

PyInstaller Manual

Version: PyInstaller v1.5.1
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Revision: 1545
Source URL: \$HeadURL:
<https://src.develer.com/svnoss/pyinstaller/branches/1.5/doc/source/Manual.rst> \$
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Contents

Requirements	4
Windows	4
Linux	4
Mac OS X	4
Getting Started	4
Installing PyInstaller	4
Configuring your PyInstaller setup	4
Create a spec file for your project	5
Build your project	6
Windows COM Server support	6
Building Optimized	7
A Note on using UPX	7
How one-file mode works	8
.egg files and setuptools	9
PyInstaller Utilities	9
ArchiveViewer	9
bindepend	10
GrabVersion (Windows)	10
Analyzing Dependencies	10
pyinstaller.py	10
Spec Files	11
Introduction	11
TOC Class (Table of Contents)	11
Target Subclasses	13
Analysis	13
PYZ	13
PKG	14
EXE	14
DLL	15
COLLECT	15
Tree	15
When Things Go Wrong	16
Finding out What Went Wrong	16
Buildtime Warnings	16
Getting Debug Messages	16

Getting Python's Verbose Imports	16
Helping PyInstaller Find Modules	17
Extending the Path	17
Listing Hidden Imports	17
Extending a Package's <code>__path__</code>	18
Changing Runtime Behavior	18
Adapting to being "frozen"	19
Accessing Data Files	19
Miscellaneous	19
Win9xpopen	19
Self-extracting executables	19
One Pass Execution	20
Two Pass Execution	20
PyInstaller Archives	21
Archives Introduction	21
ZlibArchive	22
CArchive	22
License	23
Appendix	23
Building the bootloaders	24
Development tools	24
Building	24
Linux Standard Base (LSB) binary	25
mf.py: A Modulefinder Replacement	26
ImportTracker	26
analyze_one()	26
Module Classes	26
code scanning	26
Hooks	27
Warnings	27
Cross Reference	27
mf Usage	27
iu.py: An <i>imputil</i> Replacement	28
ImportManager	29
ImportDirector	29
PathImportDirector	29

Owner	29
Packages	30
Possibilities	30
Compatibility	30
Performance	30
Limitations	30
iu Usage	31

Requirements

Windows

PyWin32

Python extensions for Windows is only necessary for users of Python 2.6+.

[Back to Top](#)

Linux

ldd

Console application to print the shared libraries required by each program or shared library.

objdump

Console application to display information from object files.

[Back to Top](#)

Mac OS X

Xcode

is a suite of tools for developing software for Mac OS X. It can be also installed from your Mac OS X Install DVD. It is not necessary to install the version 4 of Xcode. PyInstaller depends on `otool` which is installed together with Xcode. `otool` displays information of object files or libraries.

[Back to Top](#)

Getting Started

Installing PyInstaller

First, unpack the archive on your path of choice. Installer is **not** a Python package, so it doesn't need to go in site-packages, or have a .pth file. For the purpose of this documentation we will assume `/your/path/to/pyinstaller/`. You will be using a couple of scripts in the `/your/path/to/pyinstaller/` directory, and these will find everything they need from their own location. For convenience, keep the paths to these scripts short (don't install in a deeply nested subdirectory).

[Back to Top](#)

Configuring your PyInstaller setup

In the `/your/path/to/pyinstaller/` directory, run:

```
python Configure.py
```

This will configure PyInstaller usage based on the current system, and save some information into `config.dat` that would otherwise be recomputed every time.

It can be rerun at any time if your configuration changes. It must be run at least once before trying to build anything.

PyInstaller is dependant to the version of python you configure it for. In other words, you will need a separate copy of *PyInstaller* for each Python version you wish to work with or you'll need to rerun `Configure.py` every time you switch the Python version).

[Back to Top](#)

Create a spec file for your project

[For Windows COM server support, see section [Windows COM Server Support](#)]

This is the first step to do. The spec file is the description of what you want *PyInstaller* to do with your program. In the root directory of *PyInstaller*, there is a simple wizard to create simple spec files that cover all basic usages:

```
python Makespec.py [--onefile] yourprogram.py
```

By default, `Makespec.py` generates a spec file that tells *PyInstaller* to create a distribution directory contains the main executable and the dynamic libraries. The option `--onefile` specifies that you want *PyInstaller* to build a single file with everything inside.

Elaborating on `Makespec.py`, this is the supported command line:

```
python Makespec.py [opts] <scriptname> [<scriptname> ...]
```

Where allowed OPTIONS are:

<code>-F, --onefile</code>	produce a single file deployment (see below).
<code>-D, --onedir</code>	produce a single directory deployment (default).
<code>-K, --tk</code>	include TCL/TK in the deployment.
<code>-a, --ascii</code>	do not include encodings. The default (on Python versions with unicode support) is now to include all encodings.
<code>-d, --debug</code>	use debug (verbose) versions of the executables.
<code>-w, --windowed, --noconsole</code>	Use the Windows subsystem executable, which does not open the console when the program is launched. (Windows only)
<code>-c, --nowindowed, --console</code>	Use the console subsystem executable. This is the default. (Windows only)
<code>-s, --strip</code>	the executable and all shared libraries will be run through strip. Note that cygwin's strip tends to render normal Win32 dlls unusable.
<code>-X, --upx</code>	if you have UPX installed (detected by Configure), this will use it to compress your executable (and, on Windows, your dlls). See note below.

<code>-o DIR, --out=DIR</code>	create the spec file in <i>directory</i> . If not specified, and the current directory is Installer's root directory, an output subdirectory will be created. Otherwise the current directory is used.
<code>-p DIR, --paths=DIR</code>	set base path for import (like using PYTHONPATH). Multiple directories are allowed, separating them with the path separator (';' under Windows, ':' under Linux), or using this option multiple times.
<code>--icon=<FILE.ICO></code>	add <i>file.ico</i> to the executable's resources. (Windows only)
<code>--icon=<FILE.EXE,N></code>	add the <i>n</i> -th icon in <i>file.exe</i> to the executable's resources. (Windows only)
<code>-v FILE, --version=FILE</code>	add <i>verfile</i> as a version resource to the executable. (Windows only)
<code>-n NAME, --name=NAME</code>	optional <i>name</i> to assign to the project (from which the spec file name is generated). If omitted, the basename of the (first) script is used.

[For building with optimization on (like Python `-O`), see section [Building Optimized](#)]

For simple projects, the generated spec file will probably be sufficient. For more complex projects, it should be regarded as a template. The spec file is actually Python code, and modifying it should be ease. See [Spec Files](#) for details.

[Back to Top](#)

Build your project

```
python Build.py specfile
```

A `buildproject` subdirectory will be created in the specfile's directory. This is a private workspace so that `Build.py` can act like a makefile. Any named targets will appear in the specfile's directory.

The generated files will be placed within the `dist` subdirectory; that's where the files you are interested in will be placed.

In most cases, this will be all you have to do. If not, see [When things go wrong](#) and be sure to read the introduction to [Spec Files](#).

[Back to Top](#)

Windows COM Server support

For Windows COM support execute:

```
python MakeCOMServer.py [OPTION] script...
```

This will generate a new script `drivescript.py` and a spec file for the script.

These options are allowed:

<code>--debug</code>	Use the verbose version of the executable.
<code>--verbose</code>	Register the COM server(s) with the quiet flag off.
<code>--ascii</code>	do not include encodings (this is passed through to Makespec).

```
--out <dir>
```

Generate the driver script and spec file in dir.

