P4OFC Design

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**Synopsis**: This documents describes the design of P4OFC - the interface between Microsoft Office and Perforce.

This document is for information purposes, particularly as regards build and installation.

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# Introduction

## Overview

P4OFC has been implemented as:

* p4com.dll – a C++ COM DLL which wraps the Perforce API and provides a VB interface
* p4comaddin.dll – a VB DLL which implements all functions in MS Office, versions 2000, XP, 2003, 2007, 2010 and 2013.
* OLBs (ThreadAPI.olb, VBoostTypes6.olb) – these are Object Library files taken from Advanced Visual Basic by Matthew Curland ([www.powervb.com](http://www.powervb.com)). Used to provide multi-threading for better offline working, and also a singleton implementation for MS Project support. **You will require a copy of the book in order to have a license for these to build your own versions.**
* P4Dialogs.dll – COM wrapper around code by Data Shades (Copyright Perforce) to provide “Open from Perforce” functionality.
* installer – this installs into various flavours of Windows.

## Technology

Tools used to write P4OFC:

* Microsoft Visual C++ (Visual Studio 2010)
* Microsoft VisualBasic 6 (SP6)
* installer written using Inno Setup (an open source setup program): <http://www.jrsoftware.org/isinfo.php>. Demonstrates install logic.

Also needed on the Build machine is an installation of Office 2003 or later (see VB & References section below).

# P4COM.DLL

## Introduction

This was produced using the MS VC++ wizard to produce a COM DLL, and thus has the associated default code.

## Modules

This has the following main modules:

|  |  |
| --- | --- |
| p4com.cpp | Main DLL entry module |
| p4com.idl | Edited definition for publically exported COM functions | |
| p4.cpp | Implementation of COM p4 class – calls in to P4ClientAPI or P4ClientUser objects | |
| p4interface.cpp | Some utility functions | |
| P4clientapi.cpp | The wrapper function around the Perforce API. It creates a UserInterface and API object and runs the Perforce command using the API call. | |
| p4clientuser.cpp | This is a sub-class of ClientUser (Perforce API class), which overrides and implements some of the output functions (outputInfo, outputError). The data is stored in global variables from where it can be picked up by p4runcmd. |
| StrBufArray.cpp | Wrapper around VarArray | |
| TraceUtils.cpp | Trace utility function | |

### Notes

The main challenge is translating strings from VB format (BSTR) to C format (StrBufs primarily for the P4 API).

All output is buffered and handed back to the caller as large arrays.

## Building

The project is set up to have 2 main configurations: Debug and ReleaseMinDependancy.

### Debug

Standard stuff really – you can set in the project properties an executable to execute (e.g. WinWord.exe, then run in debugger using F5 with appropriate breakpoints set).

Can even set VB.exe as the debug executable and then run VB in debug mode.

# P4ComAddin.dll

## Introduction

This is a VB DLL which provides the main functionality across all Office platforms via the COM addin interface to Office.

## Challenges over the years

Most of the code has evolved fairly obviously since original changes were put in.

### Unicode Support

This was needed to support Unicode servers. The main challenge was the possibility of Unicode filenames and other text needed to be displayed (and entered for Submits).

This meant that we couldn’t use standard VB forms as they don’t display Unicode text. Instead we use MS forms used by Office itself. These are distributable but not official supported and somewhat buggy – necessitating a few workarounds in some cases (e.g. events don’t fire when they should).

They are MSForms 2.0, in the file fm20.dll typically found in windows\system32 and normally installed as part of some version of office.

As you can see in the KB article this file is not redistributable, but seeing as how any version of office installs it, that is not a problem as we are an office plugin!

http://support.microsoft.com/kb/224305

### Multi Threading

This was required to support better offline working. I moved the main p4 connect calls into a separate thread and wait for it to succeed or timeout. This allows a user form to be displayed so that the user can “cancel” the connection (if they know the server is currently uncontactable). It doesn’t in fact cancel anything but just lets the thread timeout behind the scenes, meanwhile allowing the user to get on with work.

### VB and References

VB Projects contain references to used COM libraries and also to Object and Type Libraries which are used to define how VB should access Word objects or whatever.

These are encoded in the .vbp file:

Reference=\*\G{00020430-0000-0000-C000-000000000046}#2.0#0#..\..\..\..\WINDOWS\system32\stdole2.tlb#OLE Automation

Reference=\*\G{20708EE0-24E3-11D3-AB5C-D41203C10000}#1.0#0#PowerVB\VBoostTypes6.olb#VBoost Object Types (6.0)

These all need to be present on the build machine and also after installation.

