DynaPDF 4.0

Reference & Manual

API Reference Version 4.0.27

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Legal Notices

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DynaPDF uses parts or modified versions of the following third-party software:

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Data types

DynaPDF is a low level library that uses basic data types only. DynaPDF uses generally no default string class or special C++ extensions such as STL or MFC.

The data types used by DynaPDF are defined as follows (C syntax):

```
typedef unsigned char  BYTE;
typedef signed short   SI16;
typedef unsigned short UI16;
typedef double         FFLOAT; // Obsolete, do not use this data type.

#ifdef _WINDOWS
   #if defined(WIN64) || defined(_WIN64)
      typedef int          SI32;
      typedef unsigned int  UI32;
   #else
      typedef long          SI32;
      typedef unsigned long UI32;
   #endif
#elif (SIZEOF_INT == 4) // declared in drv_conf.h (Linux/UNIX only)
   typedef int          SI32;
   typedef unsigned int  UI32;
#elif (SIZEOF_LONG == 4) // declared in drv_conf.h (Linux/UNIX only)
   typedef long          SI32;
   typedef unsigned long UI32;
#else
   #error "Only 32 bit and 64 bit targets are supported!"
#endif

typedef SI32 LBOOL; // long boolean (0 = false, not 0 = true)
// This data type is provided for C only since this language does not
// support a Boolean data type.
#ifndef __cplusplus
   typedef enum
   {
      false = 0,
      true = 1
   }bool;
#endif
```

The data type char is not explicitly defined but also used by DynaPDF.

SI32 and UI32 must always be a 32 bit integer. It is not possible to use DynaPDF on a target system that does not support a 32 bit integer type, like MS-DOS. DynaPDF can be used on 32 and 64 bit operating systems. The current version was tested with Android, IBM-AIX, HP-UX, iOS, Linux, Mac OS X, Sun-Solaris, Tru64, and MS-Windows.

With very few exceptions, string values returned by DynaPDF are always null-terminated. A string length returned by DynaPDF is always the length excluding the null-terminator.

Var Parameters

```
#ifdef __cplusplus
   #define ADDR &
#else
   #define ADDR *
#endif
```

Functions in DynaPDF, which pass a value to a function parameter are handled differently in C and C++. C does not support the address operator & so that *var* parameters are defined as normal pointers to pointers in C. DynaPDF checks whether a variable or NULL was passed to a function before the function tries to access the variable. However, C++ does not allow to set a parameter to NULL if it was declared with the address operator &.

Structures

Beginning with DynaPDF 2.5 all structures which can be extended in future versions contain the member **StructSize**. This variable must be set to sizeof(StructureName). The structure size is used to identify the version of a structure so that extensions do not break backward compatibility.

The structure size is automatically set in interfaces for C#, Visual Basic, Visual Basic .Net, and Delphi. C/C++ programmers must set this member before the corresponding function can be called:

Example:

```
...
TPDFCMap cmap;
cmap.StructSize = sizeof(TPDFCMap);
pdfGetCMap(pdf, handle, &cmap);
...
```

Multi-byte Strings

Unicode

DynaPDF supports Unicode strings in UTF-16-LE format on little-endian machines and UTF-16-BE on big-endian machines. On target systems which use UTF-32 (LE or BE) as default string format such as Linux or most UNIX OS, all strings must be converted to UTF-16 before passing to DynaPDF.

You can use the predefined macro ToUTF16 to do this.

ToUTF16 is defined as follows:

```
// declared in drv_conf.h (Linux/UNIX, Mac OS X)
#if (SIZEOF_WCHAR_T == 4)
   #define ToUTF16(IPDF, s)(pdfUTF32ToUTF16((IPDF), (UI32*)(s)))
#else                       // UTF-16
   #define ToUTF16(IPDF, s)((s))
#endif
```

This macro calls pdfUTF32ToUTF16() only if the OS uses UTF-32 as Unicode string format.

On operating systems which use already UTF-16, no conversion is applied; the macro will be removed by the compiler. The function pdfUTF32ToUTF16() holds an array of 4 independent string buffers so that the macro can be used in functions which support up to four string parameters. If DynaPDF will ever support a function with more than 4 string parameters, the number of internal string buffers will be incremented.

However, take care when using the macro to initialize string variables of structures which contain more than 6 string members:

Example:

```
SOME_STRUCT myStruct;
myStruct.String1 = ToUTF16(pdf, L"String1"); // OK
myStruct.String2 = ToUTF16(pdf, L"String2"); // OK
myStruct.String3 = ToUTF16(pdf, L"String3"); // OK
myStruct.String4 = ToUTF16(pdf, L"String4"); // OK
myStruct.String5 = ToUTF16(pdf, L"String5"); // OK
myStruct.String6 = ToUTF16(pdf, L"String6"); // OK
myStruct.String7 = ToUTF16(pdf, L"String7"); // Wrong!
```

The seventh call above overrides the string buffer of String1 because only 6 internal string buffers are available. If you need to store more than 6 string variables then you must copy the converted string into another variable!

Unicode File Paths

Unicode file paths are encoded differently depending on the used operating system. While NT based Windows system use UTF-16 encoded Unicode file paths, non-Windows systems use usually UTF-8 encoded Unicode file paths. All DynaPDF functions which open a file convert UTF-16 strings to UTF-8 on non-Windows operating systems. However, to avoid this conversion step it is usually best to use directly the Ansi version of a function and passing an UTF-8 file path to it.

CJK Multi-byte Strings

CJK multi-byte strings contain mixed 8 bit / 16 bit character codes. A CJK string can be defined as an Ansi string (data type char*) and as multi-byte string (data type UI16*). The multi-byte format

uses two bytes for every character and the byte ordering of the CPU must be considered to get correct results on little-endian and big-endian machines.

However, the multi-byte format is only supported in combination with native CJK fonts and character sets (cpBig5, cpShiftJIS, cpGB2312 and so on), see SetFont() for further information.

The Ansi format is the usual format for CJK strings and supported by all CJK code pages.

When using CJK to Unicode code pages, DynaPDF must convert the incoming CJK string to Unicode before it can be used with the selected font. The required conversion algorithms are only available in the Ansi version of a string function. Because of this it is not possible to use the multi-byte format with CJK to Unicode code pages.

Data types used by different programming languages

Not all programming languages support all data types which are available in C or C++. The following table describes the data types which are used by a specific programming language. Types in black color are not natively supported.

C type	C++ type	Delphi type	VB type	VB .Net type	C#
char*	char*	PAnsiChar	String	String	String
UI16*	UI16*	PWideChar	String	String	String
UI32*	UI32*	Pointer	N/A	N/A	N/A
SI32	SI32	Integer	Long	Integer	int
UI32	UI32	Cardinal	Long	Integer	int
double	double	Double	Double	Double	double
LBOOL	LBOOL	LongBool	Long	Integer	lbool (Int32)
bool	bool	Boolean	Boolean	Boolean	bool
void*	void*	Pointer	Long	IntPtr	IntPtr

VB .Net and C# support also unsigned data types such as unsigned integer and so on. However, the .Net framework requires always an explicit conversion if an unsigned type should be passed to a signed type or vice versa. Because of this, the unsigned data types are used for very few functions in VB .Net and C#.

Prior versions of DynaPDF used the abbreviations LONG, ULONG, SHORT, and USHORT in the C/C++ interfaces. For compatibility reasons these data types are still defined on 32 bit Windows, Linux, and UNIX. However, these declarations conflict with existing declarations on 64 bit Windows operating systems so that these types should no longer be used.

Exception handling

The DynaPDF library uses no native exception handling. It is not required to leave a function block after an error occurred. All DynaPDF functions are leaved immediately when a fatal error occurred without displaying further error messages.

The library always holds its internal state consistent, regardless what happens.

Exception handling in C, C++, C#, Delphi

Error messages and warnings are passed to a callback function (see SetOnErrorProc()) if set. If no callback function is set, you must check the return value of important functions. Negative return values indicate by default that an error occurred. Call GetErrorMessage() to get the last error message in this case.

The Delphi interface uses native language exceptions in the following reasons:

- When loading the dynapdf.dll (Cannot find dynapdf.dll)
- When loading a DynaPDF function (Cannot find function: …)
- When creating a new instance of the wrapper class TPDF (Out of memory).

Only these three exceptions can occur when using DynaPDF with Delphi. All other errors do not raise an exception; the error callback function is called instead if any.

The error callback function is defined as follows (C/C++):

```
typedef SI32 PDF_CALL TErrorProc(
   const void* Data,       // User defined pointer
   SI32 ErrCode,           // Error code
   const char* ErrMessage, // Error message
   SI32 ErrType)           // Error type

#define PDF_CALL __stdcall // Windows only, otherwise empty
```

All callback functions contain a parameter named "Data" which holds a user defined pointer. *Data* can be set with SetOnErrorProc(). If you don't need this pointer, set it to NULL. The pointer *Data* is always passed unchanged to the callback function.

ErrCode is a positive error number starting at zero. *ErrType* is a bit mask to determine what kind of error occurred. The following constants are defined:

```
#define E_WARNING      0x02000000
#define E_SYNTAX_ERROR 0x04000000
#define E_VALUE_ERROR  0x08000000
#define E_FONT_ERROR   0x10000000
#define E_FATAL_ERROR  0x20000000
#define E_FILE_ERROR   0x40000000
```


At time of publication only one flag is set at any one time. Future versions maybe set multiple flags, e.g. E_SYNTAX_ERROR and E_WARNING.

Because of this, it is required to mask out the error type:

```
if (ErrType & E_SYNTAX_ERROR)
{
   // some code
   return 0; // continue processing
}
```

If the error callback function returns a value other than zero, processing stops immediately.

All callback functions must use the correct calling convention. The C definition above contains the macro PDF_CALL that is defined as __stdcall under Windows. Note that a wrongly defined calling convention causes an access violation!

When using DynaPDF with C or C++, you can change the calling convention to __fastcall or __cdecl by changing the macro PDF_CALL in the main interface dynapdf.h and in the project settings. However, standard call is strongly recommended. Note that the library must be recompiled when changing the calling convention. Delphi, Visual Basic, and VB .Net require standard call!

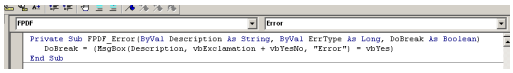
Exception handling in Visual Basic, Visual Basic .Net

The Visual Basic wrapper class CPDF uses events instead of callback functions to pass error messages and warnings to the user; native language exceptions are not used.