Now [Build your project](#) on the generated spec file.

If you have the win32dbg package installed, you can use it with the generated COM server. In the driver script, set `debug=1` in the registration line.

Warnings: the inprocess COM server support will not work when the client process already has Python loaded. It would be rather tricky to non-obtrusively hook into an already running Python, but the show-stopper is that the Python/C API won't let us find out which interpreter instance I should hook into. (If this is important to you, you might experiment with using apartment threading, which seems the best possibility to get this to work). To use a "frozen" COM server from a Python process, you'll have to load it as an exe:

```
o = win32com.client.Dispatch(progid,
                             clsctx=pythoncom.CLSCTX_LOCAL_SERVER)
```

MakeCOMServer also assumes that your top level code (registration etc.) is "normal". If it's not, you will have to edit the generated script.

Back to Top

Building Optimized

There are two facets to running optimized: gathering .pyo's, and setting the `Py_OptimizeFlag`. Installer will gather .pyo's if it is run optimized:

```
python -O Build.py ...
```

The `Py_OptimizeFlag` will be set if you use a `('O', '', 'OPTION')` in one of the TOCs building the EXE:

```
exe = EXE(pyz,
          a.scripts + [('O', '', 'OPTION')],
          ...
```

See [Spec Files](#) for details.

Back to Top

A Note on using UPX

On both Windows and Linux, UPX can give truly startling compression - the days of fitting something useful on a diskette are not gone forever! Installer has been tested with many UPX versions without problems. Just get it and install it on your PATH, then rerun configure.

For Windows, there is a problem of compatibility between UPX and executables generated by Microsoft Visual Studio .NET 2003 (or the equivalent free toolkit available for download). This is especially worrisome for users of Python 2.4+, where most extensions (and Python itself) are compiled with that compiler. This issue has been fixed in later beta versions of UPX, so you will need at least UPX 1.92 beta. [Configure.py](#) will check this for you and complain if you have an older version of UPX and you are using Python 2.4.

UPX and Unix

Under UNIX, old versions of UPX were not able to expand and execute the executable in memory, and they were extracting it into a temporary file in the filesystem, before spawning it. This is no longer valid under Linux, but the information in this paragraph still needs to be updated.

For Linux, a bit more discussion is in order. First, UPX is only useful on executables, not shared libs. Installer accounts for that, but to get the full benefit, you might rebuild Python with more things statically linked.

More importantly, when `run` finds that its `sys.argv[0]` does not contain a path, it will use `/proc/pid/exe` to find itself (if it can). This happens, for example, when executed by Apache. If it has been upx-ed, this symbolic link points to the tempfile created by the upx stub and *PyInstaller* will fail (please see the UPX docs for more information). So for now, at least, you can't use upx for CGI's executed by Apache. Otherwise, you can ignore the warnings in the UPX docs, since what PyInstaller opens is the executable Installer created, not the temporary upx-created executable.

Back to Top

How one-file mode works

Bootloader

The bootloader (also known as *stub* in literature) is the small program which starts up your packaged program. Usually, the archive containing the bytecoded modules of your program is simply appended to it. See [Self-extracting executables](#) for more details on the process.

A `--onefile` works by packing all the shared libs / dlls into the archive attached to the bootloader executable (or next to the executable in a non-elf configuration). When first started, it finds that it needs to extract these files before it can run "for real". That's because locating and loading a shared lib or linked-in dll is a system level action, not user-level. With PyInstaller v1.5.1 it always uses a temporary directory (`_MEIXXXXX`, where `XXXXX` is a random number to avoid conflicts) in the user's temp directory. It then executes itself again, setting things up so the system will be able to load the shared libs / dlls. When execution is complete, it recursively removes the entire directory it created.

The temporary directory is exported to the program's environment as `os.environ['_MEIPASS2']`. This can be used in case you manually modified the spec file to tell PyInstaller to add additional files (eg: data files) within the executable (see also [Accessing Data Files](#)).

This has a number of implications:

- You can run multiple copies - they won't collide.
- Running multiple copies will be rather expensive to the system (nothing is shared).
- On Windows, using Task Manager to kill the parent process will leave the directory behind.
- On *nix, a kill -9 (or crash) will leave the directory behind.
- Otherwise, on both platforms, the directory will be recursively deleted.
- So any files you might create in `os.environ['_MEIPASS2']` will be deleted.
- The executable can be in a protected or read-only directory.

Notes for *nix users: Take notice that if the executable does a `setuid root`, a determined hacker could possibly (given enough tries) introduce a malicious lookalike of one of the shared libraries during the hole between when the library is extracted into the temporary directory and when it gets loaded by the

execvp'd process. So maybe you shouldn't do setuid root programs using `--onefile`. **In fact, we do not recomend the use of `--onefile` on setuid programs.**

Back to Top

.egg files and setuptools

[setuptools](#) is a distutils extensions which provide many benefits, including the ability to distribute the extension as *eggs*. Together with the nifty [easy_install](#) (a tool which automatically locates, downloads and installs Python extensions), *eggs* are becoming more and more widespread as a way for distributing Python extensions.

eggs can be either files or directories. An *egg* directory is basically a standard Python package, with some additional metadata that can be used for advanced [setuptools](#) features like entry-points. An *egg* file is simply a ZIP file, and it works as a package as well because Python 2.3+ is able to transparently import modules stored within ZIP files.

PyInstaller supports *eggs* at a good level. In fact:

- It is able to follow dependencies within *eggs* (both files and directories). So if your program imports a package shipped in *egg* format, and this package requires additional libraries, *PyInstaller* will correctly include everything within the generated executable.
- *egg-files* are fully supported. To let everything works (entry-points, `pkg_resource` library, etc.), *PyInstaller* either copy the *egg-files* into the distribution directory (in one-dir mode) or packs them as-is within the generated executable and unpack them at startup into the temporary directory (see [How one-file mode works](#)).
- *egg-directories* are partially supported. In fact, *PyInstaller* at build time treat them as regular package. This means that all advanced features requiring *egg* metadatas will not work.

Improved support for *eggs* is planned for a future release of *PyInstaller*.

Back to Top

PyInstaller Utilities

ArchiveViewer

```
python ArchiveViewer.py <archivefile>
```

ArchiveViewer lets you examine the contents of any archive build with *PyInstaller* or executable (PYZ, PKG or exe). Invoke it with the target as the first arg (It has been set up as a Send-To so it shows on the context menu in Explorer). The archive can be navigated using these commands:

O <nm>

Open the embedded archive <nm> (will prompt if omitted).

U

Go up one level (go back to viewing the embedding archive).

X <nm>

Extract nm (will prompt if omitted). Prompts for output filename. If none given, extracted to stdout.

Q

Quit.

Back to Top

bindepend

```
python bindepend.py <executable_or_dynamic_library>
```

bindepend will analyze the executable you pass to it, and write to stdout all its binary dependencies. This is handy to find out which DLLs are required by an executable or another DLL. This module is used by *PyInstaller* itself to follow the chain of dependencies of binary extensions and make sure that all of them get included in the final package.

GrabVersion (Windows)

```
python GrabVersion.py <executable_with_version_resource>
```

GrabVersion outputs text which can be eval'ed by `versionInfo.py` to reproduce a version resource. Invoke it with the full path name of a Windows executable (with a version resource) as the first argument. If you cut & paste (or redirect to a file), you can then edit the version information. The edited text file can be used in a `version = myversion.txt` option on any executable in an *PyInstaller* spec file.

