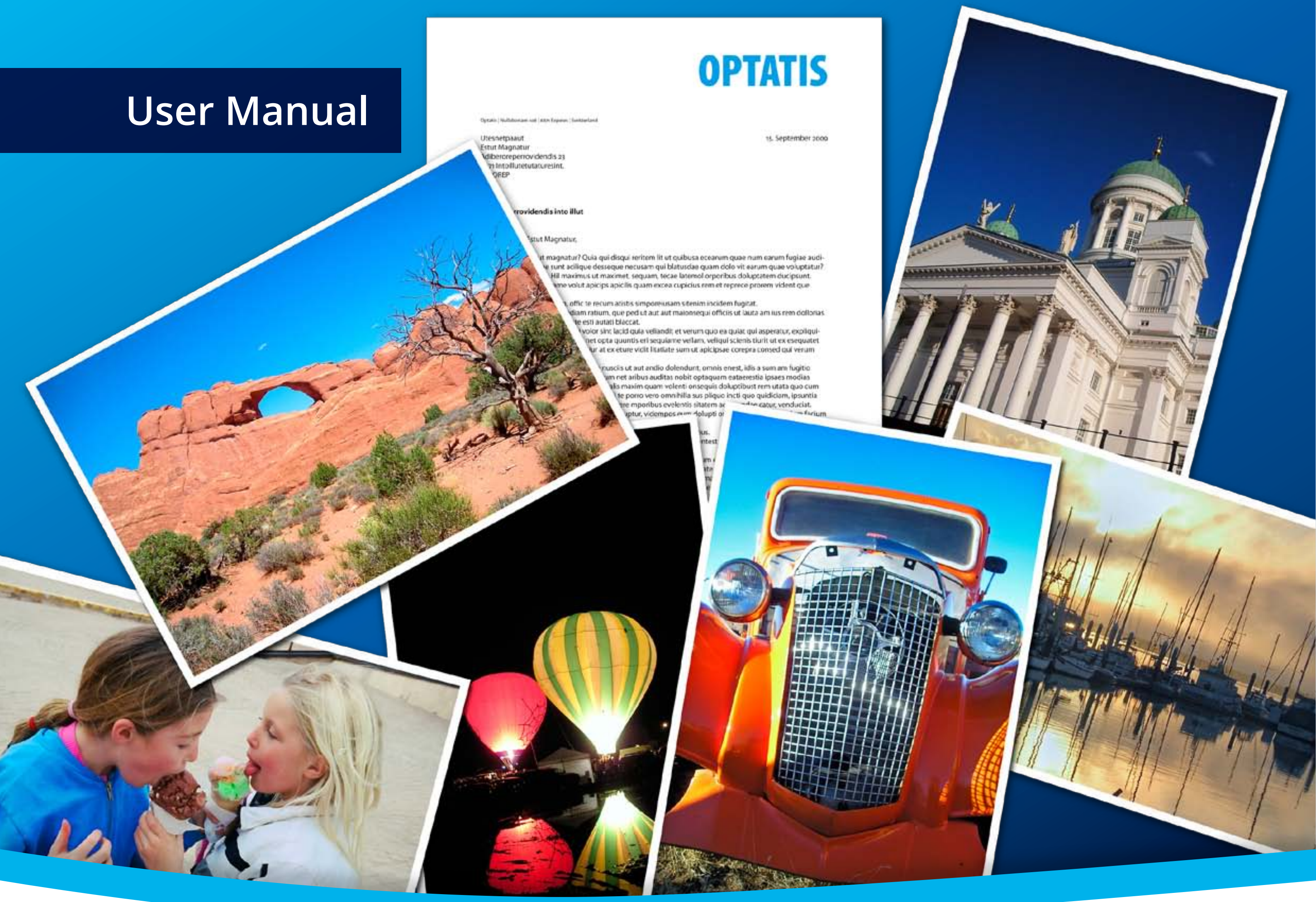
User Manual



3-Heights™ PDF to Image Converter API

Rendering Engine 2.0

PDF/A compliant

Version 4.10

PDF-TOOLS.COM
Premium PDF Technology

Contents

1 Introduction

1.1 Description

The 3-Heights™ PDF to Image Converter API converts PDF documents into single page or multi-page raster images such as TIFF or JPEG. It can also convert PDF files into rasterized PDF.

Its areas of use include the web, TIFF-based DMS solutions, archive and workflow systems and the protection of PDF documents. The Converter is characterized by its high speed and outstanding quality.

1.2 Functions

The 3-Heights™ PDF to Image Converter API merges pages from different input files to form one or more files. Color space and image size are defined automatically during the process. The Converter supports scaled and un-scaled conversions and a variety of image formats such as PNG, TIFF, JBIG2 or JPEG2000.

1.2.1 Features

PDF to Image

- Create single page and multi-page image files and rasterized PDF documents
- Convert individual pages
- Convert PDF files to CCITT fax files
- Define page dimensions in points or pixels
- Set rotation (Force portrait or landscape or inherit rotation from original document)
- Set resolution (DPI)
- Dithering (Floyd Steinberg, Halftone Block, Halftone Continuous, Atkinson)
- Set image filters
- Set color depth
- Set color space
- Set TIFF file compression
- Set the quality of lossy image compression
- Set bit filling order for fax files
- Add Watermark images

PDF to PDF Image

- Raster PDF content (image)
- Keep or remove links, outlines or viewer preferences in PDF output document

1.2.2 Formats

Input Formats

- PDF 1.2, 1.3, 1.4, 1.5, 1.6, 1.7
- PDF/A-1, PDF/A-2, PDF/A-3

Target Formats

- TIFF (Tagged Image File Format)
- JPEG (Joint Photographic Expert Group)
- PNG (Portable Network Graphics)
- GIF (Graphics Interchange Format)
- BMP (Window Bitmap)
- EPS (Encapsulated PostScript)
- JBIG2 (Joint Bi-level Image Experts Group)
- JPEG2000
- Extended JPEG2000
- PBM (Portable Bitmap File Format)

1.3 Interfaces

The following interfaces are available:

- C
- Java
- .NET
- COM
- PHP

1.4 Operating Systems

The 3-Heights™ PDF to Image 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

2 Installation and Deployment

2.1 Windows

The 3-Heights™ PDF to Image 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 Image 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 Profiles and Fonts respectively.

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 Image 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 Image Converter API:

File Description

Name	Description
`bin/‹platform›/libPdf2ImgAPI.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/Pdf2ImgAPI.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›/libPdf2ImgAPI.so /usr/lib
```

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

   ```
   ldd libPdf2ImgAPI.so
   ```

   - *On AIX*:

   ```
   dump -H libPdf2ImgAPI.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 Profiles and Fonts respectively.

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 libPdf2ImgAPI.dylib libPdf2ImgAPI.jnilib
```

2.3 Interfaces

The 3-Heights™ PDF to Image 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›\Pdf2ImgAPI.dll`	Req.	Req.	Req.	Req.	Req.
`bin\*NET.dll`	Req.				
`bin\*NET.xml`	Doc.				
`bin\‹platform›\php*_pdftools.dll`					Req.
`doc\*.pdf`	Doc.	Doc.	Doc.	Doc.	Doc.
`doc\Pdf2ImgAPI.idl`			Doc.		
`doc\javadoc\*.*`		Doc.			
`doc\pdf2img_doc.php` and `pdftoolsenums_doc.php`					Doc.
`include\pdf2imgapi_c.h`				Req.	
`include\*.*`				Opt.	
`jar\Pdf2ImgAPI.jar`		Req.			
`lib\‹platform›\Pdf2ImgAPI.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›\Pdf2ImgAPI.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.
`doc\*.*`	Various documentations.
`include\*.*`	Contains files to include in your C / C++ project.
`lib\‹platform›\Pdf2ImgAPI.lib`	The object file library needs to be linked to the C/C++ project.
`jar\Pdf2ImgAPI.jar`	The Java API archive.
`bin\‹platform›\php*_pdftools.dll`	The `PdfTools` PHP extension must be added to the PHP extension directory.

File Description

`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›\Pdf2ImgAPI.dll`	Req.	Req.	Req.	Req.	Req.
`bin\*NET.dll`	Req.				
`jar\Pdf2ImgAPI.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 `application.exe`. Color profiles are not used.
2. The application uses the COM interface and is distributed on Windows only.
   - The main DLL `Pdf2ImgAPI.dll` must be distributed.
3. All files are copied to the target location using a batch script. This script contains the following commands:

```
copy application.exe %targetlocation%\.
copy Pdf2ImgAPI.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%\Pdf2ImgAPI.dll.
```

[1] These files must reside in the same directory as Pdf2ImgAPI.dll.

2.4 Interface Specific Installation Steps

2.4.1 COM Interface

Registration Before you can use the 3-Heights™ PDF to Image 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 Pdf2ImgAPI.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›\Pdf2ImgAPI.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 Image 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 `Pdf2ImgAPI.dll`.

2.4.2 Java Interface

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

For compilation and execution When using the Java interface, the Java wrapper `jar\Pdf2ImgAPI.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\Pdf2ImgAPI.jar" sample.java
```

For execution Additionally the library `Pdf2ImgAPI.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\Pdf2ImgAPI.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:

[2] Otherwise you get the following message: `LoadLibrary("Pdf2ImgAPI.dll") failed - The specified module could not be found.`
[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`

```
... -classpath ".:/path/to/Pdf2ImgAPI.jar" ...
```

2.4.3 .NET Interface

The 3-Heights™ PDF to Image 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.

`Pdf2ImgAPI.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 `Pdf2ImgAPI.dll` is called by the .NET assembly `Pdf2ImgNET.dll`.

`Pdf2ImgAPI.dll` must be found at execution time by the Windows operating system. The common way to do this is adding `Pdf2ImgAPI.dll` as an existing item to the project and set its property "Copy to output directory" to "Copy if newer".

Alternatively the directory where `Pdf2ImgAPI.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 `pdf2imgapi_c.h` needs to be included in the C/C++ program.
- The library `Pdf2ImgAPI.lib` needs to be linked to the project.
- The dynamic link library `Pdf2ImgAPI.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`.