The usage of the event functions is quite easy; just declare a local instance variable of the wrapper class CPDF in the Option Explicit section of the unit as follows:

```
Private WithEvents FPDF As CPDF
```

The command above enables the event support of the class CPDF. The instance variable FPDF is now listed in the left combo box of the VB code editor.



The right combo box contains the available events, when selecting the event "Error" VB adds automatically an empty event procedure to your source code:


```
Private Sub FPDF_Error(ByVal Description As String, ByVal ErrType As
Long, DoBreak As Boolean)
    ' Add your code here
End Sub
```

Now you can enter some code that should be executed when the event is fired. Note that you must still create an instance of the class CPDF before a DynaPDF function can be executed (see Language bindings/Visual Basic for further information).

The handling of events in VB .Net is exactly the same as in VB 6.0.

Special issues in Visual Basic and .Net

The usage of events in Visual Basic or VB .Net is quite easy; however, there is a special behaviour that must be taken into account when developing VB applications. When using the DoEvents procedure in a VB function you must make sure that the function cannot be executed again while a previous call of the function is still running.

DoEvents enables the asynchronous processing of the message loop so that the user interface can be updated and the user can execute something while a function is running (e.g. break processing). DoEvents is often used because it is an easy way to avoid blocking of an application without using of threads.

However, when using DoEvents it is possible that a user clicks on the button again that executes DynaPDF functions while a previous call is still running. This is normally no problem but it is impossible to execute an event function inside of a cloned function. When DynaPDF tries to raise an event inside the cloned function an access violation occurs and VB crashes. VB .Net does not crash but raises a System.NullReference exception in that case.

To avoid such problems check whether the function is still running:

```
Option Explicit
Private WithEvents FPDF As CPDF 'Enable event support
Private FRunning As Boolean

Private Sub Command1_Click()
   If FRunning Then Exit Sub 'Check whether a previous call is running
   FRunning = True
   'Call some DynaPDF functions here...
   DoEvents 'Process messages
   FRunning = False
End Sub
```

The code above simply checks whether a previous call of the function is running before the function can be executed again.

Customized Exception handling

By default, only fatal errors will stop processing. Warnings, syntax errors and so on are all ignored. You can customize the exception handling to your own requirements with the property Get/SetOnErrorMode(). With the following constants you can determine what kind of error should be treated as fatal error:

```
typedef SI32 TErrMode;
#define emIgnoreAll    0x00000000 // default
#define emSyntaxError  0x00000001
#define emValueError   0x00000002
#define emWarning      0x00000004
#define emFileError    0x00000008
#define emFontError    0x00000010
#define emAllErrors    0x0000FFFF
#define emNoFuncNames  0x10000000 // Do not output function names
```

If a specific flag is set, DynaPDF treats this error type as fatal error; the internal resources will be freed and all changes made before are lost.

DynaPDF never produces a damaged PDF file if a warning or error message was ignored, but certain functions may be not executed. For example, if SetFont() cannot find the selected font, it returns with a warning and no font is set, the active font (if any) is left unchanged.

If no other font was set before, it is not possible to output text. All text functions also return then with a warning because there is no active font, but nothing more happens than a warning is issued.

When a fatal error occurred, all functions are leaved immediately. No further warnings or error messages are displayed. It is not possible to execute a function (except global properties which do not change PDF objects directly) after a fatal error occurred.

There is no need to check the return value of each function, and there is no need to leave a function block after a fatal error occurred. The internal error flag is cleared when CreateNewPDF() is called the next time.

The special flag ***emNoFuncNames*** names can be used to avoid the output of the function name in error messages. Error messages start normally always with the function name in which the error occurred. While this information is useful during development, it is often not useful in an end user application.

Remarks:

The constants are defined as enum in Visual Basic, VB .Net, and C#.

Custom Library Changes

This section is only of interest if you have a copy of the source codes. If you use a version without source codes you can skip this chapter.

Compiler Switches

DynaPDF supports several compiler switches to disable unnecessary features. The following macros disable or enable one of the image libraries used by DynaPDF as well as other features. The macros are defined in the header file /main/drv_type.h.

```
#define DRV_SUPPORT_AES  1 // AES encryption and decryption
#define DRV_SUPPORT_CJK  1 // about 150 KB (CJK to Unicode conversion)
#define DRV_SUPPORT_EMF  1 // EMF Converter
#define DRV_SUPPORT_GIF  1 // about 1 KB
#define DRV_SUPPORT_IMP  1 // about 50 KB (PDF import)
#define DRV_SUPPORT_JP2K 1 // about 180 KB
#define DRV_SUPPORT_JPEG 1 // about 90 KB (no effect if TIFF is enabled)
#define DRV_SUPPORT_PGM  1 // PBM, PGM, PNM, PPM Image formats, ~1 KB
#define DRV_SUPPORT_PNG  1 // about 100 KB
#define DRV_SUPPORT_PSD  1 // about 1 KB
#define DRV_SUPPORT_RC4  1 // RC4 encryption and decryption
#define DRV_SUPPORT_SIGN 1 // Self sign signatures -> AiCrypto Library
#define DRV_SUPPORT_TIFF 1 // about 310 KB
```

To disable a specific feature set the constant to zero. Note that the TIFF library uses also the JPEG library. Because of this, disabling the JPEG library only does not reduce the library size.

The following constants are used by WriteFText() (defined in dynapdf.h).

```
#define PDF_MAX_LIST_COUNT 6    // Maximum count of nested list levels
#define PDF_LIST_SEP_WIDTH 10.0 // Default list separator with
#define DEFAULT_LIST_CHAR  159  // Default list character
#define PDF_LIST_FONT "Wingdings-Regular" // Default list font
```

The list font must be the PostScript name of the font (see SetFont() for further information). When changing the list font you may also change the default list character. When using DynaPDF under Linux or UNIX you may define a font that is available in one of your font search directories.

Note that the list font can be overridden at runtime with the function SetListFont(). So, it is usually better to load the font at runtime with SetListFont() since you can properly handle cases in which the font cannot be found.

Main object types

In PDF, two basic object types can be created, ***resource objects*** such as fonts, images and so on which are used by content streams and ***global objects*** such as annotations, bookmarks, form fields and so on. Global objects can use resource objects but not vice versa.

In most cases both object types are defined as normal classes, which contain their own constructors and destructors to initialize and destroy allocated memory.

Global objects can be deleted or marked as deleted at runtime. Resource objects must never be deleted if the object was already used.

General design requirements

We describe here only the general rules which must be taken into account when extending DynaPDF with certain features. We do not explain how the entire library works; this would fill an entire book. To understand how an object must be written to the file we recommended that you debug especially the function CloseFile(). All objects must be prepared for writing in a two stage phase to reserve object numbers. The first stage assignes object numbers to all objects and the second run writes all objects to file. Objects must be written in the exact order in which they were previously prepared for writing.

A PDF file is described in memory as large set of classes which can be referenced or used multiple times by other classes. Due to the references which are stored in certain classes we must define a strict set of rules so that no exception occurs if an object must be deleted:

1. The owner of all resources and global objects is CPDF. No other class is permitted to destroy an object class or change its values.
2. All object classes must be derived from CBaseObject. This class holds the object number as well as several flags to determine whether the object was used, created, or already written, and whether it is part of the first page. This class contains the function CreateObject() which must be called in CPDF::PreparePageObjects() if the object is part of a page. If the object is not included in a page object then CreateObject() must be called in CPDF::PrepareObjects().
3. All classes which hold pointers to other object classes must check the "Used" flag before writing the object data to the file (GetUsed() is a member of CBaseObject and returns true if the used flag was set).
4. All classes must be well initialized so that the class can be deleted at any time without causing memory leaks or other unwanted side effects.
5. No object class is permitted to unset the "Used" flag of other object classes.
6. Page resources such as fonts, images, templates and so on must **NEVER** be deleted at runtime and their "Used" flag must **NEVER** be unset.
7. All resource classes must be derived from CBaseResource.
8. Object classes must set the "Used" flag of the resource object, if the class is used by this object.

9. The "Used" flag of non-page resources can be unset at runtime with SetUnUsed(). This will mark the class as an unused or deleted object. When writing the file, such an object must be ignored.
10. Never delete an object if you don't know exactly what you are doing. If a destroyed object is referenced in any other object, the library will crash.
11. If a **used** page resource is deleted or if the "Used" flag is unset at runtime when it was already set, the resulting PDF file will be damaged.
12. Make sure that the function FreePDF() can be called at any time without causing memory leaks or other unwanted side effects.

Requirements to add your own code to DynaPDF

If you want to make your own features permanent, you are welcome to send us your source codes including a description what kind of feature it enables.

However, we cannot accept any old code; your code must be properly written in C++ and tested with certain operating systems and compilers. It must not produce warnings of any kind and it must not use external libraries, except those are already used by DynaPDF (see drv_type.h for a full list).

Basic C functions such as strcpy, strcat, memcpy and so on, as well as templates from the STL are **NOT** allowed to use. Take a look into drv_base_func.h, drv_templ.h, or pdf_utils.h before using an external function or template. The implementations used by DynaPDF are faster and work on all operating systems in the same way.

Windows GDI functions are normally not permitted too. However, under certain circumstances GDI functions are permitted. DynaPDF uses already a few GDI functions to convert WMF files to EMF or to raster EMF files. Windows specific code must be encapsulated into a #ifdef _WINDOWS section.

If your code handles strings, it must **NOT** use an external string class which is available in any standard C++ library. Use the DynaPDF class CString or CPDFString() instead. These classes support many PDF specific functions.

Your code should be tested with Microsoft Visual C++ 6.0 **AND** Visual Studio 2005 or higher. If possible, you should test your code also with GCC 4.0 or higher under Linux or Mac OS X.

The following important defines are available depending on the operating system and characteristics of the target CPU:

Constant	Test code	Comment
_WINDOWS	#ifdef _WINDOWS	Set on Windows.
MAC_OS_X	#ifdef MAC_OS_X	Set on Mac OS X.
DRV_BIG_ENDIAN	#if (DRV_BIG_ENDIAN == 1)	Endian configuration.
VS_2005_OR_HIGHER	#if (VS_2005_OR_HIGHER == 1)	Functions which are considered as unsafe in Visual Studio 2005 or higher must be replaced with their safe versions. Use this macro to test the compiler version.