This was done in this way because version resources are rather strange beasts, and fully understanding them is probably impossible. Some elements are optional, others required, but you could spend unbounded amounts of time figuring this out, because it's not well documented. When you view the version tab on a properties dialog, there's no straightforward relationship between how the data is displayed and the structure of the resource itself. So the easiest thing to do is find an executable that displays the kind of information you want, grab it's resource and edit it. Certainly easier than the Version resource wizard in VC++.

Back to Top

Analyzing Dependencies

You can interactively track down dependencies, including getting cross-references by using `mf.py`, documented in section [mf.py: A modulefinder Replacement](#)

Back to Top

pyinstaller.py

```
python pyinstaller.py [options] <scriptname> [ <scriptname> ...] | <specfile>
```

Utility `pyinstaller.py` is new alternative interface for using *PyInstaller*. It will be the default interface for using *PyInstaller* in next major release (*PyInstaller* v1.6). `pyinstaller.py` should simplify usage of *PyInstaller* by wrapping the fuctionality of scripts `Configure.py`, `Makespec.py` and `Build.py`.

It should accept all optios of `Configure.py`, `Makespec.py` and `Build.py`.

Spec Files

Introduction

When you run `Makespec.py` (documented in section [Create a spec file for your project](#)), it generates a spec file for you. In fact, you can think of `Makespec.py` just like a wizard that lets you generate a standard spec file for most standard usages. But advanced users can learn to edit spec files to fully customize PyInstaller behaviour to their needs, giving beyond the standard settings provided by the wizard.

Spec files are in Python syntax. They are evaluated by `Build.py`. A simplistic spec file might look like this:

```
a = Analysis(['myscript.py'])
pyz = PYZ(a.pure)
exe = EXE(pyz, a.scripts, a.binaries, name="myapp.exe")
```

This creates a single file deployment with all binaries (extension modules and their dependencies) packed into the executable.

A simplistic single directory deployment might look like this:

```
a = Analysis(['myscript.py'])
pyz = PYZ(a.pure)
exe = EXE(a.scripts, pyz, name="myapp.exe", exclude_binaries=1)
dist = COLLECT(exe, a.binaries, name="dist")
```

Note that neither of these examples are realistic. If you want to start hacking a spec file, use `Makespec.py` to create a basic specfile, and tweak it (if necessary) from there.

All of the classes you see above are subclasses of `Build.Target`. A `Target` acts like a rule in a makefile. It knows enough to cache its last inputs and outputs. If its inputs haven't changed, it can assume its outputs wouldn't change on recomputation. So a spec file acts much like a makefile, only rebuilding as much as needs rebuilding. This means, for example, that if you change an `EXE` from `debug=1` to `debug=0`, the rebuild will be nearly instantaneous.

The high level view is that an `Analysis` takes a list of scripts as input, and generates three "outputs", held in attributes named `scripts`, `pure` and `binaries`. A `PYZ` (a `.pyz` archive) is built from the modules in `pure`. The `EXE` is built from the `PYZ`, the scripts and, in the case of a single-file deployment, the binaries. In a single-directory deployment, a directory is built containing a slim executable and the binaries.

Back to Top

TOC Class (Table of Contents)

Before you can do much with a spec file, you need to understand the `TOC` (Table Of Contents) class.

A `TOC` appears to be a list of tuples of the form (name, path, typecode). In fact, it's an ordered set, not a list. A `TOC` contains no duplicates, where uniqueness is based on name only. Furthermore, within this constraint, a `TOC` preserves order.

Besides the normal list methods and operations, `TOC` supports taking differences and intersections (and note that adding or extending is really equivalent to union). Furthermore, the operations can take a real list of tuples on the right hand side. This makes excluding modules quite easy. For a pure Python module:

```
pyz = PYZ(a.pure - [('badmodule', '', '')])
```

or for an extension module in a single-directory deployment:

```
dist = COLLECT(..., a.binaries - [('badmodule', '', '')], ...)
```

or for a single-file deployment:

```
exe = EXE(..., a.binaries - [('badmodule', '', '')], ...)
```

To add files to a TOC, you need to know about the typecodes (or the step using the TOC won't know what to do with the entry).

typecode	description	name	path
'EXTENSION'	An extension module.	Python internal name.	Full path name in build.
'PYSOURCE'	A script.	Python internal name.	Full path name in build.
'PYMODULE'	A pure Python module (including <code>__init__</code> modules).	Python internal name.	Full path name in build.
'PYZ'	A .pyz archive (archive_rt.ZlibArchive).	Runtime name.	Full path name in build.
'PKG'	A pkg archive (carchive4.CArchive).	Runtime name.	Full path name in build.
'BINARY'	A shared library.	Runtime name.	Full path name in build.
'DATA'	Arbitrary files.	Runtime name.	Full path name in build.
'OPTION'	A runtime option (frozen into the executable).	The option.	Unused.

You can force the include of any file in much the same way you do excludes:

```
collect = COLLECT(a.binaries +
    [('readme', '/my/project/readme', 'DATA')], ...)
```

or even:

```
collect = COLLECT(a.binaries,
    [('readme', '/my/project/readme', 'DATA')], ...)
```

(that is, you can use a list of tuples in place of a TOC in most cases).

There's not much reason to use this technique for `PYSOURCE`, since an `Analysis` takes a list of scripts as input. For `PYMODULEs` and `EXTENSIONs`, the hook mechanism discussed here is better because you won't have to remember how you got it working next time.

This technique is most useful for data files (see the `Tree` class below for a way to build a TOC from a directory tree), and for runtime options. The options the run executables understand are:

Option	Description	Example	Notes
v	Verbose imports	('v', '', 'OPTION')	Same as Python -v ...
u	Unbuffered stdio	('u', '', 'OPTION')	Same as Python -u ...

W spec	Warning option	('W ignore', '', 'OPTION')	Python 2.1+ only.
s	Use site.py	('s', '', 'OPTION')	The opposite of Python's -S flag. Note that site.py must be in the executable's directory to be used.

Advanced users should note that by using set differences and intersections, it becomes possible to factor out common modules, and deploy a project containing multiple executables with minimal redundancy. You'll need some top level code in each executable to mount the common `PYZ`.

Back to Top

Target Subclasses

Analysis

```
Analysis(scripts, pathex=None, hookspath=None, excludes=None)
```

scripts

a list of scripts specified as file names.

pathex

an optional list of paths to be searched before `sys.path`.

hookspath

an optional list of paths used to extend the hooks package.

excludes

an optional list of module or package names (their Python names, not path names) that will be ignored (as though they were not found).

An `Analysis` has five outputs, all `TOCs` accessed as attributes of the `Analysis`.

scripts

The scripts you gave `Analysis` as input, with any runtime hook scripts prepended.

pure

The pure Python modules.

binaries

The extension modules and their dependencies. The secondary dependencies are filtered. On Windows, a long list of MS DLLs are excluded. On Linux/Unix, any shared lib in `/lib` or `/usr/lib` is excluded.

datas

Data-file dependencies. These are data-file that are found to be needed by modules. They can be anything: plugins, font files, etc.

zipfiles

The zipfiles dependencies (usually egg-files).

Back to Top

PYZ

```
PYZ(toc, name=None, level=9)
```

toc

a TOC, normally an `Analysis.pure`.

name

A filename for the `.pyz`. Normally not needed, as the generated name will do fine.

level

The Zlib compression level to use. If 0, the zlib module is not required.

