PyScaffold Documentation

Release 4.2.3

PyScaffold Contributors

Jun 17, 2022
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PyScaffold is a project generator for bootstrapping high-quality Python packages, ready to be shared on PyPI and installable via pip. It is easy to use and encourages the adoption of the best tools and practices of the Python ecosystem, helping you and your team to stay sane, happy and productive. The best part? It is stable and has been used by thousands of developers for over half a decade!

**Note:** This document refers to the latest version of PyScaffold (v4). Please refer to v3.3 for the previous stable version. Both versions are compatible with Python 3.6 and greater.

For legacy Python 2.7 please install PyScaffold 2.5 (*not officially supported*).
CHAPTER ONE

INSTALLATION

1.1 Requirements

The installation of PyScaffold only requires a recent version of setuptools, (at least version 46.1), pip, as well as a working installation of Git (meaning at least your name and email were configured but also setting the default branch might be useful in your first-time git setup). Especially Windows users should make sure that the command git is available on the command line. Otherwise, check and update your PATH environment variable or run PyScaffold from the Git Bash.

Tip: It is recommended to use an isolated development environment as provided by virtualenv or conda for your work with Python in general. You might want to install PyScaffold globally in your system, but consider using virtual environments when developing your packages.

1.2 Installation

PyScaffold relies on a Python package manager for its installation. The easiest way of getting started is via our loved pip. Make sure you have pip installed¹, then simply type:

```
pip install --upgrade pyscaffold
```

to get the latest stable version. The most recent development version can be installed with:

```
pip install --pre --upgrade pyscaffold
```

Using pip also has the advantage that all requirements are automatically installed. If you want to install PyScaffold with all official extensions, run:

```
pip install --upgrade pyscaffold[all]
```

¹ In some operating systems, e.g. Ubuntu, this means installing a python3-pip package or similar via the OS’s global package manager.
1.3 Alternative Methods

It is very easy to get PyScaffold installed with pip, but some people do prefer other package managers such as conda while doing their work.

If you do lots of number crunching or data science in general\(^2\) and you already rely on conda-forge packages, you might also use the following method:

```
conda install -c conda-forge pyscaffold
```

It is also very common for developers to have more then one Python version installed on their machines, and a plethora of virtual environments spread all over the place… Instead of constantly re-installing PyScaffold in each one of these installations and virtual environments, you can use pipx to do a “minimally-invasive” system-wide installation and have the putup command always available independently of which Python you are using:

```
pipx install pyscaffold
```

Please check the documentation of each tool to understand how they work with extra requirements (e.g. [all]) or how to add extensions (e.g. `pipx inject pyscaffold pyscaffoldext-dsproject`).

1.4 Additional Requirements

We strongly recommend installing tox together with PyScaffold (both can be installed with pip, conda or pipx), so you can take advantage of its automation capabilities and avoid having to install dependencies/requirements manually. If you do that, just by running the commands `tox` and `tox -e docs`, you should able to run your tests or build your docs out of the box (a list with all the available tasks is obtained via the `tox -av` command).

If you dislike tox, or are having problems with it, you can run commands (like `pytest` and `make -C docs`) manually within your project, but then you will have to deal with additional requirements and dependencies yourself. It might be the case you are already have them installed but this can be confusing because these packages won’t be available to other packages when you use a virtual environment. If that is the case, just install following packages inside the environment you are using for development:

- Sphinx
- pytest
- pytest-cov

Note: If you have problems using PyScaffold, please make sure you are using Python 3.6 or greater.

\(^2\) conda is a very competent package manager for Python, not only when you have to deal with numbers. In general, when you rely on native extensions, hardware acceleration or lower level programming languages integration (such as C or C++), conda might just be the tool you are looking for.
PyScaffold comes with a lot of elaborated features and configuration defaults to make the most common tasks in developing, maintaining and distributing your own Python package as easy as possible.

## 2.1 Configuration, Packaging & Distribution

All configuration can be done in `setup.cfg` like changing the description, URL, classifiers, installation requirements and so on as defined by `setuptools`. That means in most cases it is not necessary to tamper with `setup.py`. The syntax of `setup.cfg` is pretty much self-explanatory and well commented, check out this [example] or `setuptools` documentation.

If you use `tox`, PyScaffold will already configure everything out of the box\(^1\) so you can easily build your distribution, in a [PEP 517](https)/[PEP 518](https) compliant way, by just running:

```
tox -e build
```

Alternatively, if you are not a huge fan of isolated builds, or prefer running the commands yourself, you can execute `python -m build --no-isolation`.