To get the full list of available defines take a look into the header file /main/drv_type.h. On non Windows operating systems the configure script creates also the header file /main/drv_conf.h which contains many OS specific defines. Note that this header file can only be included on non Windows operating systems.

Note also that the class structure in DynaPDF is not fixed. Changes can be made without further notice at any time. So, you cannot assume that a class or member of a class that exists today exists in a newer version too. Although most classes and templates do seldom change, changes can always occur!

To avoid dependencies to a specific source code version it is usually best to ask us for the best strategy if you want to add certain features to the library.

Language bindings

Differences between DynaPDF interfaces

DynaPDF can be used with most programming languages which support standard DLLs. The usage of DynaPDF is nearly identical in all programming languages. However, this help file describes all DynaPDF functions in C syntax.

All DynaPDF functions contain an instance pointer of the active PDF instance (`const PPDF* IPDF`) as first parameter. This pointer is hidden for the user in the programming languages Visual Basic, Visual Basic .Net, Visual C#, and Delphi. We deliver native wrapper classes for these programming languages which handle the PDF instances automatically.

However, this help file describes the raw API of DynaPDF that is used by the programming languages C and C++. The C/C++ interface is a direct interface that does not encapsulate the DynaPDF API into a class or other structures to improve processing speed.

The usage of DynaPDF is almost identical in all programming languages; you must only consider that the instance pointer IPDF is contained in the C/C++ interface only.

Visual Basic, Visual C#, or Delphi users must create an instance of the wrapper class CPDF or TPDF in Delphi before a DynaPDF function can be executed. The instance of the wrapper class must also be deleted by calling the destructor of the class.

C or C++ programmers must create a PDF instance with the function pdfNewPDF() before a DynaPDF function can be executed. This instance must be deleted with the function pdfDeletePDF() when it is no longer needed.

We tried also to consider the specific requirements for each programming language so that DynaPDF can always be used without limitations. This causes slightly differences because of the differences between programming languages. For instance, the Visual Basic interfaces uses events instead of callback functions because the usage of callback functions is more complicated in VB as in other programming languages.

Embarcadero C++ Builder

To use DynaPDF with Embarcadero's C++ Builder, proceed as follows:

1. Open a new project or your favourite project in C++ Builder.
2. Include the header file ***/include/C_CPP/dynapdf.h*** into the units which will use DynaPDF functions.
3. Add the import library ***/borland_lib/dynapdf.lib*** to your project.
4. Copy the ***dynapdf.dll*** into a Windows search path (e.g. Windows/System32) or into the output directory.
5. Finished!

If you want to use DynaPDF with a C++ project, add the line "using namespace DynaPDF;" after including the header file dynapdf.h.

The usage in C is essentially the same as in C++, with the exception that the namespace DynaPDF must not be declared.

A PDF instance can be used to create an arbitrary count of PDF files. All used resources are automatically freed when the PDF file is closed (except when the PDF file was created in memory). To improve processing speed, use one instance as long as possible.

If you want to use DynaPDF with an older version of C++ Builder, you may rebuild the lib file by using implib.exe. Implib is delivered with C++ Builder; you find it in the *Bin* directory of your C++ Builder installation directory.

To create a new import library run implib from the command line as follows:

```
implib dynapdf.lib dynapdf.dll
```

DynaPDF uses standard call as calling convention. C++ Builder requires for that calling convention no underscores before function names. Because of this the option -a must not be used to build the import library (see your C++ Builder help for further information).

Copy *implib* and the dynapdf.dll into the same directory and execute the command above.

Example (C++ Builder):

```
// Standard includes by all C++ Builder projects
#include <vcl.h>
#pragma hdrstop

#include "Unit1.h"
//---------------------------------------------------------------------
#pragma package(smart_init)
#pragma resource "*.dfm"
```



```
// Include the DynaPDF header file (change the path if necessary)
#include "dynapdf.h"
// All data types and functions are declared in the namespace DynaPDF.
using namespace DynaPDF;
// First, we declare an error callback function that is called by
// DynaPDF if an error occurred.
SI32 PDF_CALL PDFError(const void* Data, SI32 ErrCode, const char*
ErrMessage, SI32 ErrType)
{
   char errMsg[PDF_MAX_ERR_LEN + 30];
   // An error message returned by DynaPDF is a pointer to a null-
   // terminated static string.
   sprintf(errMsg, "%s\n\nAbort processing?\n", ErrMessage);
   if (MessageDlg(errMsg, mtError,
   TMsgDlgButtons() << mbYes << mbNo, 0) == mrYes)
      return -1; // break processing
   else
      return 0;  // ignore the error
}

// Place a button on the form and double click on it. Add the
// following code to the function.
void __fastcall TForm1::Button1Click(TObject *Sender)
{
   void* pdf = pdfNewPDF(); // Create a new PDF instance
   if (!pdf) return; // Out of memory?
   // Set the error callback first
   pdfSetOnErrorProc(pdf, NULL, PDFError);
   pdfCreateNewPDF(pdf, "c:/myfirst.pdf");
   pdfSetDocInfo(pdf, diSubject, "My first C++ output");
   pdfSetDocInfo(pdf, diProducer, "C++ Builder test application");
   pdfSetDocInfo(pdf, diTitle, "My first C++ output");
   // We want to use top-down coordinates
   pdfSetPageCoords(pdf, pcTopDown);

   pdfAppend(pdf);
   pdfSetFont(pdf, "Arial", DynaPDF::fsItalic, 40.0, true, cp1252);
   pdfWriteFText(pdf, DynaPDF::taCenter, "My first C++ output!");
   pdfEndPage(pdf);

   pdfCloseFile(pdf); // Close the file and free all used resources
   pdfDeletePDF(pdf); // Do not forget to delete the PDF instance
}
```


Microsoft Visual C++

To use DynaPDF with Microsoft's Visual C++, proceed as follows:

1. Open a new project, or your favourite project, in Visual Studio.
2. Include the header file ***/include/C_CPP/dynapdf.h*** into the units which will use DynaPDF functions.
3. VC++ 6.0 only: Add the file ***/include/C_CPP/dynapdf.cpp*** to your project (see comment below).
4. Add the import library ***/mvs_lib/dynapdf.lib*** or ***/mvs_lib/dynapdfm.lib*** to your project.
5. Copy the ***dynapdf.dll*** or ***dynapdfm.dll*** into a Windows search path (e.g. Windows/System32).
6. Finished!

The file ***dynapdf.cpp*** contains dummy declarations of all exported DynaPDF functions; because the functions are not exported, they do not conflict with the original declarations. These declarations enable the usage of Microsoft's Intellisense (code completion) in Visual C++ 6.0. Due to implementation limits of Microsoft's Intellisense, code completion does maybe not work without this file. However, it seems that this issue was partially solved with Update Pack 6 of Microsoft's Visual Studio. If code completion does not work in your environment then include this file.

See also bug report „190974 PRB: Function Prototypes Do Not Generate Parameter Info“, (www.microsoft.com).

DynaPDF was compiled and developed with Microsoft Visual Studio 6.0 SP 6 and Visual Studio 2005. Two versions of the library are delivered:

- `dynapdf.dll  // Compiled with Multithreaded`
- `dynapdfm.dll // Compiled with Multithreaded DLL`

Both versions are fully compatible to VC++ 7.0 or higher (Visual Studio .Net). To avoid conflicts with different standard library versions choose the right DynaPDF DLL and import library depending on your project settings. A pre-compiled single threaded version of DynaPDF is not available.

Please note that the dynapdfm.dll does not support PDF files larger than 2 GB. When the library is compiled with Visual Studio 2005 or higher, then this limitation does no longer exist. However, in this case, you must deliver the Visual Studio Runtime library MSVCR80.DLL or higher with your application. This library causes often problems since it must be installed on the system and cannot be placed in the application folder.

If possible, then use the dynapdf.dll instead. This library requires no additional dependencies to enable 64 bit file support.

If you want to use DynaPDF with a C++ project, add the line "using namespace DynaPDF;" after including the header file dynapdf.h.

The usage in C is essentially the same as in C++, with the exception that the namespace DynaPDF must not be declared.

A PDF instance can be used to create an arbitrary count of PDF files. All used resources are automatically freed when the PDF file is closed (except when the PDF file was created in memory). To improve processing speed, use one instance as long as possible.

Most examples are written in C or C++ which can directly be used with a Embarcadero or Microsoft Compiler.

Example (C++):

```
// Include the DynaPDF header file (change the path if necessary)
#include "dynapdf.h"
// All data types and functions are declared in the namespace DynaPDF.
using namespace DynaPDF;
// First, we declare an error callback function that is called by
// DynaPDF if an error occurred.
SI32 PDF_CALL PDFError(const void* Data, SI32 ErrCode, const char*
ErrMessage, SI32 ErrType)
{
   printf("%s\n", ErrMessage);
   return 0; // Any other return value break processing
}
// Place a button on the form and double click on it. Add the
following
// code to the function.
int main(int argc, char* argv[])
{
   void* pdf = pdfNewPDF(); // Create a new PDF instance
   if (!pdf) return 2; // Out of memory?
   // Set the error callback first
   pdfSetOnErrorProc(pdf, NULL, PDFError);
   pdfCreateNewPDF(pdf, "c:/myfirst.pdf");
   pdfSetPageCoords(pdf, pcTopDown); // We use top-down coordinates
   pdfAppend(pdf);
   pdfSetFont(pdf, "Arial", fsItalic, 40.0, true, cp1252);
   pdfWriteFText(pdf, taCenter, "My first C++ output!");
   pdfEndPage(pdf);
   pdfCloseFile(pdf); // Close the file and free all used resources
   pdfDeletePDF(pdf); // Do not forget to delete the PDF instance
}
```


Microsoft Visual Basic 6.0

The usage of DynaPDF with Visual Basic is essentially the same as with C or C++ except that the exported DLL functions are encapsulated in the wrapper class CPDF to make the usage easier. The instance pointer IPDF which is used by every DynaPDF function is hidden for the user in Visual Basic. The instance pointer is controlled by the wrapper class so that you don't need to create PDF instances manually.