Back to Top

PKG

Generally, you will not need to create your own PKGs, as the EXE will do it for you. This is one way to include read-only data in a single-file deployment, however. A single-file deployment including TK support will use this technique.

```
PKG(toc, name=None, cdict=None, exclude_binaries=0)
```

toc

a TOC.

name

a filename for the PKG (optional).

cdict

a dictionary that specifies compression by typecode. For example, `PYZ` is left uncompressed so that it can be accessed inside the PKG. The default uses sensible values. If zlib is not available, no compression is used.

exclude_binaries

If 1, `EXTENSIONS` and `BINARYS` will be left out of the PKG, and forwarded to its container (usually a `COLLECT`).

Back to Top

EXE

```
EXE(*args, **kws)
```

args

One or more arguments which are either TOCs or Targets.

kws

Possible keyword arguments:

console

Always 1 on Linux/unix. On Windows, governs whether to use the console executable, or the Windows subsystem executable.

debug

Setting to 1 gives you progress messages from the executable (for a `console=0`, these will be annoying MessageBoxes).

name

The filename for the executable.

exclude_binaries

Forwarded to the PKG the EXE builds.

icon

Windows NT family only. `icon='myicon.ico'` to use an icon file, or `icon='notepad.exe,0'` to grab an icon resource.

version

Windows NT family only. `version='myversion.txt'`. Use `GrabVersion.py` to steal a version resource from an executable, and then edit the output to create your own. (The syntax of version resources is so arcane that I wouldn't attempt to write one from scratch.)

append_pkg

If `True`, then append the PKG archive to the EXE. If `False`, place the PKG archive in a separate file `exename.pkg`. The default is taken from a flag in `config.dat` and depends on whether `Make.py` was given the `-n` argument when building the loader. The default is `True` on Windows. On non-ELF platforms where concatenating arbitrary data to an executable does not work, `append_pkg` must be set to `False`.

Back to Top

DLL

On Windows, this provides support for doing in-process COM servers. It is not generalized. However, embedders can follow the same model to build a special purpose DLL so the Python support in their app is hidden. You will need to write your own dll, but thanks to Allan Green for refactoring the C code and making that a manageable task.

Back to Top

COLLECT

```
COLLECT(*args, **kws)
```

args

One or more arguments which are either TOCs or Targets.

kws

Possible keyword arguments:

name

The name of the directory to be built.

Back to Top

Tree

```
Tree(root, prefix=None, excludes=None)
```

root

The root of the tree (on the build system).

prefix

Optional prefix to the names on the target system.

excludes

A list of names to exclude. Two forms are allowed:

name

files with this basename will be excluded (do not include the path).

***.ext**

any file with the given extension will be excluded.

Since a `Tree` is a TOC, you can also use the exclude technique described above in the section on TOCs.

Back to Top

When Things Go Wrong

Finding out What Went Wrong

Buildtime Warnings

When an `Analysis` step runs, it produces a warnings file (named `warnproject.txt`) in the spec file's directory. Generally, most of these warnings are harmless. For example, `os.py` (which is cross-platform) works by figuring out what platform it is on, then importing (and rebinding names from) the appropriate platform-specific module. So analyzing `os.py` will produce a set of warnings like:

```
W: no module named dos (conditional import by os)
W: no module named ce (conditional import by os)
W: no module named os2 (conditional import by os)
```

Note that the analysis has detected that the import is within a conditional block (an `if` statement). The analysis also detects if an import within a function or class, (delayed) or at the top level. A top-level, non-conditional import failure is really a hard error. There's at least a reasonable chance that conditional and / or delayed import will be handled gracefully at runtime.

Ignorable warnings may also be produced when a class or function is declared in a package (an `__init__.py` module), and the import specifies `package.name`. In this case, the analysis can't tell if name is supposed to refer to a submodule of package.

Warnings are also produced when an `__import__`, `exec` or `eval` statement is encountered. The `__import__` warnings should almost certainly be investigated. Both `exec` and `eval` can be used to implement import hacks, but usually their use is more benign.

Any problem detected here can be handled by hooking the analysis of the module. See [Listing Hidden Imports](#) below for how to do it.

Back to Top

Getting Debug Messages

Setting `debug=1` on an `EXE` will cause the executable to put out progress messages (for console apps, these go to stdout; for Windows apps, these show as MessageBoxes). This can be useful if you are doing complex packaging, or your app doesn't seem to be starting, or just to learn how the runtime works.

Back to Top

Getting Python's Verbose Imports

You can also pass a `-v` (verbose imports) flag to the embedded Python. This can be extremely useful. I usually try it even on apparently working apps, just to make sure that I'm always getting my copies of the modules and no import has leaked out to the installed Python.

You set this (like the other runtime options) by feeding a phone TOC entry to the `EXE`. The easiest way to do this is to change the `EXE` from:


```
EXE(..., anal.scripts, ....)
```

to:

```
EXE(..., anal.scripts + [('v', '', 'OPTION')], ...)
```

These messages will always go to `stdout`, so you won't see them on Windows if `console=0`.

Back to Top

Helping PyInstaller Find Modules

Extending the Path

When the analysis phase cannot find needed modules, it may be that the code is manipulating `sys.path`. The easiest thing to do in this case is tell `Analysis` about the new directory through the second arg to the constructor:

```
anal = Analysis(['somedir/myscript.py'],
               ['path/to/thisdir', 'path/to/thatdir'])
```

In this case, the `Analysis` will have a search path:

```
['somedir', 'path/to/thisdir', 'path/to/thatdir'] + sys.path
```

You can do the same when running `Makespec.py`:

```
Makespec.py --paths=path/to/thisdir;path/to/thatdir ...
```

(on *nix, use `:` as the path separator).

Back to Top

Listing Hidden Imports

Hidden imports are fairly common. These can occur when the code is using `__import__` (or, perhaps `exec` or `eval`), in which case you will see a warning in the `warnproject.txt` file. They can also occur when an extension module uses the Python/C API to do an import, in which case `Analysis` can't detect anything. You can verify that hidden import is the problem by using Python's verbose imports flag. If the import messages say "module not found", but the `warnproject.txt` file has no "no module named..." message for the same module, then the problem is a hidden import.

Standard hidden imports are already included!

If you are getting worried while reading this paragraph, do not worry: having hidden imports is the exception, not the norm! And anyway, PyInstaller already ships with a large set of hooks that take care of hidden imports for the most common packages out there. For instance, [PIL](#), [PyWin32](#), [PyQt](#) are already taken care of.

Hidden imports are handled by hooking the module (the one doing the hidden imports) at `Analysis` time. Do this by creating a file named `hook-module.py` (where `module` is the fully-qualified Python name, eg, `hook-xml.dom.py`), and placing it in the `hooks` package under *PyInstaller's* root directory,

(alternatively, you can save it elsewhere, and then use the `hookspath` arg to `Analysis` so your private hooks directory will be searched). Normally, it will have only one line:

```
hiddenimports = ['module1', 'module2']
```

When the `Analysis` finds this file, it will proceed exactly as though the module explicitly imported `module1` and `module2`. (Full details on the analysis-time hook mechanism is in the [Hooks](#) section).

If you successfully hook a publicly distributed module in this way, please send us the hook so we can make it available to others.

Back to Top

Extending a Package's `__path__`

Python allows a package to extend the search path used to find modules and sub-packages through the `__path__` mechanism. Normally, a package's `__path__` has only one entry - the directory in which the `__init__.py` was found. But `__init__.py` is free to extend its `__path__` to include other directories. For example, the `win32com.shell.shell` module actually resolves to `win32com/win32comext/shell/shell.pyd`. This is because `win32com/__init__.py` appends `../win32comext` to its `__path__`.