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 `libPdf2ImgAPI.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 `libPdf2ImgAPI.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 `libPdf2ImgAPI.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 Image 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 `Pdf2ImgAPI.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

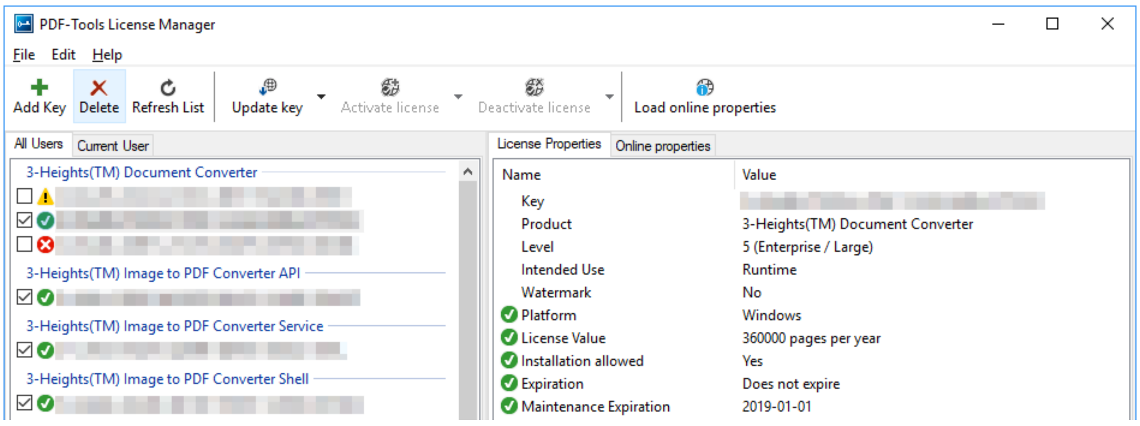
3.1 License Installation and Management

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

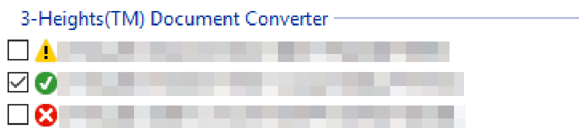
3.2 License Selection and Precedence

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:

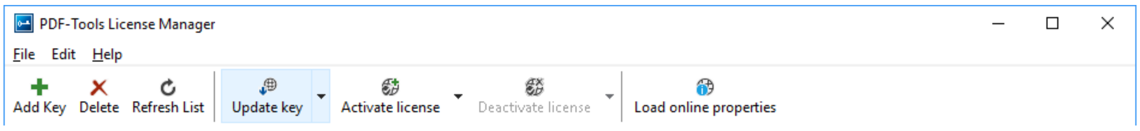
1. License key passed at runtime.
2. License selected for the current user
3. License selected for the current user (legacy key format)
4. License selected for all users
5. License selected for all users (legacy key format)

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:


PDF-Tools License Manager
File Edit Help
Add Key Delete Refresh List Update key Activate license Deactivate license Load online properties

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.

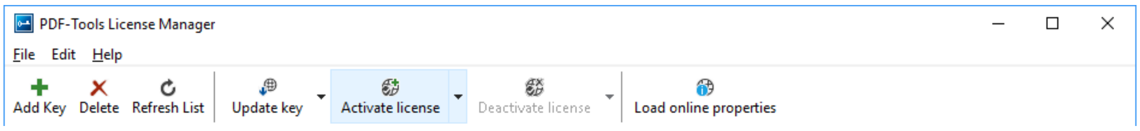
The license activation is tied to a specific computer. If the license is installed at user scope, the activation is also tied to that specific user. The same license key can be activated multiple times, if the license quantity is larger than 1.

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:


PDF-Tools License Manager
File Edit Help
Add Key Delete Refresh List Update key Activate license Deactivate license Load online properties

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

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

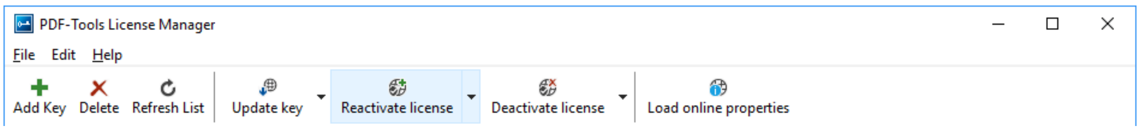
Note that the key has to be installed first.

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`:

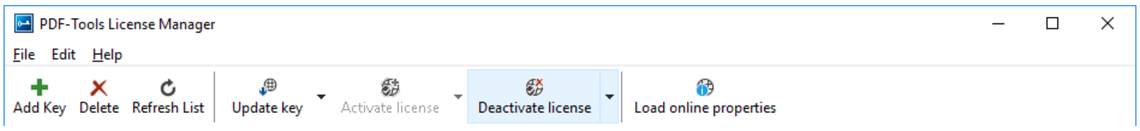
```
licmgr reactivate 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

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:

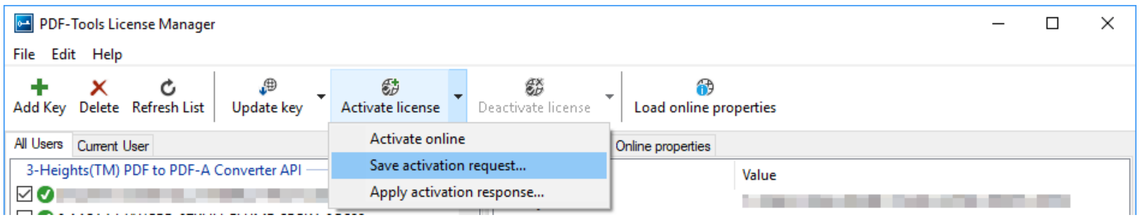
- License Activation
- License Reactivation

- 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:



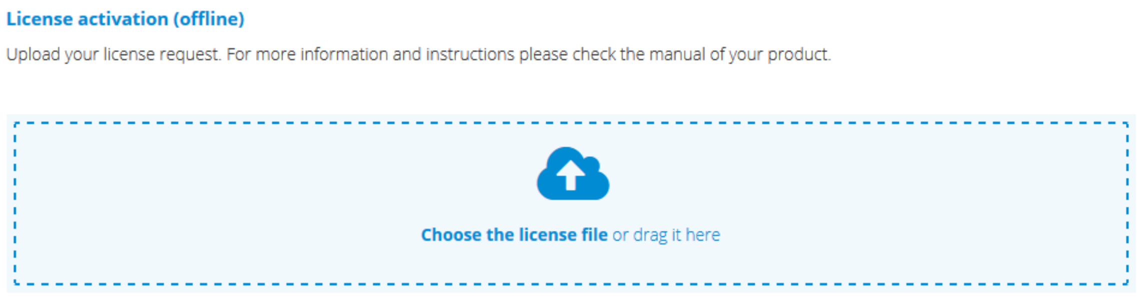
With the Command Line Interface use the `-fs` option to specify the destination path of the request file:

```
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:

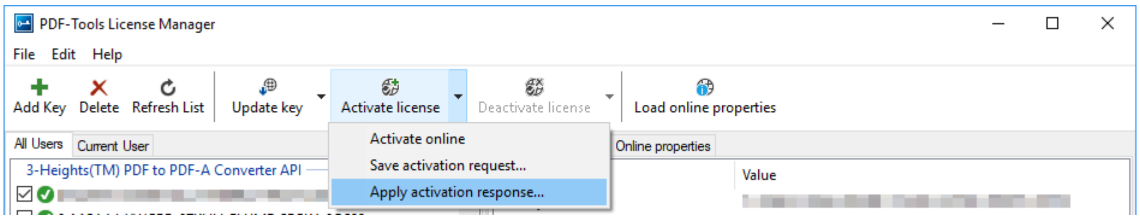

License activation (offline)

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:


PDF-Tools License Manager
File Edit Help
Add Key Delete Refresh List Update key Activate license Deactivate license Load online properties
All Users Current User
3-Heights(TM) PDF to PDF-A Converter API
Activate online
Save activation request...
Apply activation response...
Online properties
Value

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.

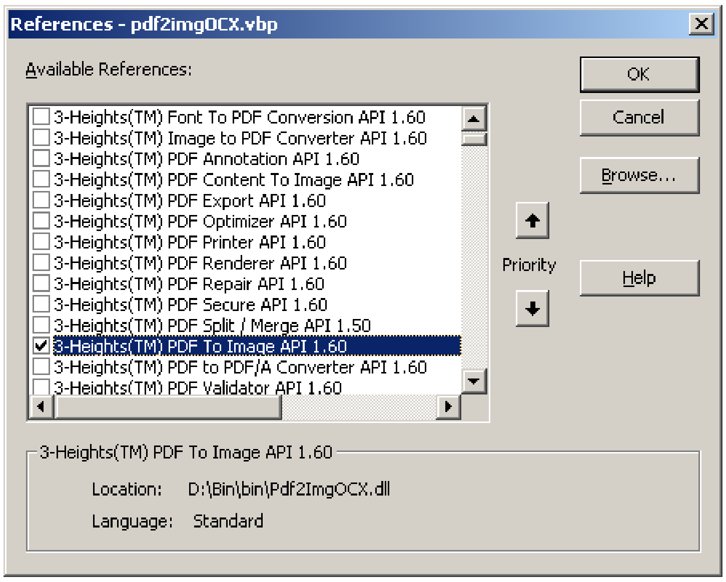
4 Programming Interfaces

4.1 Visual Basic 6

After installing the 3-Heights™ PDF to Image Converter API and registering the COM interface (see Installation and Deployment), 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 Image Converter API component to your project.