To use DynaPDF with Visual Basic proceed as follows:

- Add the file ***/include/Visual_Basic/DynapPDFInt.bas*** to your project (menu Project/Add Module/Existing…).
- Add the file ***/include/Visual_Basic/CPDF.cls*** to your project (menu Project/Add Class Module/Existing…).
- Add the file ***/include/Visual_Basic/IPDFCallback.cls*** to your project (menu Project/Add Class Module/Existing…).
- If you want to use the table class then add also the file ***/include/Visual_Basic/CPDFTable.cls*** to your project (menu Project/Add Class Module/Existing…).
- Finally, make sure that the ***dynapdf.dll*** can be found by Visual Basic in debug mode; just copy the DLL into Windows/System32 or into Windows/SysWow64 on a 64 bit system, finished!

Note that Visual Basic supports the 32 bit dynapdf.dll only. If you work on a 64 bit OS then copy the library into Windows/SysWow64. Yes, this is the right folder for 32 bit DLLs!

All DynaPDF functions are encapsulated in the wrapper class CPDF. This class makes sure that the library can be used without limitations and programming is more comfortable since you can work with a native VB class. You don't need to consider specific return values of the DLL, the class converts special data types automatically to VB data types.

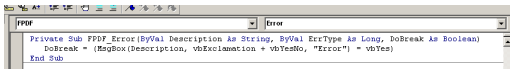
Exception handling in Visual Basic

The standard exception handling of DynaPDF uses a callback function to pass error messages and warnings to the client application. However, in Visual Basic we use events instead. The usage of events is quite easy and frees you from dealing with DynaPDF API function calls.

To enable the event support of the wrapper class CPDF declare a local instance variable as follows:

```
Option Explicit
Private WithEvents FPDF As CPDF 'Enable event support
```

The instance variable FPDF is now listed in the left combo box of the VB code editor.



The right combo box contains the available events, when selecting the event "Error" VB adds automatically an empty event procedure to your source code:

```
Private Sub FPDF_Error(ByVal Description As String, ByVal ErrType As
Long, DoBreak As Boolean)
   ' Add your code here
   ' To break processing after an error occurred set the variable
   ' DoBreak to True
End Sub
```

Now you can enter some code that should be executed when the event is fired. Note that you must still create an instance of the class CPDF before a DynaPDF function can be executed (see the example below).

Note also that VB exceptions are not used so that an error block will normally never be executed. The following declaration has effect in the means of the DynaPDF exception handling:

```
On Error GoTo errPDF
...
' Call some DynaPDF functions...
: errPDF
If Err.Number <> 0 Then
   MsgBox Err.Description
   Exit Sub
End If
```

The error block cannot be executed because DynaPDF does never raise an exception (except the class constructor). If an error occurred, the event "Error" is raised instead. However, there are still cases in which a VB exception can occur, e.g. when passing an empty array to a function that requires some values in it. So, the code should still be encapsulated in an error block. All you need to know that this error block does not affect the normal exception handling of DynaPDF.

The DoEvents problem

The usage of events in Visual Basic is quite easy but there is a special behaviour that must be taken into account when developing VB applications. When using the DoEvents procedure in a VB function you must make sure that the function cannot be executed again while a previous call of the function is still running.

DoEvents enables the asynchronous processing of the message loop so that the user interface can be updated and the user can execute something while a function is still running (e.g. press a

break button). DoEvents is often used because it is an easy way to avoid blocking of an application without using of threads.

However, when using DoEvents it is possible that a user clicks on the button again that executes DynaPDF functions while a previous call is still running. This is normally no problem but it is impossible to execute an event functions inside of a cloned function. When DynaPDF tries to raise an event inside the cloned function an access violation occurs and VB crashes.

To avoid such problems check whether the function is still running:

```
Option Explicit
Private WithEvents FPDF As CPDF 'Enable event support
Private FRunning As Boolean

Private Sub Command1_Click()
   If FRunning Then Exit Sub 'Check whether a previous call is running
   FRunning = True
   'Call some DynaPDF functions here...
   DoEvents 'Process messages
   FRunning = False
End Sub
```

The code above checks whether a previous call of the function is running before the function can be executed again; a quite simple but effective solution that makes your application stabile.

Example:

```
Option Explicit
Private WithEvents FPDF As CPDF ' Enable event support
Private Sub Form_Load()
   ' We hold one instance of the class CPDF in memory
   Set FPDF = new CPDF
   If FPDF Is Nothing Then
      MsgBox "Out of memory!", vbCritical, "Fatal error"
   End If
End Sub
Private Sub Form_Terminate()
   ' Delete the class instance
   Set FPDF = Nothing
End Sub
Private Sub Command1_Click()
   FPDF.CreateNewPDFA "c:/vbout.pdf"
   FPDF.SetDocInfoA diAuthor, "Jens Boschulte"
   FPDF.SetDocInfoA diSubject, "My first VB output"
   FPDF.SetDocInfoA diTitle, "My first VB output"
   FPDF.Append
   FPDF.SetFont "Arial", fsItalic, 30#, True, cp1252
   FPDF.WriteFTextA taCenter, "My first VB output"
   FPDF.EndPage
```

```
   FPDF.CloseFile
End Sub
' Error event procedure
Private Sub FPDF_Error(ByVal Description As String, ByVal ErrType As
Long, DoBreak As Boolean)
   DoBreak = (MsgBox(Description, vbExclamation Or vbYesNo,
             "Error") = vbYes)
End Sub
```


Visual Basic .Net

The usage of DynaPDF with Visual Basic .Net is essentially the same as with C or C++ except that the exported DLL functions are encapsulated in the wrapper class CPDF to make the usage easier. The instance pointer IPDF that is used by every DynaPDF function is hidden for the user in VB .Net. The instance pointer is controlled by the wrapper class so that you don't need to create PDF instances manually.

To use DynaPDF with VB .Net proceed as follows:

- Add the file ***/include/Visual_Basic_Net/CPDF.vb*** to your project (menu Project/Add Existing Element…).
- Finally, make sure that the ***dynapdf.dll*** can be found; just copy the DLL into Windows/System32, finished!

64 Bit Applications

With VB .Net you can develop 32 bit and 64 bit applications. One thing that must be considered is that the target CPU type in Visual Studio must **not** be set to *UseAny*. This is impossible since you can either link the 32 bit dynapdf.dll or the 64 bit version but not both.

So, a 32 bit and 64 bit version must be compiled separately. Another thing that is often misunderstood is the right system directory for the dynapdf.dll. If you develop a 32 bit application on a 64 bit Windows version then copy the 32 bit version of the dynapdf.dll into Windows/SysWow64 and the 64 bit version into Windows/System32. Yes, this is correct!

Both versions can be used simultaneously. Windows loads automatically the right version if you have copied the DLLs into the right directories.

Note that the DLL should be copied into the system folder on your development machine only so that Visual Studio is able to load it. The installer of your application should copy the DLL into the application directory instead.

General Note:

Visual Studio .Net copies the interface files into your project directory if the option "Link file" is not selected when adding the files to your project. Make sure that you always link the files to your project. Otherwise you must update the interface files manually whenever you install a newer version of DynaPDF.

All DynaPDF functions are encapsulated in the wrapper class CPDF. This class makes sure that the DynaPDF functions can be used without limitations and programming with DynaPDF becomes more comfortable. You don't need to consider specific return values of the DLL; the class converts API data types automatically to VB .Net data types.

VB .Net supports more data types than VB 6.0 but the usage of the new data types is complicated. For instance, a signed integer cannot be passed to an unsigned integer variable without explicit conversion. The same behaviour is required for nearly all other new data types. This makes the usage of the new types practically impossible.

However, to make the usage of DynaPDF less complicated the VB .Net interface uses only base data types which are already available since VB 6.0. An exception is the definition of pointers. VB .Net supports the new Data IntPtr that is a variable pointer type with a length of 32 bit on a 32 bit Windows machine and 64 bit on a 64 bit Windows machine. This data type is used for all pointers so that the .Net interface can also be used on a 64 bit Windows machine. Note that the 64 bit version of DynaPDF must be used in this case.

Data types used by DynaPDF

DynaPDF uses a large set of enums and other data types which are mostly declared within the class CPDF. However, a few data types are declared in the file DynaPDFInt.vb, this must be taken into account when developing VB .Net applications. If you cannot find a data type in the class CPDF then take a look into the file DynaPDFInt.vb.

Exception handling in VB .Net

The exception handling in Visual Basic .Net is the same as in Visual Basic 6.0. The class CPDF uses per default events instead of callback functions. This makes the usage easier and frees you from handling with unmanaged data types. Please take a look into Visual Basic Exception handling for a detailed description.

It is also possible to declare callback functions instead of events but the use of callback functions is rather complicated in VB .Net. While C# handles callback functions correctly without further considerations, VB .Net users must test their callback function properly. It seems that VB .Net invalidates sometimes the pointers of callback functions if memory must be reallocated. This error occurs mostly if DynaPDF functions are executed in different classes. If you get a NullReference exception check whether the same error occurs if no error callback function is set. If the exception does no longer occur use the error event handling of DynaPDF instead.

The DoEvents problem

The usage of events in VB .Net is quite easy; however, there is a special behaviour that must be taken into account when developing .Net applications. When using the DoEvents procedure in a function you must make sure that the function cannot be executed again while a previous call of the function is still running.

DoEvents enables the asynchronous processing of the message loop so that the user interface can be updated and the user can execute something while a function is still running (e.g. press a break button). DoEvents is often used because it is an easy way to avoid blocking of an application without using of threads.

However, when using DoEvents it is possible that a user clicks on the button again that executes DynaPDF functions while a previous call is still running. This is normally no problem but when using events the event functions become invalid. This is the same behaviour as in Visual Basic 6.0 with the exception that .Net does not crash, a System.NullReferenceException is raised instead.

It is not clear why this exception occurs, it seems that this is a general bug in the event handling of Visual Basic 6.0 and VB .Net. A native programming language like C/C++ or Delphi would never cause an access violation or exception here.

However, to avoid such problems check whether the function is still running:

```
Private WithEvents FPDF As CPDF 'Enable event support
Private FRunning As Boolean

Private Sub Command1_Click(ByVal eventSender As System.Object, ByVal
eventArgs As System.EventArgs) Handles Command1.Click
   If FRunning Then Exit Sub 'Check whether a previous call is running
   FRunning = True
   'Call some DynaPDF functions here...
   DoEvents 'Process messages
   FRunning = False
End Sub
```

The code above checks whether a previous call of the function is running before the function can be executed again. A quite simple but effective solution that makes your application stabile.