Snipping some info for clarity we get:

#### Standard References

The following are part of standard VB

#..\..\..\..\WINDOWS\system32\stdole2.tlb#OLE Automation

#..\..\..\..\Program Files\Microsoft Visual Studio\VB98\VB6EXT.OLB#Microsoft Visual Basic 6.0 Extensibility

The next is a library for creating COM addins for Office:

#..\..\..\..\Program Files\Common Files\Designer\msaddndr.dll#Microsoft Add-In Designer

The next contains FileSystemObject and similar functions for

#..\..\..\..\WINDOWS\system32\scrrun.dll#Microsoft Scripting Runtime

This is for Unicode forms support (installed as part of any version of Office):

#..\WINDOWS\system32\FM20.DLL#Microsoft Forms 2.0 Object Library

This is for the tab control used on the Options form:

Object=#0; tabctl32.ocx

#### Office Application References

The following are all references to Office COM models. It is important that the project references versions of these from Office 2000 since they are upward compatible with Office 2002/2003/2007/2010/2013 but not downwards compatible.

Thus if you have a reference to Office 2003 versions of these libraries when you build, you will not be able to run the built .dll on a machine with an earlier version of Office. **Similarly if you have Office2013 installed on your build machine then the installer will not work on any machine with Office2010 or earlier!**

#..\Office\MSO9.DLL#Microsoft Office 9.0 Object Library

#..\Office\MSPRJ9.OLB#Microsoft Project 9.0 Object Library

#..\Office\MSWORD9.OLB#Microsoft Word 9.0 Object Library

#..\Office\EXCEL9.OLB#Microsoft Excel 9.0 Object Library

#..\Office\MSPPT9.OLB#Microsoft PowerPoint 9.0 Object Library

#### VBoost Libraries

From the book Advanced VB ([www.powervb.com](http://www.powervb.com)), these are:

#PowerVB\VBoostTypes6.olb#VBoost Object Types (6.0)

#PowerVB\ThreadAPI.olb#VBoost: API declares used for threading

#### P4OFC References

These are the C++ COM components which are part of P4OFC itself for P4API interface and also

#..\p4dialogs.dll#P4Dialogs 1.0 Type Library

#..\p4com.dll#p4com 1.0 Type Library

## Connect.DSR

This is a MS Addin Designer which is required to trap Office add-in events.

It is called from Office 2000 - 2013 when the appropriate registry settings are activated and responds to automatic loading of the addins.

It needs to create extra menus and items on those menus and respond to the click events on those items.

## p4interface.cls

This is a global multiuse class which contains the basic functions to implement the menu commands (e.g. P4Office\_Add, P4Office\_Edit etc).

It also contains a few helpful functions such as IsWord() and IsExcel() to determine which application we are running in.

## officeapp.cls

This class contains specific functions to perform such actions as closing the current document, reading various flags on the current document.

The reason for the class is that it needs to implement things slightly differently for Word, Excel, PowerPoint and Project.

## Fstat.cls

This class just executes an fstat command and provides easy property functions for the result.

## PPEventHandler.cls and PPEvent.cls

I discovered that PowerPoint behaves differently to Word and Excel in that it is not possible to close the current document if you are within the Presentations\_Open event (i.e. a new presentation has been opened). Word and Excel allow you to do this.

As a result, these classes are used to store requests to close and reopen the current document (e.g. when reverting the current doc). The events are actioned by PPEventHandler on a timer which executes once the Presentations\_Open event has finished.

## Debugging

Similarly to VC++, you set the project properties to include a debug executable, press F5 and away you go.

## Building and Dependencies

The key thing is to look at the Sconscript file which defines the Scons build ([www.scons.org](http://www.scons.org))

### Building on a new machine

It can be a chicken and egg thing with certain references being setup appropriately on a new machine.

You need to install the following things:

* Office (preferably 2003 for building but later versions if you want to test them)
* Visual Studio 6 (Visual Basic) – SP6 required
* Visual Studio 2010 (VC++) – SP1 preferred
* Python 2.7
* Scons 2.3

I recommend that you first run the P4OFC.exe installer in order to setup some basic references (DLLs) and put them in the registry. If you do not do this then you may find that when you open the p4comaddin.vbp file up in VB6 it is missing certain registry settings.

From the root directory run “Scons” (ensure it is in your path), and from a clean install you should get something like this output:

c:\work\cowhamr.p4ofc.public.build>scons

scons: Reading SConscript files ...

scons: done reading SConscript files.

scons: Building targets ...