### 2.1.1 Uploading to PyPI

Of course uploading your package to the official Python package index PyPI for distribution also works out of the box. Just create a distribution as mentioned above and use `tox` to publish with:

```
tox -e publish
```

This will first upload your package using TestPyPI, so you can be a good citizen of the Python world, check/test everything is fine, and then, when you are absolutely sure the moment has come for your package to shine, you can go ahead and run `tox -e publish -- --repository pypi`\(^2\). Just remember that for this to work, you have to first register a PyPI account (and also a TestPyPI one).

Under the hood, `tox` uses `twine` for uploads to PyPI (as configured by PyScaffold in the `tox.ini` file), so if you prefer running things yourself, you can also do:

```
pip install twine
twine upload --repository testpypi dist/*
```

---

1. `tox` is a virtual environment management and test tool that allows you to define and run custom tasks that call executables from Python packages. In general, PyScaffold will already pre-configure `tox` to do the most common tasks for you. You can have a look on what is available out of the box by running `tox -av`, or go ahead and check `tox docs` to automatisate your own tasks.

2. The verbose command is intentional here to prevent later regrets. Once a package version is published to PyPI, it cannot be replaced. Therefore, be always sure your are done and all set before publishing.
Please notice that PyPI does not allow uploading local versions, e.g. 0.0.dev5+gc5da6ad, for practical reasons. Thus, you have to create a Git tag before uploading a version of your distribution. Read more about it in the versioning section below.

**Warning:** Old guides might mention python setup.py upload, but its use is strongly discouraged nowadays and even some of the new PyPI features won’t work correctly if you don’t use twine.

### 2.1.2 Namespace Packages

If you want to work with namespace packages, you will be glad to hear that PyScaffold supports the PEP 420 specification for implicit namespaces, which is very useful to distribute a larger package as a collection of smaller ones. putup can automatically setup everything you need with the --namespace option. For example, use:

```
putup my_project --package my_package --namespace com.my_domain
```

To define my_package inside the namespace com.my_domain, Java-style.

**Note:** Prior to PyScaffold 4.0, namespaces were generated explicitly with pkg_resources, instead of PEP 420. Moreover, if you are developing “subpackages” for already existing namespaces, please check which convention the namespaces are currently following. Different styles of namespace packages might be incompatible. If you don’t want to update existing namespace packages to PEP 420, you will probably need to manually copy the __init__.py file for the umbrella namespace folder from an existing project. Additionally have a look in our FAQ about how to disable implicit namespaces.

### 2.1.3 Package and Files Data

Additional data, e.g. images and text files, that must reside within your package, e.g. under my_project/src/my_package, and are tracked by Git will automatically be included if include_package_data = True in setup.cfg. In case that data files are not packaged, use git ls-files to debug if they are really tracked by Git. It is not necessary to have a MANIFEST.in file for this to work. Just make sure that all files are added to your repository. To read this data in your code, use:

```
from pkgutil import get_data
data = get_data('my_package', 'path/to/my/data.txt')
```

Starting from Python 3.7 an even better approach is using importlib.resources:

```
from importlib.resources import read_text, read_binary
data = read_text('my_package.sub_package', 'data.txt')
```

Note that we need a proper package structure in this case, i.e. directories need to contain __init__.py and be named as a valid Python package (which follow the same rules as variable names). We only specify the file data.txt, no path is allowed. The library importlib_resources provides a backport of this feature.

Please have in mind that the include_package_data option in setup.cfg is only guaranteed to be read when creating a wheels distribution. Other distribution methods might behave unexpectedly (e.g. always including data files even when include_package_data = False). Therefore, the best option if you want to have data files in your repository but not as part of the pip installable package is to add them somewhere outside the src directory (e.g. a files directory in the root of the project, or inside tests if you use them for checks). Additionally you can exclude them
explicitly via the [options.packages.find] exclude option in setup.cfg. More information about data files support is available on the setuptools website.

Tip: Using package files to store runtime configuration or mutable data is not considered good practice. Package files should be read-only. If you need configuration files, or files that should be written at runtime, please consider doing so inside standard locations in the user’s home folder (platformdirs is a good library for that). If needed you can even create them at the first usage from a read-only template, which in turn can be a package file.

2.2 Versioning and Git Integration

Your project is already an initialised Git repository and setuptools uses the information of tags to infer the version of your project with the help of setuptools_scm. To use this feature you need to tag with the format MAJOR.MINOR[.PATCH], e.g. 0.0.1 or 0.1.