Example (Visual Basic .Net):

```
Private WithEvents FPDF As CPDF 'Enable event support

Private Sub Form1_Load(ByVal eventSender As System.Object, ByVal
eventArgs As System.EventArgs) Handles MyBase.Load
   ' We hold one instance of the class CPDF in memory
   FPDF = New CPDF()
End Sub

Private Sub Command1_Click(ByVal eventSender As System.Object, ByVal
eventArgs As System.EventArgs) Handles Command1.Click
   FPDF.CreateNewPDFA("c:/vbout.pdf")
   FPDF.SetDocInfoA(CPDF.TDocumentInfo.diAuthor, "Jens Boschulte")
   FPDF.SetDocInfoA(CPDF.TDocumentInfo.diSubject, "My first VB output")
   FPDF.SetDocInfoA(CPDF.TDocumentInfo.diTitle, "My first VB output")

   FPDF.Append()
   ' The data type TFStyle is defined in DynaPDFInt.vb
   FPDF.SetFontA("Arial", TFStyle.fsItalic, 30.0, True, CPDF.TCodepage.cp1252)
   FPDF.WriteFTextA(CPDF.TTextAlign.taCenter, "My first VB .Net output")
   FPDF.EndPage()
   FPDF.CloseFile()
```

```
End Sub

' Error event procedure
Private Sub FPDF_PDFError(ByVal Description As String, ByVal ErrType
As Integer, ByRef DoBreak As Boolean) Handles FPDF.PDFError
   DoBreak = (MsgBox(Description, _
              MsgBoxStyle.Exclamation Or _
              MsgBoxStyle.YesNo, _
             "Error") = MsgBoxResult.Yes)
End Sub
```


Visual C#

The usage of DynaPDF with Visual C# is essentially the same as with C or C++ except that the exported DLL functions are encapsulated in the wrapper class CPDF to make the usage easier. The instance pointer IPDF that is used by every DynaPDF function is hidden for the user in C#. The instance pointer is controlled by the wrapper class so that you must not create PDF instances manually.

To use DynaPDF with Visual C# proceed as follows:

- Add the file ***/include/Visual_C#/CPDF.cs*** to your project (menu Project/Add Existing Element…).
- Make sure that the ***dynapdf.dll*** can be found; just copy the DLL into the Windows/System32 directory, finished!

64 Bit Applications

With C# you can develop 32 bit and 64 bit applications. One thing that must be considered is that the target CPU type in Visual Studio must **not** be set to *UseAny*. This is impossible since you can either link the 32 bit dynapdf.dll or the 64 bit version but not both.

So, a 32 bit and 64 bit version must be compiled separately. Another thing that is often misunderstood is the right system directory for the dynapdf.dll. If you develop a 32 bit application on a 64 bit Windows version then copy the 32 bit version of the dynapdf.dll into Windows/SysWow64 and the 64 bit version into Windows/System32. Yes, this is correct!

Both versions can be used simultaneously. Windows loads automatically the right version if you have copied the DLLs into the right directories.

Note that the DLL should be copied into the system folder on your development machine only so that Visual Studio is able to load it. The installer of your application should copy the DLL into the application directory instead.

General Note:

Visual Studio .Net copies the interface file CPDF.cs into your project directory if the option "Link file" is not selected when adding the files to your project. Make sure that you always link the files to your project. Otherwise you must update the interface manually whenever you install a newer version of DynaPDF.

All DynaPDF functions are encapsulated in the wrapper class CPDF. This class makes sure that the DynaPDF functions can be used without limitations and programming with DynaPDF becomes more comfortable. You don't need to consider specific return values of the DLL; the class converts API data types automatically to C# data types.

However, C# uses a very restrictive data type handling that causes that already signed integers cannot be passed to unsigned integer variables of the same type without explicit conversion.

To make the usage of DynaPDF less complicated most function parameters which would normally declared as unsigned integer, e.g. PDF object handles, are declared as signed integer to get rid of permanent explicit data type conversions.

The usage of DynaPDF with C# is nearly identical in comparison to C++. The interface does generally not use events like in VB .Net because callback functions work very well in C#.

Data types in C#

All structures and enums used by DynaPDF are declared in the namespace DynaPDF. Because it is not possible to declare constants in a namespace, such constants are declared in the class CPDF. All data types, structures, and constants are defined in the file CPDF.cs. No further files are required to use DynaPDF.

Example (Visual C#):

```
using System;
using DynaPDF;
using System.Runtime.InteropServices.Marshal;

namespace hello_world
{
   class Hello_World
   {
      // Error callback function.
      static int PDFError(IntPtr Data, int ErrCode, IntPtr ErrMessage,
      int ErrType)
      {
         // The error type is a bitmask.
         Console.Write("{0}\n", PtrToStringAnsi(ErrMessage));
         Console.Write("\n");
         return 0; // We try to continue if an error occurs.
      }

      [STAThread]
      static void Main(string[] args)
      {
         try
         {
            String outFile = "c:/c#out.pdf";
            CPDF pdf = new CPDF();
            // Error messages are passed to the callback function.
            pdf.SetOnErrorProc(IntPtr.Zero, new
               DynaPDF.TErrorProc(PDFError));
            // We open the output file later if no error occurs.
```



```
            pdf.CreateNewPDF(null);
            // We use top down coordinates in this example
            pdf.SetPageCoords(DynaPDF.TPageCoord.pcTopDown);
            pdf.Append(); // An an empty page to the file
            // Before printing text you must set a font
            pdf.SetFont("Arial", DynaPDF.TFStyle.fsItalic, 20.0, true,
               DynaPDF.TCodepage.cp1252);
            pdf.WriteTextA(50.0, 50.0, "My first PDF output...");
            pdf.WriteTextA(50.0, 80.0, "File created: " +
               DateTime.Now.ToString());
            pdf.EndPage(); // Close the open page

            // No fatal error occurred?
            if (pdf.HaveOpenDoc())
            {
               // OK, now we can open the output file.
               if (!pdf.OpenOutputFile(outFile))
               {
                  Console.Write("Make sure that you have write access
                     to drive C:\nor change the output file path!\n");
                  Console.Read();
                  return;
               }
               if (pdf.CloseFile())
               {
                  Console.Write("PDF file \"{0}\" successfully
                     created!\n", outFile);
               }
            }
            pdf = null;
         }catch(Exception e)
         {
            Console.Write(e.Message);
         }
         Console.Read();
      }
   }
}
```

Embarcadero Delphi

The usage of DynaPDF with Embarcadero's Delphi is essentially the same as with C or C++ except that the exported DLL functions are encapsulated in the wrapper class TPDF to make the usage easier. The instance pointer lPDF that is used by every DynaPDF function is hidden for the user in Delphi. The instance pointer is controlled by the wrapper class so that you don't need to create PDF instances manually.

To use DynaPDF with Delphi, proceed as follows:

- Add the interface file ***/include/Delphi/dynapdf.pas*** to your project.
- Add the unit dynapdf in the uses section in every source file where you want to use DynaPDF.
- Copy the ***dynapdf.dll*** into a Windows search path (e.g. Windows/System32) or into your application directory, finished!

64 Bit Applications

Since Rad Studio XE2 you can develop 32 bit and 64 bit applications with Delphi. One thing that is often misunderstood is where the 32 bit and 64 bit versions of dynapdf.dll must be stored. If you develop a 32 bit application on a 64 bit Windows version then copy the 32 bit version of the dynapdf.dll into Windows/SysWow64 and the 64 bit version into Windows/System32. Yes, this is correct!

Both versions can be used simultaneously. Windows loads automatically the right version if you have copied the DLLs into the right directories.

Note that the DLL should be copied into the system folder on your development machine only so that Delphi is able to load it. The installer of your application should copy the DLL into the application directory instead.

General Usage

The Delphi interface encapsulates all DLL functions in the wrapper class TPDF. This class can be used like any other VCL class. The class is thread-safe and can be used without synchronization in multithreading applications.

However, some details must be known about the class. When the first instance is created, the constructor loads the dynapdf.dll with the API function LoadLibrary(). When creating a further instance of the wrapper class TPDF, also a new PDF instance is created inside the DLL. Each instance of the wrapper class uses its own DLL instance.

If an instance of the wrapper class TPDF is destroyed, the destructor deletes the used PDF instance; if no other instance uses the library then it will be unloaded with the API function FreeLibrary().

However, the DLL is unloaded each time if the reference count of the DLL is zero. In most cases it makes sense to hold one instance of the wrapper class in memory to avoid unloading the library. The internal resources used by DynaPDF are always freed when CloseFile() is called (except when the file is created in memory), so that there is no need to destroy the main instance of TPDF.

Exception handling in Delphi

DynaPDF itself uses no native Delphi exception handling. Error messages and warnings are passed to an error callback function if any (see SetOnErrorProc()). If no callback function is used, then use the function GetErrorMessage() to get information about the last error.

However, the wrapper class TPDF uses native exceptions in the following cases:

- When creating a new instance of the wrapper class TPDF.
- When loading a DLL function with the API function GetProcAddress() (**all functions**).

If a function listed above fails, then an exception is raised by the class TPDF. Always encapsulate all function calls into a try / except block. Only a few exceptions can occur but these exceptions must not be ignored. Especially when using DynaPDF in multi-threading applications it is highly recommended to use try / except or try / finally blocks. A thread must always catch all exceptions inside the thread.

Using DynaPDF in Multithreading Applications

The usage of DynaPDF inside a thread is the same as in single-threaded applications.

However, if a callback function should be used, you must make sure that the callback function is declared in the same thread or that each thread uses its own copy of the callback function. In addition, it is highly recommended that only thread-safe functions are called inside the callback function. If any unsafe function must be executed the function that causes the execution of the callback function must be synchronized because it is impossible to synchronize a callback function itself.

Threads should be used completely isolated from the main-thread of the application. Function calls to and from the main-thread must be synchronized. The entire PDF file should be created inside the thread including the instance of the wrapper class TPDF. The class instance must also be deleted before the thread is terminated.

A running thread can be terminated at any time but it is highly recommended to wait for any running functions to end before a thread will be terminated. This can be done easily by checking the property Terminated within the thread before a new function is executed.

After a running function returns, the class instance can be destroyed by using the Free() method for that instance. This will clean up the used resources and the thread can be terminated. The instance of the wrapper class TPDF can be safely destroyed at any time after a running function

returned. All internal used resources will be freed, there is no need to call FreePDF() manually beforehand.