- [ ] 3-Heights(TM) Font To PDF Conversion API 1.60
- [ ] 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
- [x] 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 To Image API 1.60

Location: D:\Bin\bin\Pdf2ImgOCX.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 Pdf2ImgAPI.Pdf2Img
    conv.ConvertFile "C:\pdf\in.pdf", "C:\image\out.tif", ""
End Sub
```

The two steps of the above code are very simple: (1) Create a Pdf2Img object, (2) open the PDF file for input, create an image file for output, render all pages of the PDF (if the output file a TIFF which supports multi-page images).
There are two ways to convert pages from PDF files to image pages. The simpler approach is described above. The other, a bit longer, but also more powerful approach, is dividing this one large step into several single steps. As a consequence, it is possible to open different PDF input files and render random pages to one output multi-page image.
A construct which does this could look like that:

```
Private Sub Command1_Click()
  Dim conv As New Pdf2ImgAPI.Pdf2Img
  conv.CreateImage "C:\image\out.tif"
  conv.Open "C:\pdf\in1.pdf", ""
  conv.RenderPage 1
  conv.Close
  conv.Open "C:\pdf\in2.pdf", ""
  conv.RenderPage 3
  conv.RenderPage 6
  conv.Close
  conv.CloseImage
End Sub
```

4.2 ASP

The COM name of the class, for example used in ASP or PHP, of the 3-Heights™ PDF to Image Converter API is `PDF2IMGAPI.Pdf2Img`.

Here is a small ASP sample using VBScript:

```
<%@ Language=VBScript %>
<%
  option explicit
  dim conv set
  conv = Server.CreateObject("Pdf2ImgAPI.Pdf2Img")
  if not conv.CreateImage("C:\temp\output.jpg") then
    Response.Write "<p>"
    Response.Write "Could not create output file." & "<br>"
  else
    Response.Write "<p>"
    Response.Write "Output file created successfully." & "<br>"
    if not conv.Open("C:\PDF-Tools\doc\license.pdf") then
      Response.Write "<p>"
      Response.Write "Could not open input file." & "<br>"
    else
      Response.Write "<p>"
      Response.Write "Input file opened successfully." & "<br>"
      if not conv.RenderPage(1) then
        Response.Write "<p>"
        Response.Write "Could not render page 1." & "<br>"
      else
        Response.Write "<p>"
        Response.Write "Page 1 rendered successfully." & "<br>"
      end if
    end if
  end if
  conv.Close
  conv.CloseImage
%>
```

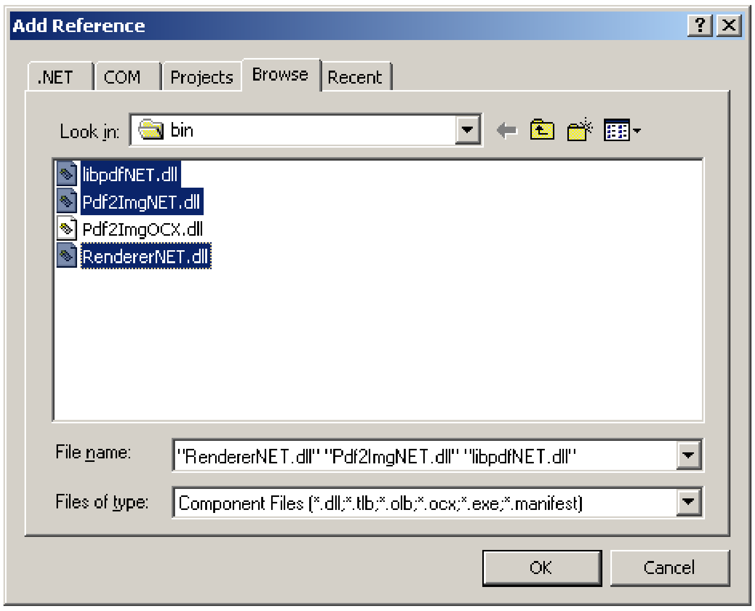
4.3 .NET

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 Image 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`, `RendererNET.dll`, and `Pdf2ImgNET.dll`.
Add them to the project as shown below:



Look in: bin

libpdfNET.dll
Pdf2ImgNET.dll
Pdf2ImgOCX.dll
RendererNET.dll

File name: "RendererNET.dll" "Pdf2ImgNET.dll" "libpdfNET.dll"

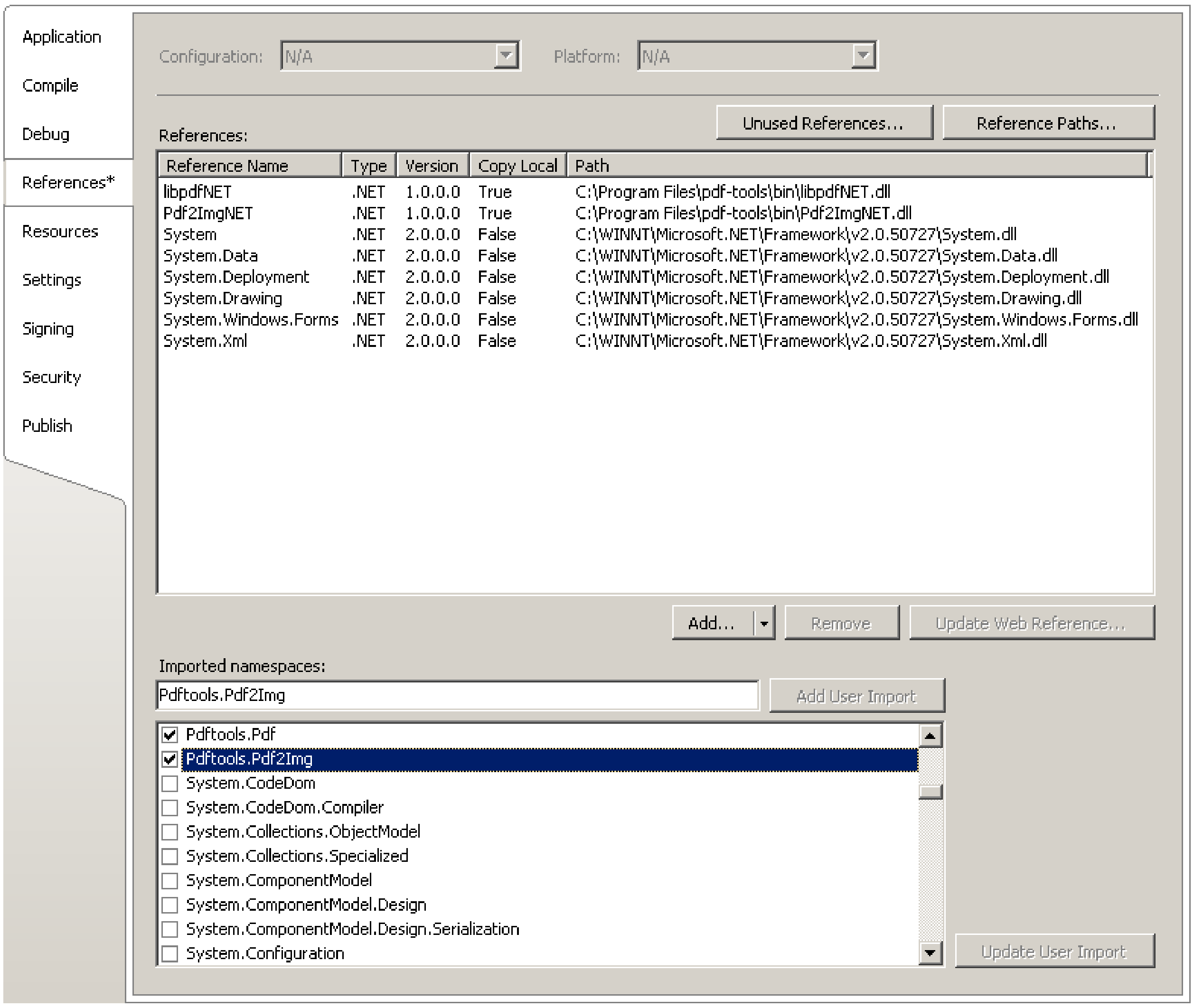
Files of type: Component Files (*.dll;*.tlb;*.olb;*.ocx;*.exe;*.manifest)

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.

4.3.1 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`, `Pdftools.PdfRenderer` , and `Pdftools.Pdf2Img`.
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
Pdf2ImgNET	.NET	1.0.0.0	True	C:\Program Files\pdf-tools\bin\Pdf2ImgNET.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.Pdf2Img

- [x] Pdftools.Pdf
- [x] Pdftools.Pdf2Img
- [ ] System.CodeDom
- [ ] System.CodeDom.Compiler
- [ ] System.Collections.ObjectModel
- [ ] System.Collections.Specialized
- [ ] System.ComponentModel
- [ ] System.ComponentModel.Design
- [ ] System.ComponentModel.Design.Serialization
- [ ] System.Configuration

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

Example:

```
Dim conv As New Pdftools.Pdf2Img.Converter
conv.Open(...)
...
```

4.3.2 C#

3. Add the following namespaces:

Example:

```
using Pdftools.Pdf;
using Pdftools.PdfRenderer;
using Pdftools.Pdf2Img;
```

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

Example:

```
using (Converter conv = new Converter())
{
    conv.Open(...);
    ...
}
```

4.3.3 Deployment

This is a guideline on how to distribute a .NET project that uses the 3-Heights™ PDF to Image 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 `Pdf2ImgAPI.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 Image Converter API have the file name `bin\*NET.dll`.
4. At runtime, the native DLL `Pdf2ImgAPI.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.

4.3.4 Troubleshooting: TypeInitializationException

The most common issue when using the .NET interface is that the correct native DLL `Pdf2ImgAPI.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 `Pdf2ImgAPI.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 `Pdf2ImgAPI.dll` could not be found at execution time.

Resolve this by either:

- adding `Pdf2ImgAPI.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 `Pdf2ImgAPI.dll` resides to the environment variable `%Path%`, or
- copying `Pdf2ImgAPI.dll` to the output directory of your project.

Troubleshooting: BadImageFormatException

The exception means, that the native DLL `Pdf2ImgAPI.dll` has the wrong “bitness” (i.e. platform 32 vs. 64 bit). There are two versions of `Pdf2ImgAPI.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.

5 User's Guide

5.1 Supported Codecs

The following table lists which capabilities of the different codecs are supported by the 3-Heights™ PDF to Image Converter API.

Codec Capabilities

Codec	Bits per Pixel	Gray	Indexed	Quality	Compression
`TIFF`	1,2,3,4,8,24[5]	Yes	Yes	Yes	Raw, Flate, LZW(default), JPEG, Group3, Group3_2D, Group4
`JPEG`	8, 24	Yes	No	Yes	JPEG (lossy only)
`BMP`	1, 2, 4, 8, 24[5]	Yes	Yes	No	Raw
`GIF`	2-8	Yes	Yes	No	LZW
`PNG`	1-8, 24	Yes	Yes	No	Flate
`JBIG2`	1	Yes	No	No	JBIG2 (lossless only)
`JPEG2000`	8, 24	Yes	Yes	Yes	JPEG2000 (lossless: Q = 100)[6]
`PBM`	1-8, 24	Yes	No	No	Raw
`EPS`	1, 2, 4, 8, 24[5]	Yes	No	No	Raw

Codec The **Co**mpression/**Dec**ompression Type.

Bits Per Pixel The supported values for bits per pixel. 1 = bi-tonal, 8 = 256 colors/grey scales, 24 = True Color

Gray This format supports grey scale.

Indexed This format supports indexed colors.

Quality This format supports the setting of a quality parameter.

Compression Supported compression types.

5.1.1 File and Compression Type

Most image types have a predefined compression algorithm. For TIFF, the type of compression can be selected manually.

JPEG and JPEG2000 formats allow the compression rate to be adjusted via a quality parameter. These two formats are of newer date and will not work with older PDF software.

[5] For palette creation: The number of palette entries is equal to 2 BitsPerPixel where BitsPerPixel is smaller or equal to 8. This means it is possible to create a 3 bits per pixel TIFF or BMP, but the palette size is equal as for 4 bits. However the 3 bits per pixel image will compress better than the 4 bits per pixel image.

[6] To create lossless JPEG2000 images, set the quality parameter to 100. For values <100, a lossy compression algorithm is applied.

Here are some suggestions of what image type could be selected for which purpose.

Lossless

- Black/White JBIG2 or TIFF with G4 compression
- Gray scale PNG, JPEG2000 (Q = 100)
- Color PNG, JPEG2000 (Q = 100)

Lossy

- Gray scale JPEG, JPEG2000
- Color JPEG, JPEG2000

For the Internet

- Black/White PNG
- Color (Photos) JPEG, PNG
- Color (Artificial) GIF, PNG

As a general note: Compression algorithms that are lossy require more CPU as lossless algorithms. The file size is usually smaller but the time to create (compress) or read (decompress) the file is higher.

Images formats that are supported by most Internet browsers are JPEG, GIF and PNG.

5.2 How to Create Multi and Single-Page Images

5.2.1 Multi-Page Images

The TIFF format is an image format which supports multi-page images.

To create multi-page TIFF images, just keep rendering pages, and open/close PDF documents without closing the TIFF image.

5.2.2 Single-Page Images

To create single-page TIFF images, render one page, close the image and create a new image file.

5.3 How to Set Pixels Equal Points

How to create images with pixel (in image) equal to points (in PDF)?

The default value of the resolution in the created image is 150 DPI. The PDF format uses a resolution of 72 DPI. In order to create an image with as many pixels per dimension as the PDF had in points, use an image resolution of 72 DPI as well. Please note that generally this yields in a grainy image when viewed at 100% zoom, since the monitor uses a resolution of 96 DPI.

5.4 How to Reduce the File Size

There are different ways to reduce the file size of an image. One needs to be aware that from a certain point on, a smaller file size results in a poorer visual quality.

The main factors on which the file size of an image depends are:

- Dimensions in pixel (width and height)
- Bits per pixel
- Compression Type
- The content of the image (influenced by dithering)

5.4.1 Dimensions

Reducing the dimensions and therefore the amount of the total pixels reduces also the file size. Obviously a 1024x768 pixel image has a larger file size than an equivalent 600x480 image.

Example: Set the dimensions in pixels.