Because the `__init__.py` is not actually run during an analysis, we use the same hook mechanism we use for hidden imports. A static list of names won't do, however, because the new entry on `__path__` may well require computation. So `hook-module.py` should define a method `hook(mod)`. The `mod` argument is an instance of `mf.Module` which has (more or less) the same attributes as a real module object. The hook function should return a `mf.Module` instance - perhaps a brand new one, but more likely the same one used as an arg, but mutated. See [mf.py: A Modulefinder Replacement](#) for details, and [hooks/hook-win32com.py](#) for an example.

Note that manipulations of `__path__` hooked in this way apply to the analysis, and only the analysis. That is, at runtime `win32com.shell` is resolved the same way as `win32com.anythingelse`, and `win32com.__path__` knows nothing of `../win32comext`.

Once in awhile, that's not enough.

Back to Top

Changing Runtime Behavior

More bizarre situations can be accomodated with runtime hooks. These are small scripts that manipulate the environment before your main script runs, effectively providing additional top-level code to your script.

At the tail end of an analysis, the module list is examined for matches in `rthooks.dat`, which is the string representation of a Python dictionary. The key is the module name, and the value is a list of hook-script pathnames.

So putting an entry:

```
'somemodule': ['path/to/somescript.py'],
```

into `rthooks.dat` is almost the same thing as doing this:

```
anal = Analysis(['path/to/somescript.py', 'main.py'], ...
```

except that in using the hook, `path/to/somescript.py` will not be analyzed, (that's not a feature - we just haven't found a sane way fit the recursion into my persistence scheme).

Hooks done in this way, while they need to be careful of what they import, are free to do almost anything. One provided hook sets things up so that win32com can generate modules at runtime (to disk), and the generated modules can be found in the win32com package.

Back to Top

Adapting to being "frozen"

In most sophisticated apps, it becomes necessary to figure out (at runtime) whether you're running "live" or "frozen". For example, you might have a configuration file that (running "live") you locate based on a module's `__file__` attribute. That won't work once the code is packaged up. You'll probably want to look for it based on `sys.executable` instead.

The bootloaders set `sys.frozen=1` (and, for in-process COM servers, the embedding DLL sets `sys.frozen='dll'`).

For really advanced users, you can access the `iu.ImportManager` as `sys.importManager`. See [iu.py](#) for how you might make use of this fact.

Back to Top

Accessing Data Files

In a `--onedir` distribution, this is easy: pass a list of your data files (in TOC format) to the COLLECT, and they will show up in the distribution directory tree. The name in the `(name, path, 'DATA')` tuple can be a relative path name. Then, at runtime, you can use code like this to find the file:

```
os.path.join(os.path.dirname(sys.executable), relativename))
```

In a `--onefile` distribution, data files are bundled within the executable and then extracted at runtime into the work directory by the C code (which is also able to reconstruct directory trees). The work directory is best found by `os.environ['_MEIPASS2']`. So, you can access those files through:

```
os.path.join(os.environ["_MEIPASS2"], relativename))
```

Back to Top

Miscellaneous

Win9xpopen

If you're using `popen` on Windows and want the code to work on Win9x, you'll need to distribute `win9xpopen.exe` with your app. On older Pythons with Win32all, this would apply to `Win32pipe` and `win32popenWin9x.exe`. (On yet older Pythons, no form of `popen` worked on Win9x).

Back to Top

Self-extracting executables

The ELF executable format (Windows, Linux and some others) allows arbitrary data to be concatenated to the end of the executable without disturbing its functionality. For this reason, a `CArchive`'s Table of Contents is at the end of the archive. The executable can open itself as a binary file name, seek to the end and 'open' the `CArchive` (see figure 3).

On other platforms, the archive and the executable are separate, but the archive is named `executable.pkg`, and expected to be in the same directory. Other than that, the process is the same.

Back to Top

One Pass Execution

In a single directory deployment (`--onedir`, which is the default), all of the binaries are already in the file system. In that case, the embedding app:

- opens the archive
- starts Python (on Windows, this is done with dynamic loading so one embedding app binary can be used with any Python version)
- imports all the modules which are at the top level of the archive (basically, bootstraps the import hooks)
- mounts the `ZlibArchive(s)` in the outer archive
- runs all the scripts which are at the top level of the archive
- finalizes Python

Back to Top

Two Pass Execution

There are a couple situations which require two passes:

- a `--onefile` deployment (on Windows, the files can't be cleaned up afterwards because Python does not call `FreeLibrary`; on other platforms, Python won't find them if they're extracted in the same process that uses them)
- `LD_LIBRARY_PATH` needs to be set to find the binaries (not extension modules, but modules the extensions are linked to).

The first pass:

- opens the archive
- extracts all the binaries in the archive (in PyInstaller v1.5.1, this is always to a temporary directory).
- sets a magic environment variable
- sets `LD_LIBRARY_PATH` (non-Windows)
- executes itself as a child process (letting the child use his stdin, stdout and stderr)
- waits for the child to exit (on *nix, the child actually replaces the parent)
- cleans up the extracted binaries (so on *nix, this is done by the child)

The child process executes as in [One Pass Execution](#) above (the magic environment variable is what tells it that this is pass two).

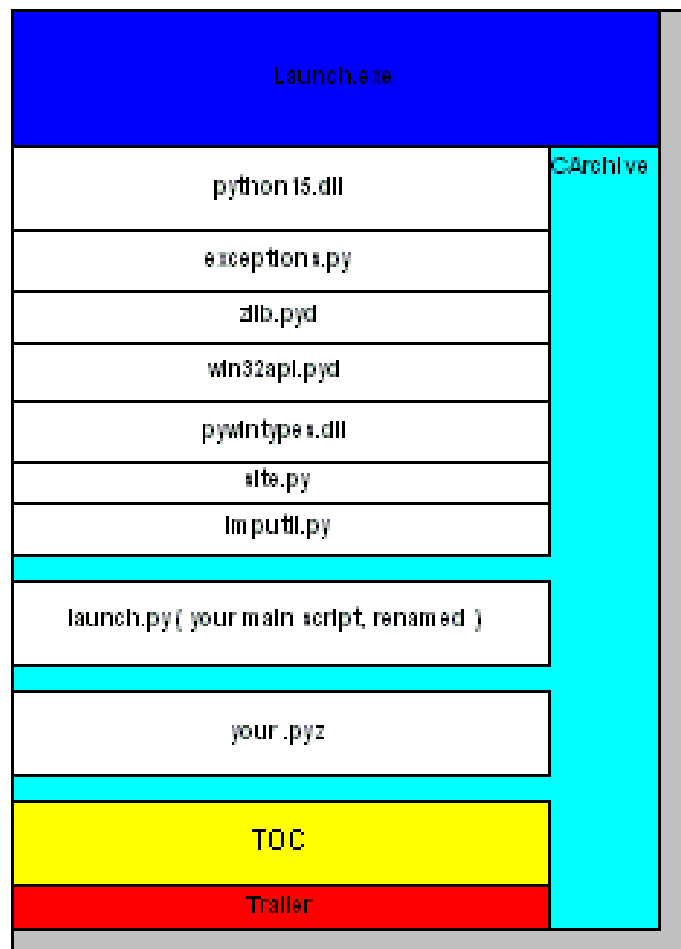


figure 3 - Self Extracting Executable

There are, of course, quite a few differences between the Windows and Unix/Linux versions. The major one is that because all of Python on Windows is in `pythonXX.dll`, and dynamic loading is so simple-minded, that one binary can be use with any version of Python. There's much in common, though, and that C code can be found in [source/common/launch.c](#).