Example (Single threaded):

In the following example we use a simple message box inside the error callback function. However, in a larger project it makes sense to output error messages into an error log or list box. DynaPDF ignores non-fatal errors by default so that it is possible to continue, but you can protocol each warning and errors during PDF creation.

```
unit Unit1;

interface

uses Windows, Messages, SysUtils, Classes, Controls, Forms, Dialogs,
StdCtrls, dynapdf; // Include the file dynapdf.pas to the unit
type
  TForm1 = class(TForm)
  Button1: TButton;
  procedure Button1Click(Sender: TObject);
 private
 public
end;
var Form1: TForm1;
implementation
// First, we define our callback function that is called if an
// error occurred. Note: The calling convention is stdcall!
function ErrProc(const Data: Pointer; ErrCode: Integer; const
ErrMessage: PChar; ErrType: Integer): Integer; stdcall;
var s: String;
begin
   s := Format('%s'#13'Abort processing?', [ErrMessage]);
   if MessageDlg(s, mtError, [mbYes, mbNo], 0) = mrYes then
      Result := -1 // break processing
   else
      Result := 0; // try to continue
end;
procedure TForm1.Button1Click(Sender: TObject);
var pdf: TPDF;
begin
   pdf := nil;
 try
   pdf := TPDF.Create;
   // set the error callback function first
   pdf.SetOnErrorProc(nil, @ErrProc);
   pdf.SetDocInfoA(diAuthor, 'Jens Boschulte');
   pdf.SetDocInfoA(diCreator, 'Delphi sample project');
   pdf.SetDocInfoA(diSubject, 'My first PDF file...');
```



```
   pdf.SetDocInfoA(diTitle, 'My first Delphi PDF output');
   pdf.SetViewerPreferences(vpDisplayDocTitle, avNone);

   pdf.CreateNewPDFA('c:\dout.pdf');
   pdf.Append;
   pdf.SetFontA('Arial', fsItalic, 40, true, cp1252);
   pdf.WriteFTextA(taCenter, 'My first Delphi output!!!');
   pdf.EndPage;
   pdf.CloseFile;
 except
   on E: Exception do MessageDlg(E.Message, mtError, [mbOK], 0);
 end;
 if pdf <> nil then pdf.Free;
end;
```

Compiling DynaPDF on Linux / UNIX

The build process of DynaPDF was designed to enable the compilation on most Linux or UNIX operating systems as easy as possible. All Linux and UNIX versions of DynaPDF are compiled with GCC 3.2 or higher which is freely available for most machine types. The configuration files are mainly designed for use with GCC and Autoconf. If you want to use another compiler you must at least change the compiler flags in the file configure.in and rebuild then the configure script with Autoconf. Note that finding the right compiler flags can be difficult and time consuming so that it is usually best to use GCC instead of another compiler.

System requirements:

1. Properly installed GCC (3.0 or higher) C and C++ compiler. We strongly recommended GCC 4.0 or higher!
2. GNU make
3. To create a static library of DynaPDF you need also ar and ranlib

Build process

1. Copy first the entire directory dynapdf_ent to your Linux or UNIX machine.
2. Change the access permissions of the following files as follows (subdirectory /source):
   a. chmod 777 config.guess
   b. chmod 777 config.sub
   c. chmod 777 confrel
   d. chmod 777 install-sh
3. Type "./confrel" and press enter. This command creates the make files for your machine and starts the compilation.
4. Clean up the directory with "make clean", finished!

Make install creates a static and shared library of DynaPDF and copies the libraries and header files, which are required to bind DynaPDF, into the subdirectory /source.

You find the following files in the subdirectory /source after compiling DynaPDF:

- `dynapdf.h` `// Main header file of DynaPDF`
- `drv_conf.h` `// Required configuration file`
- `libdynapdf.a` `// Static library`
- `libdynapdf.so` `// Extension ".sl" on HP-UX or ".dylib" on Mac OS X`

Changing the configuration scripts

DynaPDF uses the freely available tool Autoconf to create the main configuration script configure. Autoconf requires the file configure.in as input file which is located in the subdirectory /source. The final configure script can be executed without changes on all

supported Linux and UNIX operating systems as well as on Mac OS X. It creates the make files from the input files makefile.in which are located in all library directories; these files can normally be left unchanged. The top level makefile.in, which is stored in the subdirectory /source too, can be modified if further installation scripts should be executed after the library was successfully compiled. Note that the makefile.in files can be modified without rebuilding the configure script.

However, if you want to change certain compiler settings, or the compiler itself, modify the file configure.in and execute autoconf without parameters. Autoconf will then rebuild the configure script with the new settings.

Linker flags

The used linker flags are designed to create a library with minimal dependencies so that DynaPDF can be delivered without other OS specific libraries. Depending on the target OS the linker flags can be changed so that OS specific libraries can be bind dynamically. This results in a smaller library but with more dependencies. To change the linker flags, modify the variable LD_LIBS in the file configure.in and rebuild the configure script with autoconf.

Compiler flags

When compiling DynaPDF on HP-UX the flag -fPIC (Position Independent Code) must be set at the minimum to enable the usage as shared library.

Optimization Level

DynaPDF is compiled with optimization level 3. This level is a good compromise between stable and fast code. The highest optimization level 4 causes a very long compilation time and it is possible that the resulting code is less stabile. Test the library properly before using this optimization level by default.

However, a release build should use the optimization level 3 or 4 because certain dependencies to internal GCC specific libraries are only removed if the optimization level is higher than 2.

Recommended compiler version

Most DynaPDF versions for Linux and Unix are compiled with GCC 4.2 or higher. Due to certain bugs in older versions of GCC make sure that DynaPDF can be compiled at the minimum with GCC 3.0. Especially version 2.96 contains many bugs. If you use a precompiled library of DynaPDF, please note that DynaPDF is not binary compatible to GCC 2.96 or earlier. The GCC compiler should be configured with POSIX compatible thread handling if possible, although the library does not depend on it.

Compiling DynaPDF on Mac OS X

The build process on Mac OS X is very similar to Linux and UNIX operating systems. Since GCC is already the default compiler on Mac OS X it is very easy to compile DynaPDF on this operating system. All you need is a properly installed GCC compiler including make. The XCode package, which is delivered with Mac OS X, contains already the GCC compiler. The easiest way to install GCC is to install XCode 2.5 or higher because it installs GCC 3.3 as well as GCC 4.0 and all required build tools.

Once the GCC complier was installed it is already possible to compile DynaPDF in the very same way as described for Linux or UNIX. However, Apple Computers are available with different CPU types and each CPU type requires a DynaPDF version that was compiled for the target CPU.

To make the development easier GCC 4.0 or higher can be used as cross compiler to build libraries for different CPU types on the same host system as well as Universal libraries which support multiple targets.

The build system of DynaPDF creates by default static and dynamic Universal binaries for the CPU targets i386, ppc, and x86_64. Which targets are supported can be checked with the command *file*.

Example:

```
file libdynapdf.a
   or
file libdynapdf.dylib
```

If you don't want to create Universal binaries or if you need another CPU target then open the file configure.in in a text editor and modify the variable ARCH as needed.

Example (add the target Power PC 64):

ARCH=" -arch i386 -arch ppc -arch x86_64 -arch ppc64"

When finish save the file and execute autoconf. This command rebuilds the configure script. Finally type ./confrel and press enter. The configure script is now executed to build the make files and finally the script compiles the library. When finish execute make clean to clean up the build directory. The finish libraries are stored in the subdirectory /source.

Interactive Forms

DynaPDF supports a large set of functions to create and edit form fields incl. predefined actions and JavaScript actions. This section describes how an Interactive Form can be created and how certain features can be used.

Field Appearance

Interactive Form Fields support user defined background, text and border colors, as well as different border styles. These properties can be set or changed with following functions:

Global properties for new created fields:

- `Get/SetBorderStyle()` `// Border style`
- `Get/SetFieldBackColor()` `// Background color`
- `Get/SetFieldBorderColor()` `// Border color`
- `Get/SetColorSpace()` `// Color space`
- `Get/SetFieldTextColor()` `// Text color`
- `Get/SetLineWidth()` `// Line width of the border`

Functions to change the appearance of an existing field:

- `SetFieldBBox()` `// Changes the field's bounding box`
- `Get/SetFieldBorderStyle()` `// Border style`
- `Get/SetFieldBorderWidth()` `// Line width of the border`
- `Get/SetFieldColor()` `// Background, border, or text color`
- `SetFieldFont()` `// Set or change the field font`
- `SetFieldFontEx()` `// Set or change the field font`
- `SetFieldFontSize()` `// Changes the field's font size`
- `Get/SetFieldHighlightMode()` `// Highlight mode`

Global field appearance properties:

- `Get/SetNeedAppearance()` `// See below`

Other:

- `DeleteAcroForm()` `// Delete the entire AcroForm`
- `DeleteXFAForm()` `// Delete the XFA form of a hybrid form`
- `DeleteJavaScripts()` `// Delete global Javascripts and JS Actions`
- `LoadFDFData()` `// Load form data from a FDF file`

The global NeedAppearance flag of an Interactive Form defines whether the viewer should create the field appearances on demand when opening the file or whether the existing definitions should be taken from the PDF file. DynaPDF creates always appearance streams for all field types with exception of barcode fields. However, in certain cases it can be useful to let

the viewer render fields with their own algorithms because the exact way how Adobe's Acrobat builds the field appearances is not documented.

For example, when editing the contents of a text field in Adobe's Acrobat the viewer rebuilds first the field appearance before placing the editing cursor into the field. The new appearance created from Adobe's Acrobat can be slightly different in comparison to the one that was created by DynaPDF. The visible content, especially of text fields, is sometimes not absolutely stable.

If the NeedAppearance flag is set, the viewer uses already its own algorithms to build the field appearances when opening the file. This avoids visible changes when editing a field. However, the NeedAppearance flag must not be set to true if a form contains page templates.

Important field properties when creating new fields

The line width of the field border is derived from the current graphics state when a new field is created (see SetLineWidth()). No border will be drawn if either the line width is set to zero or if the border color is set to NO_COLOR (see SetFieldBorderColor()). The default background color for new fields is NO_COLOR; that means the background appears transparent. Form fields support the color spaces DeviceGray, DeviceRGB, and DeviceCMYK. The default background, border, and text color must be defined in the current color space. Note that DynaPDF does not convert the current color values if the color space will be changed.

