application plug-in for an Internet browser, the first page can be viewed without downloading the entire PDF file.
- 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.

-q: Image Quality

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

Example: JPX 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 Shell converts it to an image with regular JPEG compression and the image quality as defined by this switch.

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. The default value is 75.

-rd: Report Conformance Violations in Detail

This option lists all conformance 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 the summary (Options -rs). This option can be used in combination with -mp or -ma.

Example:

```
pdf2pdf -ma -rd input.pdf output.pdf
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, 0x00418704, "The font Arial-BlackItalic must be embedded.", 1
1, 0x83410612, "The document does not conform to the requested standard.", 1
```

-rs: Report Conformance Violations Summary

This option gives a summary of all conformance violations. If any of the following violations is detected at least once, it is reported (once). This option provides less detailed information than the detailed list per page (Option -rd).

- This option can be used in combination with -mp or -ma
- 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).

-cff: Embed Type 1 fonts as CFF

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.

-uf: Update the fonts' Unicodes

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

-ef: Add embedded file

`-ef "file"` is the same as `-af ";;;file"`.

-af: Add associated file

Add a file to the document's embedded files. For PDF/A-3, the embedded file is associated with an object of the document, i.e. it is an associated file. 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. The argument is of the form "`i;r;m;d;f`" where:

`i`	The object to associate the embedded file with. -1 for none, 0 for document, number greater than 0 for respective page. Default: 0 for PDF/A-3 and -1 otherwise.
`r`	The relationship of the embedded file to the object associated, PDF/A-3 only. Allowed values are "Source", "Data", "Alternative", "Supplement", and "Unspecified". Default: "Unspecified".
`m`	Mime-type of the embedded file. Default: "application/octet-stream". Other common values are "application/pdf", "application/xml", or "application/msword".
`d`	A description of the embedded file. This is presented to the user when viewing the list of embedded files.
`f`	The path (or URL) to the file to be embedded.

Example:

```
pdf2pdf -cl pdfa-3a -af "0;Source;application/msword;The source
    document;input.doc" input.pdf output.pdf
```

-az: Add a ZUGFeRD XML invoice file.

Add a ZUGFeRD XML invoice file. Note that this requires the compliance to be set to PDF/A-3. If the specified ZUGFeRD XML invoice file cannot be added during conversion, the following conversion error event is generated: *Remove embedded files.*

-v: Verbose Mode

This option turns on the verbose mode.

-lk: Set License Key

Pass a license key to the application at runtime instead of installing it on the system.

5.2 Processing Files in a Directory

Wildcards return a list of existing files. If you would like to convert all files in a directory to individual PDF documents, it is required to use a variable to name the output files. Here is an example for the FOR-command of the CMD-shell. It converts all TIFF files to PDFs with the same name and the extension ".pdf", in the same folder:

```
for %i in (*.pdf) do pdf2pdf -v %i %~ni.pdf
```

Of course, one can adjust the paths, or use a different output name:

```
for %i in (.\input\*.pdf) do pdf2pdf %i .\output\new_%~ni.pdf
```

For additional help to the FOR command, use the command (Windows):

```
for /?
```

Note, that variables used in a batch file require two leading "%" instead of one.

5.3 Color Profiles

See the dedicated section Color Profiles for more information on the topic.

-cs: ICC Profile for Device-Specific Color Spaces

This ICC profile represents the color profile of the scanner. It is required if a color space is used that is different from color ICC profile of the output intent. Initially there is a default color profile for RGB (sRGB) and CMYK (USWebCoatedSWOP.icc) defined in the 3-Heights™ PDF to PDF/A Converter. This switch can be used to set both, the RGB and the CMYK color profile. If an RGB color profile is passed as argument it is set as new RGB color space, if a CMYK color is provided, it is set as new CMYK color space, if an invalid file is provided, it results in error code 3. To set the color profile for both color spaces, use the switch -cl twice. The following command sets the standard sRGB color profile as color space:

```
-cs "C:\WINNT\system32\spool\drivers\color\sRGB Color Space Profile.icm"
```