```
converter.SetBitmapDimensions(600, 480);
converter.FitPage = true;
```

Example: Set the dimension in points.

```
converter.SetPageSize(600, 480);
converter.FitPage = true;
```

If the dimensions are set in points, the dimensions in pixel are computed depending on the resolution.

5.4.2 Resolution

The resolution in dots per inch (DPI) lets you specify how detailed the image is. The default value is 150 DPI, which generates an image that looks sharp when not zoomed into. A larger value generates a more detailed image, but also will increases the file size, because it requires more pixels. On the other hand, a lower resolution generates a file with a smaller file size, but the image is also of lower visual quality.

Example: Setting the resolution value to 75 DPI instead of 150 DPI reduces the file size to about one quarter.

```
converter.DPI = 75;
```

5.4.3 Bits per Pixel

Using 1-bit (black/white) or 8-bit grey scale instead of 24-bit true color will reduce the file size. Keep in mind that not all formats support all color depths.

8-bit grey scale images are a third as large in size as 24-bit color images. With 1-bit images that use dithering, the size heavily depends on the content. It can be as small as 1% of the 8-bit image.

Example: Create a gray scale image.

```
converter.BitsPerPixel = 8;
```

Example: Create a bi-level image with Atkinson dithering.

```
converter.BitsPerPixel = 1;
converter.Dithering = eDitherAtkinson;
```

5.4.4 Format/Compression Type

The 3-Heights™ PDF to Image Converter API supports various image formats. For most formats the compression is given. For example a PNG image is always Flate-compressed, a JPEG image is always JPEG-compressed. However for TIFF, the compression type is selectable.

Images formats that are supported by most Internet browsers are JPEG, GIF and PNG.

There are two fundamentally different types of compression: Lossless and lossy.

Lossless compression The transformation from the original to the compressed state of the image does not change the content. Thus the transformation is reversible and the original image can be regained from the compression state.

Lossless compression is normally used for artificial images or scanned text. It is applied to the following types of images: GIF, PNG, BMP, JPEG2000 if quality is set to 100, JBIG2 and TIFF compressed with G3, G4, LZW or Flate.

Lossy compression The compression algorithm alters the content of the image in a way that it compresses better. Thus a lossy compressed image cannot be reverted back to its original state. It also means multiple applications of lossy compression to the same image alter the image every time and thereby reduce the quality every time. How much the image may be altered to improve the compression rate is controlled by a quality index ranging from 1 to 100 and normally defaulted at 75.

Lossy algorithms usually provide a better compression rate, at the cost of visual quality. Lossy compression is normally used for photographs.

It is applied to the following types of images: JPEG, and JPEG2000 if quality is less than 100.

There are various compression types supported for the TIFF image format. These are:

CCITT Group 3, Group 3-2D CCITT Group 3 is the predecessor to CCITT Group 4, it is a simpler algorithm that normally results in a lower compression ratio.

CCITT Group 4 CCITT Group 4 is the standard compression for bi-level TIFF images (i.e. facsimile).

LZW LZW (Lempel-Ziv-Welch) compression is a lossless compression algorithm for images.

Please consult the copyright laws of your country prior to using this compression algorithm.

JPEG TIFF allows images to be compressed with JPEG, which is a lossy compression algorithm. JPEG provides a high compression ratio for 8 and 24 bit images. It is best suited for TIFFs containing photographs and little or no text.

ZIP (Flate) ZIP is a lossless compression algorithm. It is useful for the compression of large images with no loss in quality.

Flate compression (also used by the ZIP format) and JPEG compression can be used for color or grey scale images. CCITT Group 3, 3-2D and 4 as well as Flate can be used for black and white images.

Example: Apply Flate compression to a TIFF image.

```
converter.Compression = eComprFlate;
```

5.4.5 Image Content, Dithering

The content of the image itself has a direct impact on how well it compresses. It seems quite obvious that a plain white image compresses much better than a page filling photograph.

Dithering is an algorithm that arranges the pixels of an image in a way that it creates a visual effect of colors that do not exist in the available colors of the image, such as different grays in a 1-bit black and white image. This complex arrangement of pixels however does not compress well and increase the file size. Disabling dithering therefore reduces the file size. In the 3-Heights™ PDF to Image Converter API, dithering is also implemented for color images.

Example: Disable dithering (e.g. for scanned text).

```
converter.Dithering = eDitherNone;
```

For more information, see chapter Dithering.

5.5 How to Use the In-Memory Methods

An image created by the 3-Heights™ PDF to Image Converter API can consist of multiple pages. For example if the image format supports multiple pages, such as the TIFF envelope and `RenderPage` is called multiple times. `CreateImageInMemory` needs to be called for every image created. `GetImage` returns a byte array holding the image. Its length can be retrieved applying the appropriate length-operator of the programming language you are using.

5.5.1 Creating a Document in Memory

Here is a Visual Basic 6 sample that opens a document from file, creates the image in-memory and saves it to the variant pdfbytes.

```
Private Sub ConvertInMemory_Click()
Dim conv As New Pdf2ImgAPI.Pdf2Img
Dim pdfbytes As Variant
Dim length As Long
  conv.Open "C:\input.pdf"
  conv.CreateImageInMemory ".tif"
  conv.RenderPage 1
  conv.RenderPage 2
  pdfbytes = conv.GetImage
  length = LenB(pdf)
  conv.CloseImage
  conv.Close
End Sub
```

5.5.2 Reading a Document from Memory

The Visual Basic 6 code below opens a document from memory.

In part (1) the document is written into a byte array, this part is just a sample; it could as well be replaced by a process reading the byte array from a data base.

In part (2) the document is actually opened from memory.

```
Private Sub OpenFromMemory_Click()
' (1) Write PDF document to memory
    Dim conv As New Pdf2ImgAPI.Pdf2Img
    Dim bChar() As Byte
    Dim lFileLenght As Long
    Open "C:\input.pdf" For Binary As #1
    lFileLenght = LOF(1)
    ReDim bChar(lFileLenght - 1)
    Get #1, , bChar
    Close #1
' (2) open document from memory
    If Not conv.OpenMem(bChar, "") Then
       MsgBox "couldn't open document"
    End If
End Sub
```

5.6 Color Profiles

A PDF document may contain graphical objects using various different color spaces and the output file of 3-Heights™ PDF to Image Converter API may yet use another color space. Therefore often colors have to be converted between different color spaces.

For calibrated color spaces (such color spaces with an associated ICC color profile) the color conversion is well defined. For the conversion of uncalibrated device color spaces (DeviceGray, DeviceRGB, DeviceCMYK) however, the 3-Heights™ PDF to Image Converter API requires apropriate color profiles. Therefore it is important, that the profiles are available and that they describe the colors of the device your input documents are intended for.

Note: When setting an alternative color management system such as Neugebauer, no color profiles are required.

If no color profiles are available, default profiles for both RGB and CMYK are generated on the fly by the 3-Heights™ PDF to Image Converter API.

5.6.1 Default Color Profiles

If no particular color profiles are set default profiles are used. For device RGB colors a color profile named `"sRGB Color Space Profile.icm"` and for device CMYK a profile named `"USWebCoatedSWOP.icc"` are searched for in the following directories:

Windows

1. `%SystemRoot%\spool\drivers\color`
2. directory `Icc`, which must be a direct sub-directory of where the `Pdf2ImgAPI.dll` resides.

Linux and other Unixes

1. `$PDF_ICC_PATH` if the environment variable is defined
2. the current working directory

5.6.2 Set other Color Profiles

Other color profiles may be set using the methods `SetsRGBProfile` and `SetCMYKProfile`.

5.6.3 Get Other Color Profiles

Most systems have pre-installed color profiles available, for example on Windows at `%SystemRoot%\system32\spool\drivers\color\`. Color profiles can also be downloaded from the links provided in the directory `bin\Icc\` or from the following websites:

- `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`

5.7 Fonts

PDF documents may contain both embedded and non-embedded fonts. When rendering non-embedded fonts the best result can be achieved, if the font is available on the system. Therefore it is important to make sure the Font Directories contain all fonts required.

For more information on how to cope with font issues, please refer to section Font and Text Issues.

5.7.1 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 Image 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.

5.7.2 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`

5.7.3 Font Configuration File fonts.ini

The font configuration file is optional. It can be used to control the mapping of fonts used in the PDF to fonts preinstalled on the system.

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 `Pdf2ImgAPI.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`

It consists of two sections: `[fonts]` and `[replace]`. Both sections are used to map fonts in the PDF to fonts in the installed font collection on the operating system. This comes into play when the font in the PDF document does not have an embedded font program, or the embedded font is not usable.

The mapping only works if the font types of the specified fonts are matching; e.g. if the font in the PDF is a symbolic font, such as "Symbol" or "ZapfDingbats", the mapped font must be symbolic too.

The section `[fonts]` is only considered if the font-matcher does not find an appropriate font amongst the existing installed fonts. It is suggested to only use this section.

The section `[replace]` is stronger and applied before the font-matcher. This means a font will be replaced as defined, even if the correctly installed font is available on the system.

Syntax: The syntax of the mapping file is as follows