The Unix/Linux build process (which you need to run just once for any version of Python) makes use of the config information in your install (if you installed from RPM, you need the Python-development RPM). It also overrides `getpath.c` since we don't want it hunting around the filesystem to build `sys.path`.

In both cases, while one *PyInstaller* download can be used with any Python version, you need to have separate installations for each Python version.

Back to Top

PyInstaller Archives

Archives Introduction

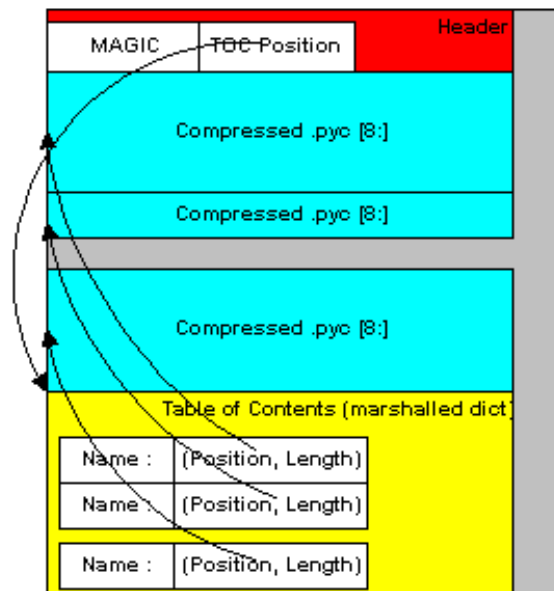
You know what an archive is: a `.tar` file, a `.jar` file, a `.zip` file. Two kinds of archives are used here. One is equivalent to a Java `.jar` file - it allows Python modules to be stored efficiently and, (with some import hooks) imported directly. This is a `ZlibArchive`. The other (a `CArchive`) is equivalent to a `.zip` file - a general way of packing up (and optionally compressing) arbitrary blobs of data. It gets its name from the fact that it can be manipulated easily from C, as well as from Python. Both of these derive from a common base class, making it fairly easy to create new kinds of archives.

[Back to Top](#)

ZlibArchive

A `ZlibArchive` contains compressed `.pyc` (or `.pyo`) files. The Table of Contents is a marshalled dictionary, with the key (the module's name as given in an `import` statement) associated with a seek position and length. Because it is all marshalled Python, `ZlibArchives` are completely cross-platform.

A `ZlibArchive` hooks in with `iu.py` so that, with a little setup, the archived modules can be imported transparently. Even with compression at level 9, this works out to being faster than the normal import. Instead of searching `sys.path`, there's a lookup in the dictionary. There's no `stat`-ing of the `.py` and `.pyc` and no file opens (the file is already open). There's just a seek, a read and a decompress. A traceback will point to the source file the archive entry was created from (the `__file__` attribute from the time the `.pyc` was compiled). On a user's box with no source installed, this is not terribly useful, but if they send you the traceback, at least you can make sense of it.



[Back to Top](#)

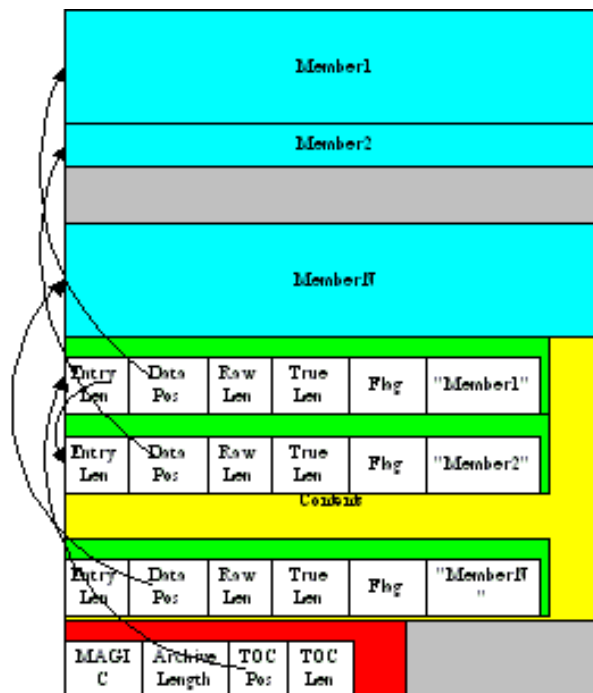
CArchive

A `CArchive` contains whatever you want to stuff into it. It's very much like a `.zip` file. They are easy to create in Python and unpack from C code. `CArchives` can be appended to other files (like ELF and COFF executables, for example). To allow this, they are opened from the end, so the TOC for a `CArchive` is at the back, followed only by a cookie that tells you where the TOC starts and where the archive itself starts.

`CArchives` can also be embedded within other `CArchives`. The inner archive can be opened in place (without extraction).

Each TOC entry is variable length. The first field in the entry tells you the length of the entry. The last field is the name of the corresponding packed file. The name is null terminated. Compression is optional by member.

There is also a type code associated with each entry. If you're using a `CArchive` as a `.zip` file, you don't need to worry about this. The type codes are used by the self-extracting executables.



Back to Top

License

PyInstaller is mainly distributed under the [GPL License](#) but it has an exception such that you can use it to compile commercial products.

In a nutshell, the license is GPL for the source code with the exception that:

1. You may use PyInstaller to compile commercial applications out of your source code.
2. The resulting binaries generated by PyInstaller from your source code can be shipped with whatever license you want.
3. You may modify PyInstaller for your own needs but *these* changes to the PyInstaller source code falls under the terms of the GPL license. In other words, any modifications to will *have* to be distributed under GPL.

For updated information or clarification see our [FAQ](#) at [PyInstaller](#) home page.

Back to Top

Appendix

You can stop reading here...

... if you are not interested in technical details. This appendix contains insights of the internal workings of *PyInstaller*, and you do not need this information unless you plan to work on *PyInstaller* itself.

Building the bootloaders

PyInstaller comes with binary bootloaders for most platforms, shipped in `/your/path/to/pyinstaller/support/loader`. If you need to build the bootloader for your own platform (either because your platform is not officially supported, or because you tweaked bootloader's source code), you can follow this guide.

Development tools

On Debian/Ubuntu systems, you can run the following lines to install everything required:

```
sudo apt-get install build-essential python-dev
```

On Fedora/RHEL and derivatives, you can run the following lines:

```
su
yum groupinstall "Development Tools"
yum install python-devel
```

On Mac OS X you can get gcc by installing [Xcode](#). It is a suite of tools for developing software for Mac OS X. It can be also installed from your Mac OS X Install DVD. It is not necessary to install the version 4 of Xcode.

On Windows you can use MinGW (gcc for Windows) and Visual Studio C++ (msvc) compilers. Python development libraries are usually installed together with Python.

Note: There is no interdependence between the Visual Studio version used to compile the bootloader and the Visual Studio version used to compile Python. The bootloader is a self-contained static executable, that imposes no restrictions on the version of Python being used. So you can simply use any Visual Studio version you have around.