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

-oi: ICC Profile for Output Intent

The ICC profile for the output intent describes the color profile of the device (monitor or display). An output intent is required for PDF/A compatibility when converting images that do not have an embedded color profile. If no output intent is specified, a default color profile is embedded. The default color profile is the *sRGB Color Space Profile.icm*. If the input document already contains an output intent, the existing output intent is kept. Providing a path that does not exist or an invalid ICC color profile file results in return code 3.

```
-oi "C:\WINNT\system32\spool\drivers\color\sRGB Color Space Profile.icm"
```

5.4 Digital Signatures

Apply a Simple Electronic Signature

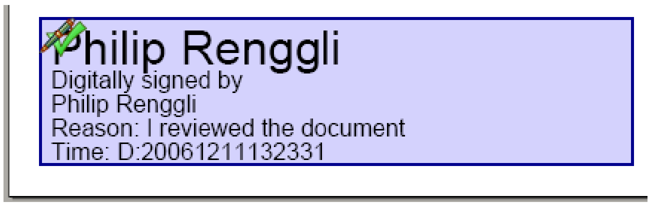
In order to digitally sign a PDF document with the 3-Heights™ PDF to PDF/A Converter Shell, a certificate is required. What a certificate is and how they can be listed on a Windows system is described in the chapter "Certificates". To create a digital signature the following steps need to be done:

- Select a signing certificate, e.g. by providing the certificate name (Subject)
- Apply settings for the signature, such as the reason text, or the visual appearance (color, position, etc).
- Process the PDF document by a user which has access to the selected certificate and thereby add the signature

The certificate name is provided with the switch `-cn`, the reason with the switch `-cr`. A sample command looks like this:

- `-cn "Philip Renggli"`
- `-cr "I reviewed the document"`
- Execute the conversion

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

Apply a Qualified Electronic Signature

The following settings are relevant for a Qualified Electronic Signature (QES):

Table: QES Settings	
Certificate Name (Subject)	`-cn "Philip Renggli"`
Certificate Issuer	`-ci "QV Schweiz ICA"`
Time Stamp URL	`-tsu server.mydomain.com:80/tsa`
(optional) Time Stamp Credentials	`-tsc username:password`
Certificate Store	`-csn MY`
Certificate Store Location	`-csl 0`

Note: The qualified certificate resides on a hardware, which requires drivers and software provided by the manufacturer to be installed. At the time the signature is applied, this software shows a dialog where a pin must be entered.

-ap: Signature Page Number

Set the page number of where the visual appearance of the digital signature should be placed. The default is the last page. The last page can also be set using -1 as argument.

-ar: Signature Annotation Rectangle

This option allows positioning the digital signature annotation. The default location is in the lower left corner. The units are PDF points (A4 = 595x842 points, Letter = 612x792 points).

Example

create a 200 by 60 points rectangle in the upper left corner of an A4 page

```
-cn "..." -ar 10 770 200 60
```

In order to create an invisible signature use the following rectangle:

```
-ar 0 0 0 0
```

-cn: Certificate Name (Subject)

In order to sign a PDF document, a valid, existing certificate name must be provided. Consult the chapter "Certificates" to learn more about certificates. The name of a certificate is to be provided as parameter to the -cn switch to digitally sign a PDF document as shown in the command below:

Example

Sign the document.

```
-cn "Philip Renggli"
```

The signature is added on the last page of the signed document.

-cr: Signature Reason

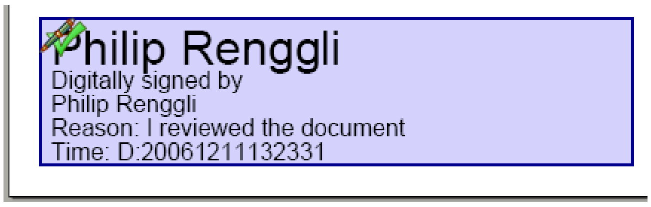
Add a descriptive text about the reason why the document was signed.

Example

Sign the document and add a reason text.

```
-cn "Philip Renggli" -cr "I reviewed the document"
```

The signature of the resulting output looks as shown below:


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

-cci: Signer contact info

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.

-ca: Abort Conversion if Document Is Signed

If -ca is set and the input document is not PDF/A compliant (i.e. a conversion is required) and contains a digital signature, the conversion is aborted and the error code 11 is returned.