```
[fonts]
PDF_font_1=installed_font_1{,font_style}
PDF_font_2=installed_font_2{,font_style}
[replace]
PDF_font_n=installed_font_n{,font_style}
```

`PDF_font_*` is the name of the font in the PDF.

This name can be found in one of the following ways:

- Use any tool that can list fonts. Such as 3-Heights™ PDF Extract or 3-Heights™ PDF Optimizer. Ignore possible prefixes of font subsets. A subset prefix consists of 6 characters followed by the plus sign. For example "KHFOKE+MonotypeCorsiva", in this case only use "MonotypeCorsiva" as font name in the mapping file.
- Open the document with Adobe Acrobat, use the "MarkUp Text Tool", mark the text of which you would like to know the font name, right-click it, select "Properties..."

`installed_font_*` is the font family name of the installed font.

To retrieve this name, find the font in the Windows' font directory and open it by double-clicking. The first line in the property window displays the font family name (this may vary depending on the operating system). The font family name does not include font styles; so an example of a font family name is "Arial", but not "Arial Italic".

`font_style` is an optional style, that is added coma-separated after the font family name.

The style is always one word. Examples of font styles are "Italic", "Bold", "BoldItalic". Omit the font style, if it is "Regular" or "Normal".

Remove blanks from all font names, i.e. in both the `PDF_font_*` and the `installed_font_*`.

Example:

```
[fonts]
Ryumin-Light=MSMincho
GothicBBB-Medium=MSGothic
[replace]
```

```
ArialIta=Arial,BoldItalic
```

5.8 How to Change the Colors—Obtain a Darker Black

CMYK colors that are used in the PDF must first be converted to RGB. There are basically two ways how to achieve this:

1. A CMYK color profile is applied. The suggested default color profile is the "U.S. Web Coated (SWOP) v2". Using a different color profile yields in an image output with different colors. See `SetCMYKProfile`, `SetsRGBProfile`.
   On Windows systems, RGB and CMKY color profiles can be found at the following location: `%SystemRoot%\system32\spool\drivers\color`
2. If the argument given to `SetCMSEngine` is a file name then the Neugebauer algorithm is used for color conversion. The file given in the argument must hold custom coefficients for the color conversion.
   Sample Visual Basic 6 code snippet:

```
Dim conv As New Pdf2ImgAPI.Pdf2Img
' Set the color management engine
conv.SetCMSEngine App.Path & "\CmykToRgb.txt"
```

The default Neugebauer coefficients convert CMYK black (0, 0, 0, 1) to an RGB black which is not a pure black. The following coefficients will create a darker black. The changes are applied on line 5. (The default coefficients for this line are approx. 0.2, see `SetCMSEngine`). To obtain an even darker black, the values for K need to be lowered even more.

```
0.996078, 0.996078, 0.996078 ; White
0.000000, 0.686275, 0.937255 ; C
0.925490, 0.149020, 0.560784 ; M
1.000000, 0.949020, 0.066667 ; Y
0.100000, 0.100000, 0.100000 ; K
0.243137, 0.247059, 0.584314 ; CM
0.000000, 0.658824, 0.349020 ; CY
0.066667, 0.176471, 0.215686 ; CK
0.929412, 0.196078, 0.215686 ; MY
0.215686, 0.101961, 0.141176 ; MK
0.200000, 0.196078, 0.125490 ; YK
0.266667, 0.266667, 0.274510 ; CMY
0.133333, 0.098039, 0.160784 ; CMK
0.074510, 0.180392, 0.133333 ; CYK
0.215686, 0.121569, 0.113725 ; MYK
0.125490, 0.121569, 0.121569 ; CMYK
```

5.9 How to Apply Isomorphic Stretching

If you have a given page size in pixel and would like to convert a PDF page to an image with exactly these given dimensions, but the height-to-width ratio of the PDF is different, you can apply isomorphic stretching. This is achieved by using different resolutions on the x and y axis. Assuming the Y-resolution is defined, the X-resolution is calculated as shown in the code sample below:

```
Dim conv As New Pdf2ImgAPI.Pdf2Img
conv.Open ...
conv.CreateImage ...
```

```
For Page = 1 To conv.PageCount
  conv.XDPI = conv.YDPI * conv.PageHeight / conv.PageWidth
                        * conv.BitmapWidth / conv.BitmapHeight
  conv.RenderPage Page
Next Page
conv.Close
conv.CloseImage
```

5.10 Dithering

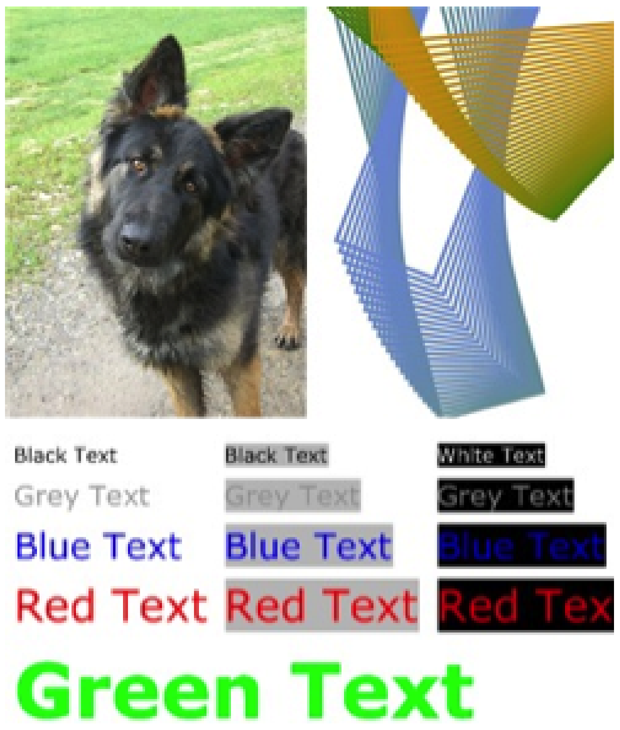
Dithering is a common means used in images to simulate colors that are not available as actual colors. Its use is best observed in image with a low color depth, where colors or shades of grey need to simulated with other colors (e.g. only black/white pixels).

5.10.1 Remarks

1. All images below have quite a low resolution. As a result the effects of the different dithering types become more obvious. The higher the resolution and the large the number of colors is, the higher the quality of the image.
2. The rendering filter and current zoom level of the PDF viewing application may have an additional impact on how the images below are displayed.

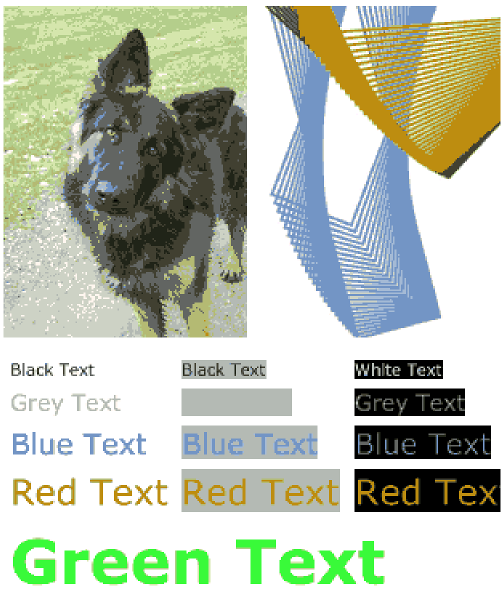
5.10.2 Color Images

Color Space	RGB (24 bit)
Dithering	None
File Size as PNG	129 kB
+	Highest quality
-	Highest file size

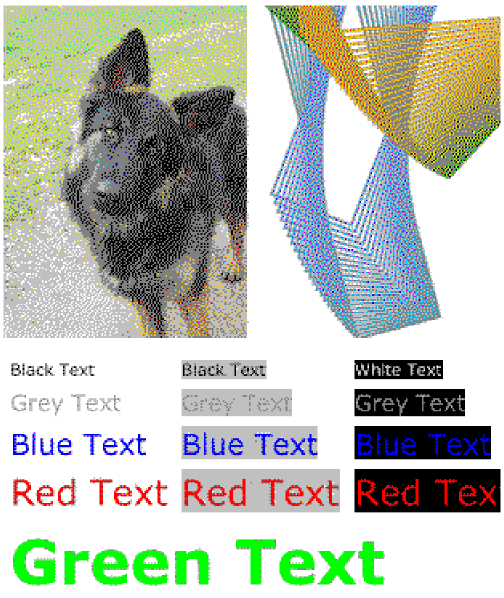


A 24 bit RGB color image can have up to 16.7 millions of different colors. Dithering does not need to be applied since all required colors exist and none need to be simulated.

Color Space	16 colors (4 bit)
Dithering	None
File Size as PNG	16 kB
+	Small file size
+	Works well for images with a small number of colors (artificial images, text)
-	Does not work well for images with lots of colors photographic images) - parts of the image can become plain-colored and details get lost



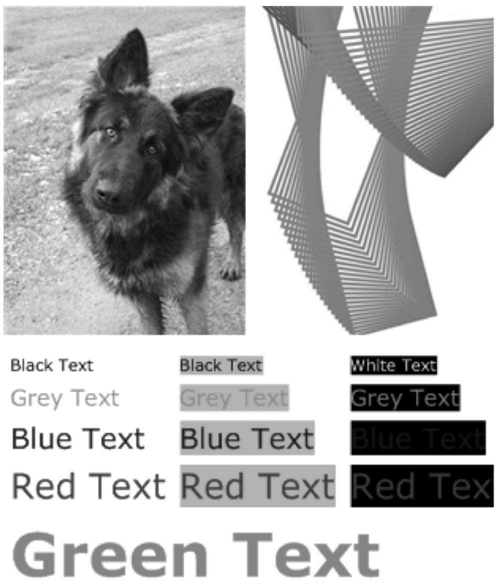
Color Space	16 colors (4 bit)
Dithering	Floyd-Steinberg
File Size as PNG	18 kB
+	Renders details better
+	Usually better overall quality, especially in photographic images than without dithering
-	Sometimes generates unwanted artifacts (striking pixels)
-	Larger file size then without dithering



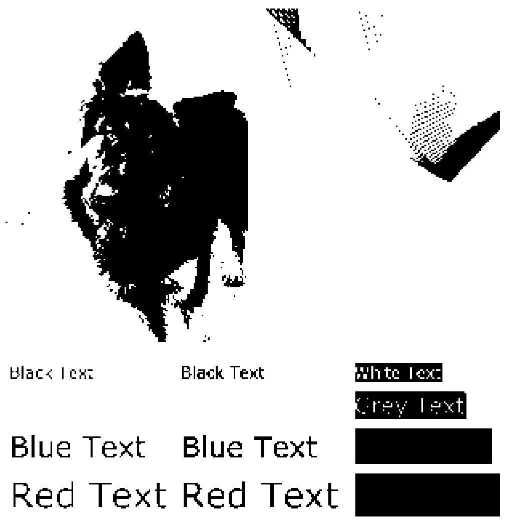
5.10.3 Bi-tonal Images

(The 8 bit image just acts as reference.)

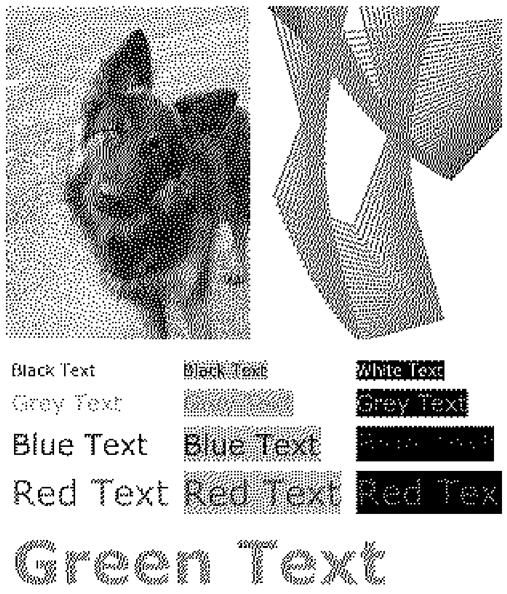
Color Space	Grayscale (8 bit)
Dithering	None
File Size as PNG	46 kB



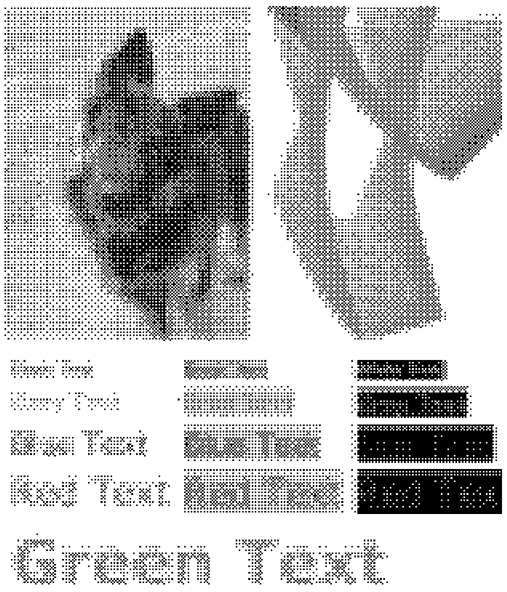
Color Space	Grayscale (1 bit)
Dithering	None
File Size as PNG	2.6 kB
+	Smallest File Size
+	Works well for documents with high contrast (black text on white background)
+	Does not generate artifacts
-	Details get lost, because shades of gray are not approximated, but converted to either black or white (in fact images or part of them can become completely black or white)



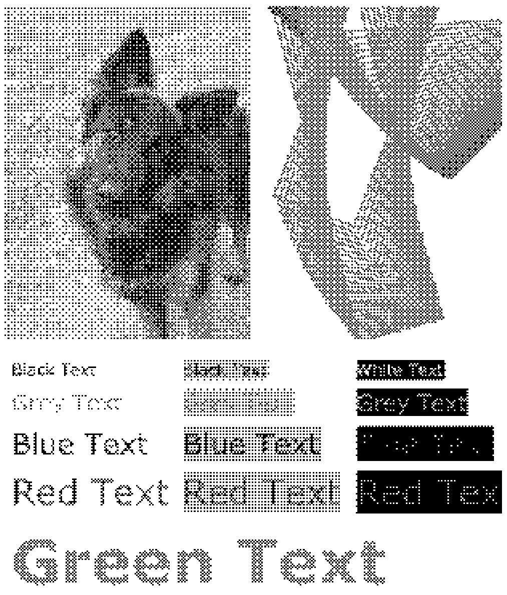
Color Space	Grayscale (1 bit)
Dithering	Floyd-Steinberg
File Size as PNG	9 kB
+	Generally higher quality, specially of photographic images
+	Can approximate any shade of gray
-	Larger file size than without dithering
-	Generates artifacts (e.g. a very bright gray paper is approximated by far-spread single black pixels)
-	Not well suited for text, unless the color of the text must be reflected



Color Space	Grayscale (1 bit)
Dithering	Halftone
File Size as PNG	4 kB
+	Small file size
+	Approximates shades of gray
-	Not well suited for text or artificial images



Color Space	Grayscale (1 bit)
Dithering	Pattern
File Size as PNG	5 kB
+	Works acceptable for all types of content (text, photographic images, artificial images)
-	Is not excellent in any type of content



5.10.4 Guidelines

As seen in the examples above, different types of dithering behave different for different types of content. Below are some suggestions, which dithering type is normally best for a give type of content:

Text, OCR No dithering

Artificial images with few colors and no bright colors No dithering

Artificial images with many colors Test which dithering type yields the best result

Photographic images Floyd-Steinberg

Mixed content Test which dithering type yields the best result

Mixed content, high-resolution For resolutions above 300 DPI, Floyd-Steinberg almost always yields the best result (exception: for pure black text on white background, use no dithering)

Keep in mind that dithering should only be applied for images with a low color depth, such as black and white (1 bit). Dithering for images with a color depth of 8 bit or higher (256 colors or grey scale) has little to no visual impact.

5.11 Error Handling

Most methods of the 3-Heights™ PDF to Image Converter API can either succeed or fail depending on user input, state of the PDF to Image 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 Programmer's Reference. 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 Open(string file, string password)
{
  if (!conv.Open(file, password))
  {
    if (conv.ErrorCode == PDFErrorCode.PDF_E_PASSWORD)
    {
      password = InputBox.Show("Password incorrect. Enter correct password:");
      return Open(file, password);
    }
    else
    {
      MessageBox.Show(String.Format(
        "Error {0}: {1}", conv.ErrorCode, conv.ErrorMessage));
      return false;
    }
  }
  [...]
}
```

6 Programmer's Reference

Note: This manual describes the COM interface only. Other interfaces (C, Java, .NET) however work similarly, i.e. they have calls with similar names and the call sequence to be used is the same as with COM.

6.1 Pdf2Img Interface

This interface is included in the `Pdf2ImgAPI.dll`.

This interface takes a PDF document as input and creates a raster image (e.g. a TIFF) as output.

6.1.1 BilevelThreshold

Property (get, set): `Long BilevelThreshold`
Default: `181`

Get or set the threshold for converting from gray to bi-tonal when Dithering is `eDitherNone`. Value must be in the range of `0` to `255`.

6.1.2 BitmapHeight

Property (get): `Long BitmapHeight`

Return the height of the bitmap in pixel.

6.1.3 BitmapWidth

Property (get): `Long BitmapWidth`

Return the width of the bitmap in pixel.

6.1.4 BitsPerPixel

Property (get, set): `Integer BitsPerPixel`
Default: `24`

Get or set the color depth. Bi-tonal: `1`, gray scale: `8`, RGB true color: `24`, CMYK: `32`.

When using 1 bit per pixel, it is suggested to disable anti-aliasing (enable `eOptionNoAntialiasing`) and set a suitable dithering algorithm (property `Dithering`).

6.1.5 `Center`

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

Set or get the center mode. When set to `True`, the document is horizontally and vertically centered on the page. When set to `False`, the document is printed to the upper left corner of the page.

6.1.6 `ClearRenderingProperties`

Method: `ClearRenderingProperties()`

Reset all rendering properties to their default value. Rendering properties can be set using `SetRenderingProperty`.

6.1.7 `Close`

Method: `Boolean Close()`

Close an opened input file. If the document is already closed the method does nothing.

Returns:

`True` The file was closed successfully.

`False` Otherwise.

6.1.8 `CloseImage`

Method: `Boolean CloseImage()`

Close an open image document. If the document is already closed the method does nothing.

Returns:

`True` The image file could successfully be closed.

`False` Otherwise.

6.1.9 ColorSpace

Property (get, set): `TPDFColorSpace ColorSpace`
Default: `eColorRGB`

Get or set color space of the output image, see enumeration `TPDFColorSpace`.

For black white bi-tonal images, a gray color space must be selected.

6.1.10 Compression

Property (get, set): `TPDFCompression Compression`
Default: `eComprLZW`

Get or set the compression type of TIFF images. For any other image format, the compression is automatically defined by the file extension (the file name).

The supported values for `TPDFCompression` are listed in the corresponding enumeration.

6.1.11 ConvertFile

Method: `Boolean ConvertFile(String PDFFileName, String ImageFileName, String Password)`

Convert a complete PDF file to a (multi-page) TIFF image file.

Parameters:

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

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

`Password` `[String]` 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.

Returns:

`True` The file was converted successfully.

`False` The PDF file does not exists, it is corrupt, the password is invalid, or the image file is locked.

6.1.12 CreateImage

Method: `Boolean CreateImage(String FileName)`

Create a new image file.

Parameter:

`FileName` [`String`] The file name and optionally the file path, drive or server string according to the operating systems file name specification rules. The file name defines the image format. Supported extensions are:

- `.bmp` (Windows Bitmap Format)
- `.gif` (Graphics Interchange Format)
- `.jb2` (JBIG2, Bi-level Images)
- `.jpg`, `.jpeg` (Joint Photographic Experts Group)
- `.jp2` (JPEG2000)
- `.jpf`, `.jpx` (JPEG2000, Part 2 - Coding Extensions)
- `.png` (Portable Network Graphics)
- `.tif`, `.tiff` (Tagged Image File Format)

Returns:

`True` The file could successfully be created.

`False` Otherwise.

6.1.13 CreateImageInMemory

Method: `Boolean CreateImageInMemory(String Extension)`

Save an image in memory as a byte array. See also method `GetImage`.