Field Properties

Most field properties and values can be read and changed with DynaPDF. The following list gives an overview over the available functions and for what they can be used.

- `GetFieldCount()` // Number of fields in the document
- `GetFieldEx()/GetFieldEx2()` // Most important properties
- `GetPageFieldCount()` // Number of fields of a page
- `GetFieldExpValCount()` // Number of values/export values
- `Get/SetFieldExpValue()` // Export value of a field
- `GetFieldExpValueEx()` // Value and export value pair
- `GetFieldGroupType()` // Base type of a field group
- `GetFieldType()` // Field type
- `SetAnnotOrFieldDate()` // Sets the modification date
- `Get/SetFieldHighlightMode()` // Field highlight mode
- `Get/SetFieldIndex()` // Index to change the tab order
- `Get/SetFieldFlags()` // Field flags
- `Get/SetFieldMapName()` // Mapping name -> export name
- `Get/SetFieldName()` // Field name
- `Get/SetFieldOrientation()` // Field orientation
- `Get/SetFieldTextAlign()` // Text alignment of a text field

- `Get/SetFieldToolTip()` // Tool tip or field description
- `Get/SetTextFieldValue()` // Text field value or default value

GetFieldEx() is the most important function to retrieve field properties. Fields can be accessed via the global handle or via the index within the field array of the current page.

What is a Group Type?

The field type ftGroup is used for different purposes depending on how fields are organized. A normal group field is used to create a logical hierarchy or group of fields but group fields are also used to create a so called "Field Group".

A normal group field is a set of fields which use a parent field of type ftGroup to achieve a logical hierarchy, e.g. Address.Street, Address.Country, and so on. The field and group type of the parent group field are both set to ftGroup in this case.

One important thing must be considered when accessing children of a group field: The group field does not occur in the field array of a page; it is only available in the global AcroForm field array. So, while GetFieldEx() returns the entire field array including group fields GetPageFieldEx() returns never group fields! The parent group field can be accessed with the Parent handle of the children in this case.

The second usage of a group field is to achieve a so called "Field Group". A Field Group is an array of fields of the same type which share the same name and value. Such fields are internally organized into a special kind of group field which holds the field name and value, as well as other properties which can be shared among the group.

The children of a Field Group have no name. So, if a field contains no name then you can already assume that it is part of a Field Group because the field name is required to be present otherwise. Children of a Field Group contain always the handle to the parent group field. The field type of this group field is set to ftGroup as usual but the group type is set to a field type other than ftGroup (see GetFieldGroupType()).

The unambiguous test whether a group field is an ordinary group field or a terminal field of a Field Group is to compare the group type with the field type. If the group type is something else than ftGroup then this is a terminal field of a Field Group.

In this case the field contains the field name of the children as well as the field value, default value, and tooltip. The field flags, background, border and text color, border width, and the border style are inherited from the terminal field but can be overridden by the children.

Please note that Adobe's Designer creates mostly Field Groups also if only one child is part of the group.

When changing a value or property of a Field Group there is nothing special that must be considered. DynaPDF sets the wished value or property automatically to the right field.

How to create a Field Group?

Field groups can be created in two ways: When creating two fields with the same name and type then DynaPDF creates automatically a field group. However, it is also possible to set the handle of the parent field to indicate that the field should be added to this field as a child. The latter variant is a little bit faster.

Example:

```
...
SI32 prt = pdfCreateTextField(pdf, "Test", -1,false,-1,50, 50,150,20);
           pdfCreateTextField(pdf, "Test",prt,false,-1,50, 80,150,20);
           pdfCreateTextField(pdf, "Test",prt,false,-1,50,110,150,20);
...
```

or

```
// Same result but requires more processing time
pdfCreateTextField(pdf, "Test", -1, false, -1, 50,  50, 150, 20);
pdfCreateTextField(pdf, "Test", -1, false, -1, 50,  80, 150, 20);
pdfCreateTextField(pdf, "Test", -1, false, -1, 50, 110, 150, 20);
```

See also section "Fields with identical names".

How to change the tabulator order?

The form fields and annotations of a page are stored in an array. The order of fields in this array represents the tab order. New fields are added to the array in the order in which they were created. To enable the definition of an arbitrary tab order, each form field and annotation holds a page index variable which can be used to sort the fields.

The page indexes of new or imported fields start always at index 1000. The indexes of annotations start at 10000. Form fields are in fact Widget Annotations and all annotations of a page are stored in the same array.

Because the indexes of form fields start at index 1000 it is easier to move a field to the beginning of the array because the indexes from 0 to 999 are free when starting to change the tab order.

The page indexes can be set to any value with SetFieldIndex(), but no field or annotation of a page should use the same index. No error occurs if two fields or annotations use the same index but the order of these fields is then of course undefined.

When all indexes are set, the fields must be sorted with SortFieldsByIndex() so that the new tabulator order can be applied. Note that the function sorts the fields of the current open page. If no open page is in memory then the function will fail.

Field Names

Interactive Form Fields are identified over the field name in a viewer application. A field name is an Ansi string that should be human readable. Beginning with PDF 1.5 field names can also be defined as Unicode string. However, all functions to create new fields in DynaPDF support Ansi strings only. All characters within the Ansi character set (code page 1252) can be used with exception of the period character (.) and characters below index 32 .

A field name should also not end with a space character because Adobe's Acrobat is then sometimes unable to access such a field with a JavaScript Action or function.

The period (.) is a reserved character because it is used to build the fully qualified field name in a viewer application. The fully qualified field name is constructed from the partial field name of the field and all of its ancestors.

For a field with no parent group field, the partial and fully qualified names are the same. For a field that is the child of another field, the fully qualified name is formed by appending the child field's partial name to the parent's fully qualified name, separated by a period, e.g. Address.Street.

Fields with identical names

It is possible to create two or more fields of the same type which use all the same name. Such fields contain always the same value if the value of one field of the group is changed.

Fields with identical names are internally represented as a special type of field group, which is automatically created by DynaPDF. This makes the handling more complicated because the children of such a group do not contain a field name. The name is set to the parent's group field but not to the children of the group. This can normally be ignored but when enumerating fields with GetField() or GetPageField() you must consider that not all fields contain a name, the parent field's handle is set instead.

However, with the exception described above, field names must be unique within the hierarchy in which they appear. This is especially important when multiple Interactive Forms are imported.

When importing multiple Interactive Forms it is highly recommended to check for invalid duplicate field names. This can be done with the function CheckFieldNames(). The function returns the handle of the first field which contains a field name that is already in use. You can then change the field name with SetFieldName() and execute CheckFieldNames() again until all invalid field names are changed.

After changing a field name you must also check whether the field is used within a JavaScript Action or function. Such scripts must be changed so that they do not become invalid. Due to the possible references of fields within JavaScript functions and Actions, merging of Interactive Forms is very complicated and should be avoided whenever possible.

Actions

Annotations, form fields, bookmarks (also known as outline items), pages, and the global Catalog object may specify an action to perform, such as opening another PDF file, jumping to page, or playing a sound, for example.

Annotations (especially link annotations) and bookmarks can dirctly be associated with an action. This action will be executed when the object is activated.

Annotations, the catalog object, pages, and form fields support also additional actions which extend the set of events which trigger the execution of an action.

Actions are usually executed in viewer applications only. Otherwise it would be very difficult to understand what happens behind the scenes when editing an object.

Actions can be accessed with the following functions:

- `GetObjActions() / GetObjEvent()`
- `GetGoToAction()`
- `GetGoToRAction()`
- `GetHideAction()`
- `GetImportDataAction()`
- `GetJavaScriptActionEx()`
- `GetLaunchAction()`
- `GetMovieAction()`
- `GetNamedAction()`
- `GetURIAction()`

GetObjActions() returns the first action of an object and a pointer to the first trigger event if any.

Actions and trigger events are stored as a single linked list. That means, every action and every trigger event can reference another action or event that should be executed.

The actions which must be executed for an object should be copied to an execution list and not directly be executed. This makes sure that a duplicate check can be applied so that no endless loop occurs when an action references itself.

The first object that should be examined is the catalog object right after a PDF file was opened with OpenImportFile() or OpenImportBuffer() and after the global objects were imported with ImportCatalogObjects().

Now render the first page and add the actions of the page to the event list of this page. After this the actions of form fields should be examined because form fields support events which must be handled when a page was opened, when it become visible or invisible and when it will be closed.

After this bookmarks can be imported with ImportBookmarks(). Because bookmarks support no trigger events the application can load actions of a bookmark one demand in the OnMouseUp event of the bookmark.

PDF objects which support trigger events do not all support the entire list of available events. The following table shows which trigger events are supported by which objects. Bookmarks are not listed here because bookmarks do not support trigger events.

Event	Catalog	Annotations	Fields	Pages
oeOnOpen	•			•
oeOnClose				•
oeOnMouseUp		•	•	
oeOnMouseEnter			•	
oeOnMouseExit			•	
oeOnMouseDown			•	
oeOnFocus			•	
oeOnBlur			•	
oeOnKeyStroke			•	
oeOnFormat			•	
oeOnCalc			•	
oeOnValidate			•	
oeOnPageVisible			•	
oeOnPageInVisible			•	
oeOnPageOpen			•	
oeOnPageClose			•	
oeOnBeforeClosing	•			
oeOnBeforeSaving	•			
oeOnAfterSaving	•			
oeOnBeforePrinting	•			
oeOnAfterPrinting	•			

Form fields must be examined for actions right after a page was loaded. Otherwise it is not possible to handle the highlighted events.

Digital Signatures

A digital signature (PDF 1.3) can be used to authenticate the identity of a user and the document's contents. It stores information about the signer and the state of the document when it was signed. Once a PDF file was digitally signed it is impossible to change the file without invalidating the signature. Because of this, it is always possible to check whether a document has been changed or not.

Depending on the Acrobat version certain signature handlers are supported by Adobe's Acrobat. DynaPDF supports the PPKLite security handler which is supported since Acrobat 4.0.

Supported Certificate Formats

DynaPDF supports internal and external signature handlers. When using the internal signature handler of DynaPDF then you need a PKCS#12 certificate file. Certificates are available in different file formats and different encryption key lengths. DynaPDF supports certificates in the file format PKCS#12 with up to 4096 bits encrypted private/public key pairs on Windows.