If -ca is not set and the input document is not PDF/A compliant, all signatures (including MDP signature) and signature appearances of the input document are removed.

If the input document is PDF/A compliant, the document is not converted and the existing signatures remain. Optionally an additional signature can be applied.

-ci: Certificate Issuer

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

-cno: Certificate Serial Number

Set the serial number of the certificate. Specify a hex string as displayed by the "Serial number" field in the Microsoft Management Console (MMC), e.g. "49 cf 7d d1 6c a9".

-cfp: Certificate Fingerprint

Set the hex string representation of the signer certificate's sha1 fingerprint. 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".

-co: Do not Embed Revocation Information

This switch inhibits the embedding of revocation information such as online certificate status response (OCSP - RFC 2560) and certificate revocation lists (CRL - RFC 3280). Revocation information is either an OCSP response or a CRL, which 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. If the embedding is enabled then the information of the signer certificate and the issuer certificates other than the root certificate is embedded as well. 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 20k) and that it requires a connection to a validation service, which delays the process of signing (normally by around

2 seconds). For mass signing it is suggested to use the caching mechanism, see chapter 'Caching of CRLs, OSCP and TSP Responses'.

Embedding revocation information requires an online connection to the CA that issues them. The firewall must be configured accordingly. In case a web proxy is used, it must be ensured the following MIME types are supported when using OCSP (not required for CRL):

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

-cp: Cryptographic Provider

The provider can either be Microsoft's Crypt API or a library that implements PKCS#11 to support HSM, USB tokens and smart cards.

- When using the Microsoft's Crypt API, the value of this property with the following syntax:
  `"[ProviderType:]Provider[;PIN]"`
  The ProviderType and PIN are optional. The corresponding drivers must be installed on Windows. Examples:
  - `Provider = "Microsoft Base Cryptographic Provider v1.0"`
  - `Provider = "Microsoft Strong Cryptographic Provider"`
  - `Provider = "PROV_RSA_AES:Microsoft Enhanced RSA and AES Cryptographic Provider"`

  The provider type PROV_RSA_AES supports the SHA-2 hash algorithms. this provider type is recommended in order to validate signatures if no PKCS#11 device is available.
  Optionally, when using an advanced certificate, the pin code can be passed as an additional, semi-column separated parameter. This does not work with qualified certificates, because they always require the pin code to be entered manually and every time. If the name of the provider is omitted, the default provider is used. Examples, "123456" being the pin code:
  - `Provider = "Microsoft Base Cryptographic Provider v1.0;123456"`
  - `Provider = ";123456"`
- When using PKCS#11, the value of this property is to be set to a string with the following syntax:
  `"PathToDll;SlotId;Pin"`
  Non-Windows platforms must use this method.
  - `PathToDll` is the path to driver library filename, which is provided by the manufacturer of the HSM, UBS token or smart card. Examples:
    - The CardOS API from Siemens uses *siecap11.dll*
    - The IBM 4758 cryptographic coprocessor uses *cryptoki.dll*
    - Devices from Aladdin Ltd. use *etpkcs11.dll*
  - `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: "Cannot access private key".

  Examples:
  - `Provider = "\WINDOWS\system32\siecap11.dll;4;123456"`

  Interoperability Support: The following cryptographic token interface (PKCS#11) products have been successfully tested:
  - SafeNet Protect Server
  - SafeNet Luna
  - SafeNetAuthentication Client
  - IBM OpenCrypTokI
  - CryptoVision
  - Siemens CardOS

-cps: Cryptographic session property (string)

String property for configuring cryptographic session. The supported names and values are specific to the cryptographic provider.

-cpf: Cryptographic session property (file)

File data property for configuring cryptographic session. The supported names and values are specific to the cryptographic provider.

-csl: Certificate Store Location

The location of the Certificate Store from where the certificate should be taken. Supported are:

`0`	Local System
`1`	The current user (default)

Usually personal certificates are stored in the current user location and company-wide certificates are stored under local system, so that all users can access it.

-csn: Certificate Store Name

The name for the certificate store depends on the OS. The default is MY. Other values are: ROOT or CA.