Parameter:

`Extension` [`String`] The name of the extension. For a list of supported extensions see method `CreateImage`. The leading "." needs to be included.

Returns:

`True` The image could successfully be created.

`False` Otherwise.

6.1.14 Dithering

Property (get, set): `TPDFDithering Dithering`
Default: `eDitherFloydSteinberg`

Get or set the dithering algorithm. Dithering refers to the procedure of simulating colors or grayscales. This is mainly useful for low color depth (e.g. black and white or indexed) images.

The supported values for `TPDFDithering` are listed in the corresponding enumeration. For more information see chapter Dithering.

6.1.15 `DPI`

Property (get, set): `Single DPI`
Default: `150`

Get or set the resolution of the image in DPI (dots per inch).

Set Both the resolutions for the x- and y-axis are set to the same value.

Get Return the square root of the product of x and y.

Setting DPI is redundant to setting the specialized properties `XDPI` and `YDPI`.

6.1.16 `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 Image 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 Image Converter API.

6.1.17 `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.

6.1.18 `FaxHSetting`, `FaxSSetting`

Method: `Boolean FaxHSetting()`

Method: `Boolean FaxSSetting()`

These two methods set the TIFF Class F settings, which is equal to:

```
conv.RotateMode = eRotatePortrait
conv.SetBitmapDimensions(1728, 0)
conv.XDPI = 204
conv.YDPI = 196 ' for Fax H
conv.YDPI = 98  ' for Fax S
conv.Compression = eComprGroup3
```

6.1.19 `FillOrder`

Property (get, set): `Integer FillOrder`
Default: `1` (MSB)

Get or set the bit fill order. `1` is MSB (Most significant bit) first, `2` is LSB (Least significant bit) first.

6.1.20 `FilterRatio`

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

This property is used to enable and parameterize super-sampling, a technique to initially render the image at a higher resolution and then sample it down to the target resolution. As a result of that process the final image appears smoother, i.e. anti-aliased.

Applying super-sampling improves the image quality when rendering at low target resolutions (72 DPI or less); the higher the target resolution the less the visual impact.

This property requires memory and CPU time quadratically to the ratio, therefore only small values, such as 2 or 3 should be used.

If a too high value (in combination with the original image size) is set, it is ignored.

6.1.21 `FitPage`

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

Get or set the fit page mode. If set to `True`, the page is scaled to fit the image (in either width or height). If set to `False`, the page is rendered with its true size.

6.1.22 `GetImage`

Method: `Variant GetImage()`

Return the byte array which was previously saved using `CreateImageInMemory`.

6.1.23 GetOcg

Method: `Ocg GetOcg(Integer Count)`

Return an interface to an optional content group item.

Parameter:

`Count` `[Integer]` The number of the optional content group. Optional content groups are numbered from `0` to `OcgCount-1`.

Returns:

An interface to an optional content group item.

See also interface Ocg Interface.

6.1.24 HasColor

Method: `Boolean HasColor(Long IPageNo)`

Return `True` if the selected page contains colors, `False` otherwise.

6.1.25 ImageQuality

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

Get or set the quality index of lossy compression types. This value ranges from `1` to `100` and is applied to JPEG and JPEG2000 compression. For JPEG2000, a quality index of `100` means lossless compression. JPEG compression is always lossy.

6.1.26 LicenseIsValid

Property (get): `Boolean LicenseIsValid`
Static

Check if the license is valid.

6.1.27 OcgCount

Property (get): `Long OcgCount`

Get the number of optional content groups (also known as “layers”) of the document.

See also GetOcg.

6.1.28 Open

Method: `Boolean Open(String Filename, String Password)`

Open a PDF file, i.e. make the objects contained in the document accessible. If another document is already open, it is closed first.

Parameters:

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

`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.

Returns:

`True` The file could be successfully opened.

`False` The file does not exist, it is corrupt, or the password is not valid. Use the properties ErrorCode and ErrorMessage for additional information.

6.1.29 OpenMem

Method: `Boolean OpenMem(Variant MemBlock, String Password)`

Open a PDF file, i.e. make the objects contained in the document accessible. If a document is already open, it is closed first.

Parameters:

`MemBlock` `[Variant]` The memory block containing the PDF file given as a one dimensional byte array.

`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.

Returns:

`True` The document could be successfully opened.

`False` The document could not be opened, it is corrupt, or the password is not valid.

6.1.30 OpenStream

Method: `Boolean OpenStream(Variant Stream, String Password)`

Open a PDF file, i.e. make the objects contained in the document accessible. If a document is already open, it is closed first.

Parameters:

`Stream` `[Variant]` The stream providing the PDF file. The stream must support random access.

`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.

Returns:

`True` The document could be successfully opened.

`False` The document could not be opened, it is corrupt, or the password is not valid.

6.1.31 Options

[Deprecated] Property (get, set): `TPDFRendererOption Options`

Use `Options2`.

6.1.32 Options2

Property (get, set): `TPDFRendererOption2 Options2`

Set or get a specific rendering option.

Use bitwise "OR" to add an option.

Use bitwise "AND NOT" to remove an option.

For more information on the options available in the 3-Heights™ PDF to Image Converter API and how to use the this property please see `TPDFRendererOption2`.

6.1.33 PageCount

Property (get): `Long PageCount`

Get the number of pages of an open document. If the document is closed or if the document is a collection (also known as PDF Portfolio) then this property is `0`.

6.1.34 `PageHeight`

Property (get): `Float PageHeight`

Return the height of the page in points.

6.1.35 `PageWidth`

Property (get): `Float PageWidth`

Return the width of the page in points.

6.1.36 `PageXOffs`, `PageYOffs`

Property (get): `Float PageXOffs`
Default: `CropBox`

Property (get): `Float PageYOffs`
Default: `CropBox`

Method: `SetPageOffs(Float x, Float y)`

Get the offset of the page in points. The default offset is the CropBox's. Set the offset before `RenderPage` and get it afterwards.

6.1.37 `PreserveAspectRatio`

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

If `True` a uniform up- or down-scaling is applied, i.e. the output image has the same ratio of width to height as the input file and its size will fit into the defined dimensions, given by `SetBitmapDimensions`.

6.1.38 `ProductVersion`

Property (get): `String ProductVersion`

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

6.1.39 `Quality`

[Deprecated] **Property (get, set):** `Integer Quality`

Use `ImageQuality` instead.

6.1.40 RenderingMode

[Deprecated] **Property (get, set):** `RenderingMode RenderingMode`

In version 2.0 and higher there is only one rendering mode.

6.1.41 RenderPage

Method: `Boolean RenderPage(Long PageNumber)`

Render (convert) the selected page in the PDF document to the raster image.

Parameter:

`PageNumber`	`[Long]`	The page number in the PDF document, non-zero based.

Returns:

`True`	The page was rendered successfully.
`False`	The page could not be rendered. Possible reasons are: out of range, no PDF opened, no image created.

6.1.42 RotateMode

Property (get, set): `TPDFRotateMode RotateMode`
Default: `eRotateAttribute`

Get or set the rotation mode of the page. There are four valid values which are described in the enumeration `TPDFRotateMode`.

6.1.43 SetBitmapDimensions

Method: `Void SetBitmapDimensions(Long X, Long Y)`

Set the dimensions of the image in pixels.

Parameters:

`X`	`[Long]`	The X dimension of the image in pixels.
`Y`	`[Long]`	The Y dimension of the image in pixels.

6.1.44 SetCMSEngine

Method: `Boolean SetCMSEngine(String CMSEngine)`

Set the Color Management System (CMS) Engine. The following strings are supported:

"None" The algorithms specified in the PDF reference are used. This results in the maximum possible contrast.

"Neugebauer" The Neugebauer algorithm efficiently converts CMYK to RGB. It does not need any color profiles. The results, however, look similar to conversion using color profiles.

"lcms" (default): Use ICC color profiles. Default profiles are used for all unmanaged device color spaces as described in section Color Profiles.

FileName Providing a file name, a configurable version of the Neugebauer algorithm is applied. The coefficients can be defined in the text file. The default Neugebauer coefficients are listed below (Red, Green, Blue; Color):

```
0.996078, 0.996078, 0.996078 ; White
0.000000, 0.686275, 0.937255 ; C
0.925490, 0.149020, 0.560784 ; M
1.000000, 0.949020, 0.066667 ; Y
0.215686, 0.203922, 0.207843 ; K
0.243137, 0.247059, 0.584314 ; CM
0.000000, 0.658824, 0.349020 ; CY
0.066667, 0.176471, 0.215686 ; CK
0.929412, 0.196078, 0.215686 ; MY
0.215686, 0.101961, 0.141176 ; MK
0.200000, 0.196078, 0.125490 ; YK
0.266667, 0.266667, 0.274510 ; CMY
0.133333, 0.098039, 0.160784 ; CMK
0.074510, 0.180392, 0.133333 ; CYK
0.215686, 0.121569, 0.113725 ; MYK
0.125490, 0.121569, 0.121569 ; CMYK
```

The Neugebauer algorithm mixes the colors based on the amount of color and the corresponding weighted coefficient. Altering the values for a pure color specifically changes the result for this pure color.

The color transition remains smooth.

6.1.45 SetCMYKProfile

Method: `Boolean SetCMYKProfile(String FileName)`

Set the path to the CMYK profile. If no path is set, a default profile is used (see Color Profiles).

Parameter:

FileName `[String]` The path and file name of the ICC CMYK color profile.

Returns:

`True` The color profile could successfully be selected.

`False` Otherwise.

6.1.46 `SetLicenseKey`

```
Method: Boolean SetLicenseKey(String LicenseKey)
```

Set the license key.

6.1.47 `SetPageSize`

```
Method: Void SetPageSize(Single X, Single Y)
```

Set the dimensions of the image in points.

Parameters:

`X` `[Single]` The X dimension of the image in points.

`Y` `[Single]` The Y dimension of the image in points.

6.1.48 `SetRenderingProperty`

```
Method: Boolean SetRenderingProperty(TPDFRenderingProperty Property, String
  Value)
```

Set a rendering property. A list of rendering properties and their allowed values can be found in `TPDFRenderingProperty`. All rendering properties can be reset to their initial value using `ClearRenderingProperties`.

Parameters:

`Property` `[TPDFRenderingProperty]` The property to set.

`Value` `[String]` The new value.

Returns:

`True` The property could successfully be set.

`False` Otherwise.

6.1.49 `SetsRGBProfile`

Method: `Boolean SetsRGBProfile(String FileName)`

Set the path to the RGB profile. If no path is set, a default profile is used (see Color Profiles).