You can download and install or unpack MinGW distribution from one of the following locations:

- [MinGW](#) - stable and mature, uses gcc 3.4 as its base
- [MinGW-w64](#) - more recent, uses gcc 4.4 and up. Please notice that Windows 64-bit is still not supported by PyInstaller, so building a 64-bit bootloader can be useful only if you plan to contribute full Windows 64-bit support.
- [TDM-GCC](#) - MinGW and MinGW-w64 installers

Building

On Windows, when using MinGW, it is needed to add `PATH_TO_MINGW\bin` to your system `PATH` variable. In command prompt before building bootloader run for example:

```
set PATH=C:\MinGW\bin;%PATH%
```

Change to the `/your/path/to/pyinstaller/source` subdirectory. Run:

```
pyinstaller$ cd source
pyinstaller/source$ python waf configure build install
```

This will produce `support/loader/YOUR_OS/run`, `support/loader/YOUR_OS/run_d`, `support/loader/YOUR_OS/runw` and `support/loader/YOUR_OS/runw_d`, which are the bootloaders.

On Windows this will produce in the `support/loader/YOUR_OS` directory: `run*.exe` (bootloader for regular programs), and `inprocsrvr*.dll` (bootloader for in-process COM servers).

Note: If you have multiple versions of Python, the Python you use to run `waf` is the one whose configuration is used.

Linux Standard Base (LSB) binary

By default, the bootloaders on Linux are LSB binaries.

LSB is a set of open standards that should increase compatibility among Linux distributions. *PyInstaller* is able produce bootloader as LSB binary in order to increase compatibility for packaged applications among distributions.

Note: LSB version 4.0 is required for successfull building of bootloader.

On Debian- and Ubuntu-based distros, you can install LSB 4.0 tools by adding the following repository to the `sources.list` file:

```
deb http://ftp.linux-foundation.org/pub/lsb/repositories/debian lsb-4.0 main
```

then after having update the apt repository:

```
sudo apt-get update
```

you can install LSB 4.0:

```
sudo apt-get install lsb lsb-build-cc
```

Most other distributions contain only LSB 3.0 in their software repositories and thus LSB build tools 4.0 must be downloaded by hand. From Linux Foundation download [LSB sdk 4.0](#) for your architecture.

Unpack it by:

```
tar -xvzf lsb-sdk-4.0.3-1.ia32.tar.gz
```

To install it run:

```
cd lsb-sdk
./install.sh
```

After having installed the LSB tools, you can follow the standard building instructions.

NOTE: if for some reason you want to avoid LSB compilation, you can do so by specifying `--no-lsb` on the `waf` command line, as follows:

```
pyinstaller/source$ python waf configure --no-lsb build install
```

This will also produce `support/loader/YOUR_OS/run`, `support/loader/YOUR_OS/run_d`, `support/loader/YOUR_OS/runw` and `support/loader/YOUR_OS/runw_d`, but they will not be LSB binaries.

Back to Top

mf.py: A Modulefinder Replacement

Module `mf` is modelled after `iu`.

It also uses `ImportDirectors` and `Owners` to partition the import name space. Except for the fact that these return `Module` instances instead of real module objects, they are identical.

Instead of an `ImportManager`, `mf` has an `ImportTracker` managing things.

Back to Top

ImportTracker

`ImportTracker` can be called in two ways: `analyze_one(name, importername=None)` or `analyze_r(name, importername=None)`. The second method does what modulefinder does - it recursively finds all the module names that importing name would cause to appear in `sys.modules`. The first method is non-recursive. This is useful, because it is the only way of answering the question "Who imports name?" But since it is somewhat unrealistic (very few real imports do not involve recursion), it deserves some explanation.

Back to Top

analyze_one()

When a name is imported, there are structural and dynamic effects. The dynamic effects are due to the execution of the top-level code in the module (or modules) that get imported. The structural effects have to do with whether the import is relative or absolute, and whether the name is a dotted name (if there are `N` dots in the name, then `N+1` modules will be imported even without any code running).

The `analyze_one` method determines the structural effects, and defers the dynamic effects. For example, `analyze_one("B.C", "A")` could return `["B", "B.C"]` or `["A.B", "A.B.C"]` depending on whether the import turns out to be relative or absolute. In addition, `ImportTracker`'s modules dict will have `Module` instances for them.

Back to Top

Module Classes

There are `Module` subclasses for builtins, extensions, packages and (normal) modules. Besides the normal module object attributes, they have an attribute `imports`. For packages and normal modules, `imports` is a list populated by scanning the code object (and therefore, the names in this list may be relative or absolute names - we don't know until they have been analyzed).

The highly astute will notice that there is a hole in `analyze_one()` here. The first thing that happens when `B.C` is being imported is that `B` is imported and its top-level code executed. That top-level code can do various things so that when the import of `B.C` finally occurs, something completely different happens (from what a structural analysis would predict). But `mf` can handle this through its hooks mechanism.

Back to Top

code scanning

Like modulefinder, `mf` scans the byte code of a module, looking for imports. In addition, `mf` will pick out a module's `__all__` attribute, if it is built as a list of constant names. This means that if a package declares an `__all__` list as a list of names, `ImportTracker` will track those names if asked to analyze `package.*`. The code scan also notes the occurrence of `__import__`, `exec` and `eval`, and can issue warnings when they're found.

The code scanning also keeps track (as well as it can) of the context of an import. It recognizes when imports are found at the top-level, and when they are found inside definitions (deferred imports). Within that, it also tracks whether the import is inside a condition (conditional imports).

Back to Top

Hooks

In modulefinder, scanning the code takes the place of executing the code object. `mf` goes further and allows a module to be hooked (after it has been scanned, but before `analyze_one` is done with it). A hook is a module named `hook-fullyqualifiedname` in the `hooks` package. These modules should have one or more of the following three global names defined:

`hiddenimports`

a list of modules names (relative or absolute) that the module imports in some untrackable way.

`attrs`

a list of `(name, value)` pairs (where `value` is normally meaningless).

`hook(mod)`

a function taking a `Module` instance and returning a `Module` instance (so it can modify or replace).

The first hook (`hiddenimports`) extends the list created by scanning the code. `ExtensionModules`, of course, don't get scanned, so this is the only way of recording any imports they do.

The second hook (`attrs`) exists mainly so that `ImportTracker` won't issue spurious warnings when the rightmost node in a dotted name turns out to be an attribute in a package module, instead of a missing submodule.

The callable hook exists for things like dynamic modification of a package's `__path__` or perverse situations, like `xml.__init__` replacing itself in `sys.modules` with `_xmlplus.__init__`. (It takes nine hook modules to properly trace through PyXML-using code, and I can't believe that it's any easier for the poor programmer using that package). The `hook(mod)` (if it exists) is called before looking at the others - that way it can, for example, test `sys.version` and adjust what's in `hiddenimports`.

Back to Top

Warnings

`ImportTracker` has a `getwarnings()` method that returns all the warnings accumulated by the instance, and by the `Module` instances in its `modules` dict. Generally, it is `ImportTracker` who will accumulate the warnings generated during the structural phase, and `Modules` that will get the warnings generated during the code scan.

Note that by using a hook module, you can silence some particularly tiresome warnings, but not all of them.

Back to Top

Cross Reference

Once a full analysis (that is, an `analyze_r` call) has been done, you can get a cross reference by using `getxref()`. This returns a list of tuples. Each tuple is `(modulename, importers)`, where `importers` is a list of the (fully qualified) names of the modules importing `modulename`. Both the returned list and the `importers` list are sorted.