Example

use the certificate store ROOT from the Local System account.

```
-cn "..." -csn ROOT -csl 0
```

-tsu: Time Stamp URL

The URL of the trusted time stamp server (TSA) from which a time stamp shall be acquired. This setting is only required when applying a Qualified Electronic Signature. 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`

-tsc: Time Stamp Credentials

If a time stamp server requires authentication, use this switch to provide the credentials.

Example

Credentials commonly have the syntax *username:password.*

```
-cn "..." -tsu SomeTimeServer -tsc username:password
```

-wpu: Web Proxy Server URL

In an organization where a web proxy server is in use, it must be ensured this web proxy server is specified. The URL is something like “http://proxy.example.org” or an IP address. When applying OCSP or time stamps, the following MIME Types must be supported by the web proxy server:

`application/ocsp-request`
`application/ocsp-response`
`application/timestamp-query`
`application/timestamp-reply`

-wpc: Web Proxy Server Credentials

If a web proxy server is used, and it requires authentication, use this switch and the syntax user:password.

Example

set a web proxy server URL and use authentication.

```
-wpu "http://proxy.example.org" -wpc user:password
```

-nc: Disable cache for CRL and OCSP

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 for more information on the caches.

5.5 OCR

In order to make use of OCR, an OCR engine must be installed. The OCR engine is provided as part of a separate product: The 3-Heights™ OCR Enterprise Add-On.

The recommended options (besides `-ocr`, `-ocl` and `-ocp`) are:

- *For scanned documents*: `-oca`
- *For born-digital documents*: `-ocs -oci`

-le: List OCR Engines

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

Abbyy FineReader OCR Engine: This engine is accessed by the OCR interface DLL *pdfocrpluginAbbyy.ocr*.

3-Heights™ OCR Service: This service is accessed by the OCR interface DLL *pdfocrpluginService.ocr*. The service accesses the Abbyy FineReader 8.1 OCR Engine.

Tesseract: This engine is accessed by the OCR interface DLL *pdfocrpluginTesseract.ocr*.

The OCR interface DLLs are provided by the 3-Heights™ PDF to PDF/A Converter Shell. The OCR engine is provided as a separate product, such as 3-Heights™ OCR Enterprise Add-On. Here is an example of listing available OCR engines:

```
-le
List of available OCR engines:
- abbyy
- abbyy10
- service
- tesseract
End of list.
```

In order to make use of the OCR engine, the OCR interface DLL and the OCR engine must be installed. The switch -le lists all available OCR interface DLLs. It does not verify the corresponding OCR engine is installed and can be initialized. The OCR engine is actually accessed when using the switch -ocr.

-ocr: Load OCR Engine

If a PDF document has to be made fully text searchable even if the text is part of a raster image then the images which are contained in the PDF document must be run through an OCR engine. With this switch the user can select an OCR engine, e.g. “Abbyy”, and instruct the tool to embed the recognized text as a hidden layer on top of the image. If the add-in is not found or the engine cannot be initialized (because it is not installed or the license key is not valid) then an error message is issued.

The name of the OCR engine can be retrieved using the switch -le. If the switch -ocr is not used, no OCR is applied. The following switch sets the OCR engine to Abbyy:

```
pdf2pdf -ocr abbyy input.pdf output.pdf
```

See also documentation for the 3-Heights™ OCR Add-On.

-ocl: Set OCR Language

In order to optimize the performance of the OCR engine, it can be given hints what languages are used. The default language of the Abbyy FineReader 8.1 OCR Engine is English. This switch can only be used if the switch -ocr is set. This setting depends on the OCR engine, e.g. it is different for Abbyy and Tesseract. The following switch set the languages to English and German:

```
pdf2pdf -ocr abbyy -ocl "English, German" input.pdf output.pdf
```

See also documentation for the 3-Heights™ OCR Add-On.

-ocp: Set OCR Parameters

Using this switch OCR engine specific parameters (key/value pairs) can be set to optimize the performance. The following switch enables the Balanced Mode to improve the speed and do not detect whether text is bold or not.

```
pdf2pdf -ocp "BalancedMode=TRUE, DetectBold=FALSE" input.pdf output.pdf
```

See also documentation for the 3-Heights™ OCR Add-On.

-ocs: Do Not Re-embed De-skewed Image

Using this switch the original images are kept instead of the OCR engine re-embedding the de-skewed images.