Install file: "help\p4ofc.chm" as "install\files\p4ofc.chm"

"""C:\Program Files (x86)\Microsoft Visual Studio 10.0\Common7\IDE\devenv.exe""" p4com\src\p4com.vcxproj /build "Release

MinDependency" /out log.txt

Install file: "p4com\src\ReleaseMinDependency\p4com.dll" as "install\files\p4com.dll"

"""C:\Program Files (x86)\Microsoft Visual Studio 10.0\Common7\IDE\devenv.exe""" p4dialogs\p4dialogs.vcxproj /build Rele

ase

"C:\Program Files (x86)\Microsoft Visual Studio\VB98\VB6.exe" /makedll p4comaddin\p4comaddin.vbp

Install file: "p4comaddin\p4comaddin.dll" as "install\files\p4comaddin.dll"

Install file: "references\VBoostTypes6.olb" as "install\files\VBoostTypes6.olb"

Install file: "references\ThreadAPI.olb" as "install\files\ThreadAPI.olb"

Install file: "p4dialogs\release\p4dialogs.dll" as "install\files\p4dialogs.dll"

Install file: "openssl-lib\libeay32.dll" as "install\files\libeay32.dll"

Install file: "openssl-lib\ssleay32.dll" as "install\files\ssleay32.dll"

"C:\Program Files (x86)\Inno Setup 5\iscc.exe" install\P4ForOffice.iss

Inno Setup 5 Command-Line Compiler

Copyright (C) 1997-2014 Jordan Russell. All rights reserved.

Portions Copyright (C) 2000-2014 Martijn Laan

Inno Setup Preprocessor

Copyright (C) 2001-2004 Alex Yackimoff. All rights reserved.

Compiler engine version: Inno Setup 5.5.5 (a)

[ISPP] Preprocessing.

[ISPP] Preprocessed.

Parsing [Setup] section, line 7

Parsing [Setup] section, line 8

Parsing [Setup] section, line 9

Parsing [Setup] section, line 10

Parsing [Setup] section, line 11

Parsing [Setup] section, line 12

Parsing [Setup] section, line 13

Parsing [Setup] section, line 14

Parsing [Setup] section, line 15

Parsing [Setup] section, line 17

Parsing [Setup] section, line 19

Parsing [Setup] section, line 20

Parsing [Setup] section, line 21

Reading file (WizardImageFile)

File: C:\Program Files (x86)\Inno Setup 5\WIZMODERNIMAGE.BMP

Reading file (WizardSmallImageFile)

File: C:\Program Files (x86)\Inno Setup 5\WIZMODERNSMALLIMAGE.BMP

Preparing Setup program executable

Reading default messages from Default.isl

Parsing [LangOptions], [Messages], and [CustomMessages] sections

File: C:\Program Files (x86)\Inno Setup 5\Default.isl

Messages in script file

Reading [Code] section

Parsing [Registry] section, line 26

Parsing [Registry] section, line 27

Parsing [Registry] section, line 28

Parsing [Registry] section, line 29

Parsing [Registry] section, line 31

Parsing [Registry] section, line 32

Parsing [Registry] section, line 33

Parsing [Registry] section, line 34

Parsing [Registry] section, line 36

Parsing [Registry] section, line 37

Parsing [Registry] section, line 38

Parsing [Registry] section, line 39

Parsing [Registry] section, line 42

Parsing [Registry] section, line 44

Parsing [Registry] section, line 47

Parsing [Files] section, line 51

Reading version info: c:\work\cowhamr.p4ofc.public.build\install\files\msaddndr.dll

Parsing [Files] section, line 54

Reading version info: c:\work\cowhamr.p4ofc.public.build\install\files\asycfilt.dll

Parsing [Files] section, line 55

Reading version info: c:\work\cowhamr.p4ofc.public.build\install\files\comcat.dll

Parsing [Files] section, line 56

Reading version info: c:\work\cowhamr.p4ofc.public.build\install\files\msvbvm60.dll

Parsing [Files] section, line 57

Reading version info: c:\work\cowhamr.p4ofc.public.build\install\files\oleaut32.dll

Parsing [Files] section, line 58

Reading version info: c:\work\cowhamr.p4ofc.public.build\install\files\olepro32.dll

Parsing [Files] section, line 61

Reading version info: c:\work\cowhamr.p4ofc.public.build\install\files\tabctl32.ocx

Parsing [Files] section, line 64

Reading version info: c:\work\cowhamr.p4ofc.public.build\install\files\scrrun.dll

Parsing [Files] section, line 67

Parsing [Files] section, line 70

Parsing [Files] section, line 71

Parsing [Files] section, line 72

Parsing [Files] section, line 73

Parsing [Files] section, line 74

Parsing [Files] section, line 77

Parsing [Files] section, line 78

Compiling [Code] section

Creating setup files

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\msaddndr.dll (6.0.81.69)

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\asycfilt.dll (2.40.4275.1)

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\comcat.dll (4.71.1460.1)

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\msvbvm60.dll (6.0.97.82)

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\oleaut32.dll (2.40.4275.1)

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\olepro32.dll (5.0.4275.1)

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\tabctl32.ocx (6.0.90.43)

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\scrrun.dll (5.6.0.6626)

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\p4ofc.chm

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\libeay32.dll

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\ssleay32.dll

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\p4dialogs.dll

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\p4com.dll

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\p4comaddin.dll

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\VBoostTypes6.olb

Compressing: c:\work\cowhamr.p4ofc.public.build\install\files\ThreadAPI.olb

Compressing Setup program executable

Updating version info

Successful compile (2.433 sec). Resulting Setup program filename is:

c:\work\cowhamr.p4ofc.public.build\install\Output\P4OFC.exe

scons: done building targets.