Back to Top

mf Usage

A simple example follows:

```
>>> import mf
>>> a = mf.ImportTracker()
>>> a.analyze_r("os")
['os', 'sys', 'posixpath', 'nt', 'stat', 'string', 'strop',
're', 'pcre', 'ntpath', 'dospath', 'macpath', 'win32api',
'UserDict', 'copy', 'types', 'repr', 'tempfile']
>>> a.analyze_one("os")
['os']
>>> a.modules['string'].imports
[('strop', 0, 0), ('strop.*', 0, 0), ('re', 1, 1)]
>>>
```

The tuples in the imports list are (name, delayed, conditional).

```
>>> for w in a.modules['string'].warnings: print w
...
W: delayed eval hack detected at line 359
W: delayed eval hack detected at line 389
W: delayed eval hack detected at line 418
>>> for w in a.getwarnings(): print w
...
W: no module named pwd (delayed, conditional import by posixpath)
W: no module named dos (conditional import by os)
W: no module named os2 (conditional import by os)
W: no module named posix (conditional import by os)
W: no module named mac (conditional import by os)
W: no module named MACFS (delayed, conditional import by tempfile)
W: no module named macfs (delayed, conditional import by tempfile)
W: top-level conditional exec statment detected at line 47
- os (C:\Program Files\Python\Lib\os.py)
W: delayed eval hack detected at line 359
- string (C:\Program Files\Python\Lib\string.py)
W: delayed eval hack detected at line 389
- string (C:\Program Files\Python\Lib\string.py)
W: delayed eval hack detected at line 418
- string (C:\Program Files\Python\Lib\string.py)
>>>
```

[Back to Top](#)

iu.py: An *imputil* Replacement

Module `iu` grows out of the pioneering work that Greg Stein did with `imputil` (actually, it includes some verbatim `imputil` code, but since Greg didn't copyright it, we won't mention it). Both modules can take over Python's builtin import and ease writing of at least certain kinds of import hooks.

`iu` differs from `imputil`: * faster * better emulation of builtin import * more manageable

There is an `ImportManager` which provides the replacement for builtin import and hides all the semantic complexities of a Python import request from it's delegates.

[Back to Top](#)

ImportManager

`ImportManager` formalizes the concept of a metapath. This concept implicitly exists in native Python in that builtins and frozen modules are searched before `sys.path`, (on Windows there's also a search of the registry while on Mac, resources may be searched). This metapath is a list populated with `ImportDirector` instances. There are `ImportDirector` subclasses for builtins, frozen modules, (on Windows) modules found through the registry and a `PathImportDirector` for handling `sys.path`. For a top-level import (that is, not an import of a module in a package), `ImportManager` tries each director on it's metapath until one succeeds.

`ImportManager` hides the semantic complexity of an import from the directors. It's up to the `ImportManager` to decide if an import is relative or absolute; to see if the module has already been imported; to keep `sys.modules` up to date; to handle the fromlist and return the correct module object.

Back to Top

ImportDirector

An `ImportDirector` just needs to respond to `getmod(name)` by returning a module object or `None`. As you will see, an `ImportDirector` can consider name to be atomic - it has no need to examine name to see if it is dotted.

To see how this works, we need to examine the `PathImportDirector`.

Back to Top

PathImportDirector

The `PathImportDirector` subclass manages a list of names - most notably, `sys.path`. To do so, it maintains a shadowpath - a dictionary mapping the names on its pathlist (eg, `sys.path`) to their associated `Owners`. (It could do this directly, but the assumption that `sys.path` is occupied solely by strings seems ineradicable.) `Owners` of the appropriate kind are created as needed (if all your imports are satisfied by the first two elements of `sys.path`, the `PathImportDirector`'s shadowpath will only have two entries).

Back to Top

Owner

An `Owner` is much like an `ImportDirector` but manages a much more concrete piece of turf. For example, a `DirOwner` manages one directory. Since there are no other officially recognized filesystem-like namespaces for importing, that's all that's included in `iu`, but it's easy to imagine `Owners` for zip files (and I have one for my own `.pyz` archive format) or even URLs.

As with `ImportDirectors`, an `Owner` just needs to respond to `getmod(name)` by returning a module object or `None`, and it can consider name to be atomic.

So structurally, we have a tree, rooted at the `ImportManager`. At the next level, we have a set of `ImportDirectors`. At least one of those directors, the `PathImportDirector` in charge of `sys.path`, has another level beneath it, consisting of `Owners`. This much of the tree covers the entire top-level import namespace.

The rest of the import namespace is covered by treelets, each rooted in a package module (an `__init__.py`).

Back to Top

Packages

To make this work, `Owners` need to recognize when a module is a package. For a `DirOwner`, this means that name is a subdirectory which contains an `__init__.py`. The `__init__` module is loaded and its `__path__` is initialized with the subdirectory. Then, a `PathImportDirector` is created to manage this `__path__`. Finally the new `PathImportDirector`'s `getmod` is assigned to the package's `__importsub__` function.

When a module within the package is imported, the request is routed (by the `ImportManager`) directly to the package's `__importsub__`. In a hierarchical namespace (like a filesystem), this means that `__importsub__` (which is really the bound `getmod` method of a `PathImportDirector` instance) needs only the module name, not the package name or the fully qualified name. And that's exactly what it gets. (In a flat namespace - like most archives - it is perfectly easy to route the request back up the package tree to the archive `Owner`, qualifying the name at each step.)

Back to Top

Possibilities

Let's say we want to import from zip files. So, we subclass `Owner`. The `__init__` method should take a filename, and raise a `ValueError` if the file is not an acceptable .zip file, (when a new name is encountered on `sys.path` or a package's `__path__`, registered `Owners` are tried until one accepts the name). The `getmod` method would check the zip file's contents and return `None` if the name is not found. Otherwise, it would extract the marshalled code object from the zip, create a new module object and perform a bit of initialization (12 lines of code all told for my own archive format, including initializing a package with its `__subimporter__`).

Once the new `Owner` class is registered with `iu`, you can put a zip file on `sys.path`. A package could even put a zip file on its `__path__`.

Back to Top

Compatibility

This code has been tested with the PyXML, mxBase and Win32 packages, covering over a dozen import hacks from manipulations of `__path__` to replacing a module in `sys.modules` with a different one. Emulation of Python's native import is nearly exact, including the names recorded in `sys.modules` and module attributes (packages imported through `iu` have an extra attribute - `__importsub__`).

Back to Top

Performance

In most cases, `iu` is slower than builtin import (by 15 to 20%) but faster than `imputil` (by 15 to 20%). By inserting archives at the front of `sys.path` containing the standard lib and the package being tested, this can be reduced to 5 to 10% slower (or, on my 1.52 box, 10% faster!) than builtin import. A bit more can be shaved off by manipulating the `ImportManager`'s `metapath`.

Back to Top

Limitations

This module makes no attempt to facilitate policy import hacks. It is easy to implement certain kinds of policies within a particular domain, but fundamentally `iu` works by dividing up the import namespace into independent domains.

Quite simply, I think cross-domain import hacks are a very bad idea. As author of the original package on which *PyInstaller* is based, McMillan worked with import hacks for many years. Many of them are highly fragile; they often rely on undocumented (maybe even accidental) features of implementation. A cross-domain import hack is not likely to work with PyXML, for example.

That rant aside, you can modify `ImportManger` to implement different policies. For example, a version that implements three import primitives: absolute import, relative import and recursive-relative import. No idea what the Python syntax for those should be, but `__ainport__`, `__rimport__` and `__rrimport__` were easy to implement.

Back to Top

iu Usage

Here's a simple example of using `iu` as a builtin import replacement.

```
>>> import iu
>>> iu.ImportManager().install()
>>>
>>> import DateTime
>>> DateTime.__importsub__
<method PathImportDirector.getmod
  of PathImportDirector instance at 825900>
>>>
```

Back to Top