-ocd: Resolution for OCR Recognition

Resample images to target resolution before they are sent to the OCR engine. If no value is set, images are re-sampled to 300 dpi for OCR, which is the preferred resolution for most OCR engines.

-oct: Threshold Resolution for OCR

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.

Example

Resample all images with a resolution of more than 300 dpi to 300 dpi:

```
-ocd 300 -oct 1
```

Example

Resample all images with a resolution of 400 dpi or more to 300 dpi (default):

```
-ocd 300 -oct 400
```

Example

Do not resample:

```
-oct -1
```

Compatibility Note: Initially this switch was called -ocD and then renamed to -oct to avoid confusions with the switch -ocd.

-ocb: Convert Images to Bitonal before OCR Recognition

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. It is suggest to use this feature with ABBYY 8 or Tesseract.

Enabling this feature automatically re-embeds the original images in the output document; the setting of -ocs is ignored.

-ocm OCR mode

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

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.

Example

Set OCR Mode 2

```
-ocm 2
```

-oci: Do not deskew image

Do not deskew original image, but skew text (with -ocs only).

-oca: Rotate the image according to the detected angle

The OCR engine may detect that an image needs to be rotated in order to have the text in an up-right position. If this is the case and this switch is used then the original image is replaced by the rotated image.

-ocbc: Embed barcodes

Embed the recognized barcodes in the XMP metadata.

-ocx: Export recognized ocr text to file

Export the retrieved OCR text to a file. This function can only be used in combination with an OCR engine (see option -ocr). 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:

`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

Example

Write extracted text to the text file "text.txt".

```
pdf2pdf -ocr abbyy -ocx text.txt input.tif output.pdf
```

5.6 Return Codes

There are different return codes supported. All but return code 0 indicate an error or problem.

`0`	Success Occurs when: ▪ Analysis only and no errors ▪ Conversion without errors ▪ Conversion and post-analysis without errors
`1`	Cannot open input file
`2`	Cannot create output file
`3`	Parameter error Examples: ▪ File does not exist ▪ Invalid XMP file ▪ File is not a valid ICC color profile ▪ ICC version is not compliant ▪ Other parameter error
`4`	Cannot convert input file due to conformance problems

5 Output file has conversion errors

A conversion error means the input document contains an element that does not exist in PDF/A, i.e. can only be converted in a way that the result may have visual or other differences. However the resulting document is PDF/A compliant. This return code depends on the setting -cem.

- Missing output intent of device color space
- Optional content removed
- FFilter or FDecodeParms removed
- Prohibited annotation type converted to text annotation
- Prohibited action removed
- Embedded files removed
- Transparency removed
- Character from show string removed because glyph missing in font

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.

6 Output file is not conformant (post analysis)

Occurs when:

- Post analysis failed

Examples:

- Missing output intent of device color space
- Font not embedded
- Annotation without appearance stream

7 There was a problem during the linearization of the file

The following return codes became deprecated with version 2.1.25.0. Instead 5 is returned, depending on the setting to mask conversion errors.

8 Input file is not conformant (pre analysis)

Occurs when:

- Analysis only with errors
- Conversion with failed pre analysis but successfully post analysis

9 Parts of the XMP metadata could not be repaired and had to be removed.

11 Input document is not PDF/A compliant and contains a digital signature and the switch -ca is set

12 A signature creation error occurred. Possible reasons are:

- Cannot create a session (or CSP)
- The certificate store is not available
- The certificate cannot be found
- The private key is not available
- Incorrect signature length

13 Cannot get response from OCSP or TSP

If the input file cannot be read, the following error is returned (return code 1):

```
0x80410101 - E - The file couldnt be opened.
Couldnt open input file input.pdf.
```

If the output file cannot be created, the following error is returned (return code 2):

```
0x80410102 - E - The file couldnt be created.
Couldnt create output file output.pdf.
```

6 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.

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
```

Errors

inhibit a successful conversion. Prefix: *

Example:

```
* Cannot open file input.pdf.
Input file 001.pdf isn't convertible.
```

Reports

are only created if the corresponding option (Details or Summary) is selected. 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.
```

7 Licensing and Copyright

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