# Installer

## Introduction

This uses the Inno Setup routines – an open source installer with embedded Pascal scripting for logic.

The main scripts are fairly self explanatory.

The basic logic is:

* if office 2000 or XP installed then
  + create registry entries such that P4ComAddin is loaded (Note that p4comaddin is also required for office 97 support in any case).
* Also install VB6 and other related system DLLs if necessary

The P4ForOFfice.iss is the Inno Script logic. When in doubt, stick very closely to this logic and ask before making changes!

## Notes on Installer

### Configuring Office Com Add-ins

These are done by writing these registry settings:

Root: HKLM; Subkey: "Software\Microsoft\Office\Word\Addins\P4ComAddin.Connect"; ValueType: dword; ValueName: "CommandLineSafe"; ValueData: "0"; Check: Office2000orGreater; Flags: uninsdeletevalue

Note that “Check: Office2000orGreater” executes a script function which decides which version of Office is installed.

# Troubleshooting

This will split into a few areas:

## Installation

Stuff to do with permissions (NT4/Win2k/WinXP) – although this can probably be solved with help from Brett.

Replacing system DLLs (95/98)

Security settings – ideally any templates such as the Project install/uninstall should be signed for improved security. Perforce’s decision to this point has been to not do this.

## Office 2000/XP

These should be fairly straight forward once the installation is OK.

When debugged, e.g. menu commands being properly enabled etc, the code is reasonably robust.

# Automated Test Suite

There is a Python based test suite which drives both Office applications via COM automation and also uses AutoIt to look for dialogs being displayed, and also to send keypresses etc.

This can’t do everything but it provides a very convenient rough check.

## Requirements

* Python (2.7)
* Pywin32
* AutoIt Control - <http://www.autoitscript.com/>

## Notes

The thing that took a little investigation was the realisation that you often can't drive menu options in Word very easily via keystrokes. I then realised that I could drive them by finding the menu controls and directly executing them.

Note that I execute the office menu commands in their own thread, since if not, the call to execute it will block synchronously and I then can't check to see if the Window is there or not and click any buttons etc.

The above has allowed to me to put quite a lot of testing around my app driven by fairly simple keystroke sending and copying things out via the clipboard to see if commands were successful or not.

Note that there are some delays (e.g. sleep statements) in the code to wait for

## Test Suites

There are 3 main suites:

* Normal – normal opening and closing of documents, submits all work as expected etc
* Options – make sure that various option settings are properly actioned
* security3 – tests for prompting of passwords etc (for completeness there are tests for security levels 1 and 2 as well, but seldom run).

## Running the Test Harness

Edit an appropriate configuration file (based on hostname of the machine you are running on):

C:\Data\work\p4foroffice\test>type config\_cowhamr-t60.py

# Robert Cowham, Vaccaperna Systems Ltd, 2003/12/04

#

p4\_port = 'localhost:1999'

p4\_user = 'robert'

p4\_password = ''

p4\_client\_executable = "C:/apps/bin/p4.exe"

p4\_server\_description = 'Perforce server'

p4\_license\_file = 'C:/Perforce/license'

p4\_server\_path = "C:/apps/bin"

p4\_server\_2010\_2\_executable = "p4d-2010-2.exe"

p4port = p4\_port

window\_wait = 15 # time to wait for a window to appear

Run with parameter to say which application is being tested:

* "-7", "--2007" – specify this parameter if testing with Office 2007
* Then specify one of the following:
  + "-w", "--word"
  + "-x", "--excel"
  + "-p", "--powerpoint"
  + "-j", "--project"

The following does the interactive tests for Excel. While it is running, you should not attempt to use the machine and various windows will pop up etc.

C:\Data\work\p4foroffice\test>test\_p4ofc.py -x

P4OFC test suite, logging to C:\Data\work\p4foroffice\test\P4OFC.20080103T122736.log

close failed: [Errno 0] No error

50% complete

Perforce Server starting...

.50% complete

Perforce Server starting...

.50% complete

Perforce Server starting...

Perforce Server starting...

.

----------------------------------------------------------------------

Ran 3 tests in 120.781s

OK

C:\Data\work\p4foroffice\test>