You can run python -m setuptools_scm to retrieve the current PEP 440-compliant version\(^4\). This version will be used when building a package and is also accessible through my_project._version_. If you want to upload to PyPI you have to tag the current commit before uploading since PyPI does not allow local versions, e.g. 0.0.dev5+gc5da6ad, for practical reasons.

Please check our docs for the **best practices and common errors with version numbers**.

2.2.1 Pre-commit Hooks

Unleash the power of Git by using its pre-commit hooks. This feature is available through the --pre-commit flag. After your project’s scaffold was generated, make sure pre-commit is installed, e.g. pip install pre-commit, then just run pre-commit install.

It goes unsaid that also a default .gitignore file is provided that is well adjusted for Python projects and the most common tools.

2.3 Sphinx Documentation

PyScaffold will prepare a docs directory with all you need to start writing your documentation. Start editing the file docs/index.rst to extend the documentation and note that even the Numpy and Google style docstrings are activated by default.

If you have tox in your system, simply run tox -e docs or tox -e doctests to compile the docs or run the doctests. Alternatively, if you have make and Sphinx installed in your computer, build the documentation with make -C docs html and run doctests with make -C docs doctest. Just make sure Sphinx 1.3 or above is installed.

The documentation also works with Read the Docs. Please check the RTD guides to learn how to import your documents into the website.

Note: In order to generate the docs locally, you will need to install any dependency used to build your doc files (and probably all your project dependencies) in the same Python environment where Sphinx is installed (either the global Python installation or a conda/virtualenv/venv environment). For example, if you want to use the Read the Docs classic theme, the sphinx_rtd_theme package should be installed.

\(^4\) Requires setuptools-scm to be installed (pip install setuptools_scm)
If you are using tox -e docs, tox will take care of generating a virtual environment and installing all these dependencies automatically. You will only need to list your doc dependencies (like sphinx_rtd_theme) under the deps property of the [testenv:{docs,doctests}] section in the tox.ini file. Your can also use the docs/requirements.txt file to store them. This file can be used by both Read the Docs and tox when generating the docs.

## 2.4 Dependency Management in a Breeze

PyScaffold out of the box allows developers to express abstract dependencies and take advantage of pip to manage installation. It also can be used together with a virtual environment (also called virtual env) to avoid dependency hell during both development and production stages.

If you like the traditional style of dependency management using a virtual env co-located with your package, PyScaffold can help to reduce the boilerplate. With the --venv option, a virtualenv will be bootstrapped and waiting to be activated. And if you are the kind of person that always install the same packages when creating a virtual env, PyScaffold’s option --venv-install PACKAGE will be the right one for you. You can even integrate pip-tools in this workflow, by putting a -e file:. in your requirements.in.

Alternatively, PyPA’s Pipenv can be integrated in any PyScaffold-generated project by following standard setuptools conventions. Keeping abstract requirements in setup.cfg and running pipenv install -e . is basically what you have to do.

You can check the details on how all of that works in Dependency Management.

**Warning:** *Experimental Feature* - Pipenv and pip-tools support is experimental and might change in the future.

## 2.5 Automation, Tests & Coverage

PyScaffold relies on pytest to run all automated tests defined in the subfolder tests. Some sane default flags for pytest are already defined in the [tool:pytest] section of setup.cfg. The pytest plugin pytest-cov is used to automatically generate a coverage report. It is also possible to provide additional parameters and flags on the commandline, e.g., type:

```bash
pytest -h
```

to show the help of pytest (requires pytest to be installed in your system or virtual environment).

### 2.5.1 JUnit and Coverage HTML/XML

For usage with a continuous integration software JUnit and Coverage XML output can be activated in setup.cfg. Use the flag --cirrus to generate templates of the Cirrus CI configuration file .cirrus.xml which even features the coverage and stats system Coveralls. Alternatively, you can also generate configuration files for GitLab CI or GitHub Actions by running putup with the --gitlab or --github-actions flags.
2.5.2 Managing test environments and tasks with tox

Projects generated with PyScaffold are configured by default to use tox to run some common tasks. Tox is a virtual environment management and test tool that allows you to define and run custom tasks that call executables from Python packages.

If you simply install tox and run from the root folder of your project:

```bash
$ tox
```

tox will download the dependencies you have specified, build the package, install it in a virtual environment and run the tests using pytest, so you are sure everything is properly tested. You can rely on the tox documentation for detailed configuration options (which include the possibility of running the tests for different versions of Python).

You are not limited to running your tests, with tox you can define all sorts of automation tasks. Here are a few examples for you:

```bash
$ tox -e build  # will bundle your package and create a distribution inside the `dist` folder
$ tox -e publish # will upload your distribution to a package index server
$ tox -e docs   # will build your docs
```

but you can go ahead and check tox examples, or this tox tutorial from Sean Hammond for more ideas, e.g. running static code analyzers (pyflakes and pep8) with flake8. Run tox -av to list all the available tasks.