On non-Windows operating systems the cross-platform signature library AiCrypto is used to sign PDF files. This signature handler supports 1024 bit RSA encrypted private keys only (the AiCrypto library supports almost all available key lengths but it creates indefined length encoded ASN1 objkects for strong encryption key lengths wheras Adobe's Acrobat supports defined length encoded ASN1 objects only).

The internal signature handler is mainly used with self-sign certificates but it is possible to sign a PDF file with any certificate that is installed on the system's certificate store, including hardware certificates.

External Signatures

In order to support software and hardware certificates with almost arbitrary encrpytion key lengths it is possible to sign a PDF file with an external signature handler. This makes it possible to select a certificate from the sytem's certificate store and to use system functions, for example, to sign a PDF file.

The function CloseAndSignFileExt() can be used to create detached and non-detached signatures. In case of a non-detached signature CloseAndSignFileExt() returns the SHA1 hash of the PDF file and the external signature handler signs this hash and creates a PKCS#7 signature object that must finally be written to the PDF file with FinishSignature().

A detached signature works almost identically with the exception that the signature handler creates also the hash from the PDF buffer to be signed. This variant is not recommended for programming languages which support no pointers like C# or VB .Net, for example, because an additional copy of the PDF buffer must usually be created and this doubles the memory usage

and requires additional processing time. However, detached signatures enable the usage of other hash algorithms than SHA1.

How to export a Windows Certificate?

To export a Windows certificate proceed as follows (description for Windows XP or higher): open the control panel and double click on the icon "Internet Options". Click on the tab "Contents" and then on the button "Certificates…". Select a certificate from the list and click on the button "Export…". The option "Export private key" must be selected (this option is not available if a certificate contains no private key). The private key is required; certificates without a private key cannot be used to sign PDF files. On the next dialog you must enter a password to encrypt the private key; this password must later be passed to the function CloseAndSignFile() or CloseAndSignFileEx() if the file should also be encrypted. Enter now the file name and path of the certificate file, finished! The result is a certificate file with the extension *.pfx, this file can now be used to digitally sign PDF files.

Importing signed PDF files

Signed PDF files can only be changed, without invalidating an existing signature, when changes are stored with an incremental update. An incremental update is a special way to modify a PDF file; changes are appended to the end of the file, leaving its original contents intact. This technique is required since altering any existing bytes in the file invalidates existing signatures.

However, incremental updates are not supported by DynaPDF that is the reason why only empty signature fields can be imported. Because DynaPDF creates always a completely new PDF file, it makes no sense to import existing signatures, they would always become invalid.

How to sign a PDF file?

Signing a PDF file with the internal signature handler of DynaPDF is quite easy; all you need is a PKCS#12 certificate file. Instead of calling the function CloseFile() or CloseFileEx() after the document was created, call either CloseAndSignFile() or CloseAndSignFileEx() if the file should also be encrypted, finished! A digital signature is always stored in a signature field. If no signature field was created beforehand, DynaPDF creates an invisible signature field on the first page and stores the signature in this field.

If the PDF file should be signed with an external signature handler call CloseAndSignFileExt(), sign the provided hash or byte ranges, and finally finish the signature with FinishSignature() to insert the signed PKCS#7 object into the PDF file.

How to create a signature field?

As mentioned above, the function CloseAndSignFile() or CloseAndSignFileEx() creates an invisible signature field on the first page if no signature field was already created or imported beforehand. If the signature field should be visible, just create one with the function

CreateSigField() on the page where the field should appear. If multiple signature fields exist, DynaPDF uses the last signature field to sign the PDF file.

How to modify the appearance of a signature field?

The appearance of a signature field can be fully user defined. The function CreateSigFieldAP() can be used to create a user defined signature appearance template. You can draw anything you want into this template such as images, vector graphics, text, and it is also possible to import a PDF page into or to draw an EMF file into the template.

What is stored in a signature field?

When signing a PDF file a signature handler, whether internal or external, creates a PKCS#7 signature object that contains the file's signature, optionally a time stamp, and a PKCS#1 certificate that was extracted from the PKCS#12 certificate. The difference between PKCS#1 and PKCS#12 is that a PKCS#1 certificate contains no private key.

A viewer application validates the signature by using the public key that is stored in the PKCS#1 certificate object. Because the private key is not stored in the PDF file it is impossible to sign other PDF files with the certificate that can be extracted from the PDF file.

Adobe's Acrobat supports defined length encoded ASN1 objects only for encryption key lengths stronger than 1024 bits.

How to validate a signature?

Acrobat validates signatures from unknown certificates not automatically. The certificate must first be added to the list of trusted identities. Once a certificate was added to the list of trusted identities, signatures of other documents which use the same certificate will be automatically validated.

PDF/A and PDF/X Compatibility

PDF files can be created for different purposes such as printing, publishing, or archiving which have all their own requirements. Due to these different requirements two separate PDF standards were defined by the ISO Committee, PDF/X and PDF/A.

PDF/X

The PDF/X-1a standard addresses blind exchanges where all files should be delivered in CMYK (and/or spot colors), with no RGB or device independent (color-managed) data. This is a common requirement in many areas around the world and in many print sectors – usually tied to an environment where the file supplier wants to retain maximum control of the print job.

PDF/X 3 is like PDF/X 1a an ISO standard for graphic content exchange. The main difference is that PDF/X 3 allows the use of color management and device-independent color in addition to CMYK and spot colors.

The PDF/X standard requires all fonts to be embedded, the appropriate PDF bounding boxes to be specified, and color to appear as CMYK, spot colors, or both. In addition, PDF/X compliant PDF files must contain information describing the printing condition for which they are prepared (see AddRenderingIntent()).

When creating PDF/X compliant files with DynaPDF you need to know that DynaPDF does not check whether certain features are allowed to use in the selected PDF/X standard. DynaPDF simply writes the required PDF/X key to the file which tells the viewer application that this file is compliant to a specific PDF/X version. Whether this is true or not depends on whether you used allowed features only and whether all required information were added to the file, e.g. the rendering intent (see AddRenderingIntent()), the document title (see SetDocInfo()) and the trim box for each page (see SetBBox()). It is usually best to check the resulting PDF file with a preflight tool before using certain features in a production environment.

However, it is not very difficult to create PDF/X compliant PDF files. The main recommendation is that all fonts are embedded, that at the least the trim box for all pages are set, and that colors are defined in the color space DeviceCMYK (see SetColorSpace()). In addition, an ICC profile must be embedded in the file (see AddRenderingIntent()) and images must not be compressed with JPEG2000 compression.

The wished output PDF version must be set with SetPDFVersion().

Example (C++):

```
// Error callback function.
SI32 PDF_CALL PDFError(const void* Data, SI32 ErrCode, const char*
ErrMessage, SI32 ErrType)
{
   printf("%s\n", ErrMessage);
   return -1; // We break processing if an error occurs
}

int main(int argc, char* argv[])
{
   void* pdf = pdfNewPDF();
   if (!pdf) return 2; // Out of memory?

   pdfSetOnErrorProc(pdf, NULL, (void*)PDFError);
   pdfCreateNewPDF(pdf, "c:/cppout.pdf");
   pdfSetDocInfo(pdf, diCreator, "C++ Example project");
   pdfSetDocInfo(pdf, diTitle, "PDF/X Compatibility");

   pdfAppend(pdf);
   // Just set the trim box to the same value as the media box if no
   // better value is known.
   TPDFRect b;
   pdfGetBBox(pdf, pbMediaBox, b);
   pdfSetBBox(pdf, pbTrimBox, b.Left, b.Bottom, b.Right, b.Top);

   // The font must be embedded (this should always be the case)
   pdfSetFont(pdf, "Arial", fsItalic, 20.0, true, cp1252);
   pdfSetColorSpace(pdf, csDeviceCMYK);
   pdfSetFillColor(pdf, PDF_CMYK(0, 0, 0, 255));
   pdfWriteFText(pdf, taCenter,
      "A very simple PDF/X compliant PDF file...");
   pdfEndPage(pdf);
   // The PDF version should be set before the file is closed because
   // it can be changed when importing a PDF file.
   pdfSetPDFVersion(pdf, pvPDFX1a_2001);
   pdfAddRenderingIntent(pdf,
      "c:/WINNT/System32/spool/drivers/color/USWebCoatedSWOP.icc");
   pdfCloseFile(pdf);

   pdfDeletePDF(pdf);
   return 0;
}
```


PDF/A

PDF/A is an ISO standard for long-term preservation. These files are primarily used for archiving. PDF/A compliant files can contain text, raster images, vector graphics, as well as annotations, hyperlinks, or bookmarks.

However, PDF/A compliant files must not contain JavaScripts or an Interactive Form. In addition, all fonts must be embedded and PDF/A compliant files must contain information describing the printing condition for which they are prepared (see AddRenderingIntent()). The output intent can be either CMYK or RGB based. However, only one device color space can be used in a document with the exception that DeviceGray can be combined with RGB or CMYK color spaces.

When creating PDF/A compatible files with DynaPDF it is important to know that DynaPDF does not automatically check whether certain features are allowed to use. DynaPDF writes simply the required PDF/A key to the file which tells the viewer application that the file is compatible to a specific PDF/A standard. Whether this is true or not depends on whether prohibited features were used and whether all required information were added to the file, e.g. the rendering intent.

However, DynaPDF contains the function CheckConformance() to check and convert non-conformant PDF files to PDF/A 1b. The function was originally developed a very powerful PDF to PDF/A converter called myPDFConvert by the DETEC GmbH in Germany.

All DynaPDF versions provide a restricted version of CheckConformance() that does not convert imported PDF files to PDF/A. The conversion of imported PDF files is possible if DynaPDF was licensed with the PDF/A Extension.

CheckConformance() is a very good helper function to get your PDF file fully PDF/A 1b compatible. CheckConformance() is not a preflight function, it automatically adjusts anything that is possible to get the file PDF/A 1b compatible. The function supports a large set of flags to specify what should be done if prohibited features were found in the file. Take a look into the function description for further information.

Example (C++):

```
// Error callback function.
SI32 PDF_CALL PDFError(const void* Data, SI32 ErrCode, const char*
ErrMessage, SI32 ErrType)
{
   printf("%s\n", ErrMessage);
   // We do not break processing if an error occurs. However, if the
   // file was fully created with DynaPDF we should not receive any
   // warning or other errors.
   return 0;
}
```