Parameter:

`FileName`	`[String]`	The path and file name of the ICC RGB color profile.

Returns:

`True`	The color profile could successfully be selected.
`False`	Otherwise.

6.1.50 `UnsupportedFeatures`

Property (get, set): `long UnsupportedFeatures`

Get the unsupported features used on the last page rendered (see enummeration `TPDFUnsupportedFeature`).

6.1.51 `XDPI, YDPI`

Property (get, set): `Single XDPI`
Default: `150`

Property (get, set): `Single YDPI`
Default: `150`

Get or set the resolution in the X and Y-axis of the image in dots per inch.

6.2 Ocg Interface

The optional content group (OCG) interface allows to list optional content groups (also known as "Layers") and their properties.

Optional content groups (OCGs) in PDF differ substantially from the simple layer paradigm found e.g. in graphics editing programs. Graphics objects in PDF do not belong to an OCG. Instead, their visibility is calculated by a Boolean function dependent on the state of any number of OCGs. For example, a path could be visible only if OCG "A" is ON and OCG "B" is OFF.

The functionality of OCG are described in depth in ISO 32000-1, chapter 8.11.4 or in the PDF Reference, chapter 4.10. OCG is supported in PDF 1.5 or later. In the 3-Heights™ PDF to Image Converter API, the Ocg interface can be used to list "layers" and set them to visible or not. To get the Ocg object, use the methods `OcgCount` and `GetOcg` from the `Pdf2Img` Interface.

6.2.1 `Label`

Property (get): `Boolean Label`

This is a flag that indicates whether this is an OCG or a label. Labels are used to label groups of OCGs in the hierarchy. Setting their visibility has no effect.

6.2.2 `Level`

Property (get): `Long Level`

In user interfaces OCGs can be shown in a tree. The property `Level` indicates the hierarchy level of the OCG in that tree.

OCG with Level `0` is a top level OCG. Level `-1` means that the OCG is not part of the hierarchy, it should not be presented to the user. Parent elements in the OCG hierarchy can be labels or OCGs. If the level of a label b is higher than its predecessor a, b is the parent element of the following objects of the same level as b. If the level of an OCG b is higher than its predecessor OCG a, a is the parent of the following objects of the same level as b. Note that the hierarchy reflects actual nesting of OCGs in the content. Setting the visibility of an OCG to `True` only has an effect if the visibilities of all its parents are set to `True`.

6.2.3 `Name`

Property (get): `String Name`

Return the name of the OCG.

6.2.4 `Visible`

Property (get, set): `Boolean Visible`

Get or set if the OCG is visible. This property controls the extraction of content objects. The default value is the one configured in the PDF document.

Note that though invisible paths generate no marks on the page, they still have an effect on the graphics state. For example their effect on the current drawing position and the clipping region does not change. Therefore, all paths are “active” and extracted regardless of their visibility. Invisible paths just use the end path operator “n”, instead of a filling or stroking operator.

Example 1:

ID, OCGs, Level:	**Hierarchy**
0, OCG A, 0	- OCG A
1, OCG B, 0	- OCG B
2, OCG B1, 1	- - OCG B1
3, OCG B2, 1	- - OCG B2
4, OCG C, -1	hidden: OCG C

Example 2:

ID, OCGs/Labels, Level	**Hierarchy**
0, OCG A, 0	- OCG A
1, Label B, 1	- Label B
2, OCG B1, 1	- - OCG B1
3, OCG B2, 1	- - OCG B2
4, Label C, 1	- Label C
5, OCG C1, 1	- - OCG C1
6, OCG D, 0	- OCG D

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 `TPDFColorSpace`

TPDFColorSpace Table

Value		Number of Channels
`eColorGray`	Gray	1: gray
`eColorGrayA`	Gray with alpha channel	2: gray and alpha
`eColorRGB`	Color RGB	3: red, green, and blue
`eColorRGBA`	Color RGB with alpha channel	4: red, green, blue, and alpha
`eColorCMYK`	Color CMYK	4: cyan, magenta, yellow, and key (black)
`eColorYCbCr`	Color YCbCr	3: luminance (Y) and chroma (Cb, Cr)

TPDFColorSpace Table

eColorYCbCrK	Color YCbCrK	4: Luminance (Y), Chroma (Cb, Cr), and black
eColorPalette	Color space using a palette	1: palette indices (into an RGB color table).
eColorLAB	Color CIE L*a*b*	3: L, A, and B
eColorOther	Other	
eColorCMYK_Konly	Gray-scale CMYK	Only the K channel is used

6.3.2 TPDFCompression

TPDFCompression Table

TPDFCompression	Description
eComprRaw	No compression
eComprJPEG	Joint Photographic Expert Group
eComprFlate	Flate compression
eComprLZW	Lempel-Ziv-Welch
eComprGroup3	CCITT Fax Group 3
eComprGroup3_2D	CCITT Fax Group 3 2D
eComprGroup4	CCITT Fax Group 4
eComprTIFFJPEG	JPEG (6). This is an older version of JPEG. Certain (older) image software may support this compression, but not the newer version of JPEG (e.g. Photoshop 8).

Note: Not all image formats/color depths support all compression types.

6.3.3 TPDFDithering

TPDFDithering Table

TPDFDithering	Description
eDitherNone	No dithering
eDitherFloydSteinberg	Floyd-Steinberg (Default)

TPDFDithering Table

eDitherHalftone	Half-toning
eDitherPattern	Pattern Dithering
eDitherG3Optimized	Dithering optimized to compress well with Group 3
eDitherG4Optimized	Dithering optimized to compress well with Group 4
eDitherAtkinson	Atkinson dithering is very fast and produces images that can be compressed really well with a reasonably good image quality.

6.3.4 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.PDFError-Code. Note that only a few are relevant for the 3-Heights™ PDF to Image 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_COLLECTION	The input file is a PDF collection without an initial document

TPDFErrorCode Table

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.

6.3.5 TPDFRendererOption2

Renderer options are set using the property Options2. To combine multiple options use a bitwise OR operator. To disable an option use the bitwise AND NOT operators.

Example: Visual Basic

Enable an option, and leave all other options untouched:

```
' Enable printing mode
.Options2 = .Options2 OR eOptionPrintingMode
```

Example: C/C++

```
int iOptions = Pdf2ImgGetOptions2(pDocument);
// Enable printing mode
Pdf2ImgSetOptions2(pDocument, iOptions | eOptionPrintingMode);
```

The following list includes renderer options that are relevant for the 3-Heights™ PDF to Image Converter API.

TPDFRendererOption2 Table

TPDFRendererOption	
eOptionNoAntialiasing	Anti-aliasing for text and path objects and filtering of image objects can be turned off with this option.
eOptionNoInterpolation	Don't use interplation filtering for images.
eOptionNoLowPassFilter	Disable image low pass filtering, which is used to downscale images Images are scaled using the nearest-neighbor algorithm, which improves performance at the cost of rendering quality.
eOptionNoHinting	Don't use hinting for glyph rendering.

TPDFRendererOption2 Table

`eOptionPrintingMode`	Draw the document as it was intended for printing. Otherwise, the document is drawn as it is shown in an interactive viewer. For example, this has an effect on which annotations are visible.
`eOptionNoBPC`	If this option flag is set then the black point compensation feature is disabled when converting colors e.g. from CMYK to RGB.
`eOptionFitPaths`	Fit clipping paths to pixel grid.
`eOptionUseBoxFilter`	Use a box filter instead of a Gauss filter to downsample images.

6.3.6 TPDFRenderingProperty

Rendering properties are set using the method `SetRenderingProperty`.

TPDFRenderingProperty Table

TPDFRenderingProperty	
`eRenderingPropertyNone`	Placeholder value for future property.

6.3.7 TPDFRotateMode

TPDFViewerOption Table

TPDFRotateMode	
`eRotateAttribute`	Set the rotation to the viewing rotation attribute of the PDF page, i.e. rendering the page with the same rotation as it is displayed in a PDF viewer.
`eRotatePortrait`	Rotate page to portrait.
`eRotateLandscape`	Rotate page to landscape.
`eRotateNone`	Process the page as it is saved in the pdf file.

7 Tips, Tricks and Troubleshooting

7.1 Font and Text Issues

1. For issues with text using non-embedded fonts:
   1. Ensure the required fonts are available on the system (see Chapter Fonts).
   2. See Section Handle Non-Embedded Fonts.

7.1.1 Handle Non-Embedded Fonts

Font Replacement Strategy

This section describes the exact behavior of font handling of the rendering engine. It is rather technical and it is not required to be understood in order to properly use the software.

The following steps are performed sequentially in the search of a font. If a font is found, the search is stopped; otherwise the next step is performed.

1. If the font is not embedded:
   a. If the font name appears in the `[replace]` section in the configuration file `fonts.ini` the name is replaced and looked up in the installed font collection.
   b. If it is a standard font[7] it is replaced by the equivalent TrueType font name and it is looked up in the installed font collection.
   c. If the font name appears in the `[fonts]` section in the configuration file `fonts.ini` the name is replaced and looked up in the installed font collection.
   d. If the font has "Italic" or "Bold" in its name the font without these styles is looked up in the installed font collection.
2. If a font name is looked up in the installed font collection then the name comparison is performed as follows:
   a. PostScript name.
   b. TrueType name without blanks (a missing style is interpreted as "Regular" or "Normal").
   c. TrueType name without modifications.
3. If a font from the installed font collection matches the metrics of the font, the installed font is used.
4. If the font is a CID font using a specific character collection, e.g. "Japan1", an installed font that contains the required code pages is used.
5. If the font is a non-symbolic simple font, a font program with the font metrics required is created dynamically.

[7] e.g. Times-Roman, Helvetica, Courier

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

- RenderingEngine R2 performance enhanced when using Type 3 fonts
- 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.
- [PHP] **New** Interface for Windows and Linux. Supported versions are PHP 5.6 & 7.0 (Non Thread Safe). The `Pdf2ImgAPI` PHP Interface is contained in the 3-Heights™ PDF Tools PHP5.6 Extension and the 3-Heights™ PDF Tools PHP7.0 Extension.

8.2 Changes in Version 4.9

- 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`[8].
- [.NET, C, Java] **New** method `OpenStream()`.
- [.NET, C, COM, Java] **New** property `ErrorMessage` to obtain a message about the occurred error in the most recent API call.

8.3 Changes in Version 4.8

- 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.
- [.NET, C, COM, Java] **New** property `ProductVersion` to identify the product version.
- [.NET] **Deprecated** method `GetLicenseIsValid`.
- [.NET] **New** property `LicenseIsValid`.

[8] This has no effect on neither the .NET, Java, nor COM API

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