2.6 Management of Requirements & Licenses

Installation requirements of your project can be defined inside setup.cfg, e.g. `install_requires = numpy; scipy`. To avoid package dependency problems it is common to not pin installation requirements to any specific version, although minimum versions, e.g. `sphinx>=1.3`, and/or maximum versions, e.g. `pandas<0.12`, are used frequently in accordance with semantic versioning.

For test/dev purposes, you can additionally create a requirements.txt pinning packages to specific version, e.g. `numpy==1.13.1`. This helps to ensure reproducibility, but be sure to read our Dependency Management Guide to understand the role of a requirements.txt file for library and application projects (pip-compile from pip-tools can help you to manage that file). Packages defined in requirements.txt can be easily installed with:

```bash
$ pip install -r requirements.txt
```

The most popular open source licenses can be easily added to your project with the help of the --license flag. You only need to specify the license identifier according to the SPDX index so PyScaffold can generate the appropriate LICENSE.txt and configure your package. For example:

```bash
$ putup --license MPL-2.0 my_project
```

will create the my_project package under the Mozilla Public License 2.0. The available licenses can be listed with putup --help, and you can find more information about each license in the SPDX index and chooselicense.com.
2.7 Extensions

PyScaffold offers several extensions:

- If you want a project setup for a Data Science task, just use `--dsproject` after having installed `pyscaffoldext-dsproject`.

- Have a README.md based on Markdown instead of README.rst by using `--markdown` after having installed `pyscaffoldext-markdown`.

- Create a Django project with the flag `--django` which is equivalent to `django-admin startproject my_project` enhanced by PyScaffold’s features (requires `pyscaffoldext-django`).

- ... and many more like `--gitlab` to create the necessary files for GitLab CI, `--github-actions` to configure GitHub Actions, `--travis` for Travis CI (see `pyscaffoldext-travis`), or `--cookiecutter` for Cookiecutter integration (see `pyscaffoldext-cookiecutter`).

Find more extensions within the PyScaffold organisation and consider contributing your own, it is very easy! You can quickly generate a template for your extension with the `--custom-extension` option after having installed `pyscaffoldext-custom-extension`. Have a look in our guide on writing extensions to get started.

All extensions can easily be installed with `pip install pyscaffoldext-NAME`.

2.8 Easy Updating

Keep your project’s scaffold up-to-date by applying `putup --update my_project` when a new version of PyScaffold was released. An update will only overwrite files that are not often altered by users like `setup.py`. To update all files use `--update --force`. An existing project that was not setup with PyScaffold can be converted with `putup --force existing_project`. The force option is completely safe to use since the git repository of the existing project is not touched! Please check out the Updating from Previous Versions docs for more information on how to migrate from old versions and configuration options in `setup.cfg`.

2.8.1 Adding features

With the help of an experimental updating functionality it is also possible to add additional features to your existing project scaffold. If a scaffold lacking `.cirrus.yml` was created with `putup my_project` it can later be added by issuing `putup my_project --update --cirrus`. For this to work, PyScaffold stores all options that were initially used to put up the scaffold under the `[pyscaffold]` section in `setup.cfg`. Be aware that right now PyScaffold provides no way to remove a feature which was once added.

2.9 PyScaffold Configuration

After having used PyScaffold for some time, you probably will notice yourself repeating the same options most of the time for every new project. Don’t worry, PyScaffold now allows you to set default flags using the `experimental default.cfg` file. Check out our Configuration section to get started.

---

3 Experimental features can change the way they work (or be removed) between any releases. If you are scripting with PyScaffold, please avoid using them.
3.1 Quickstart

A single command is all you need to quickly start coding like a Python rockstar, skipping all the difficult and tedious bits:

```
putup my_project
```

This will create a new folder called `my_project` containing a perfect project template with everything you need for getting things done. Checkout out this demo project, which was set up using Pyscaffold.

**Tip:** New in version 4.0: We are trying out a brand new interactive mode that makes it even easier to use PyScaffold in its full potential. If you want to give it a shot, use the `--interactive` or simply `-i` option.

The interactive command equivalent to the previous example is: `putup -i my_project`.

You can `cd` into your new project and interact with it from the command line after creating (or activating) an isolated development environment (with virtualenv, conda or your preferred tool), and performing the usual editable install:

```
pip install -e .
```

... all set and ready to go! Try the following in a Python shell:

```
>>> from my_project.skeleton import fib
>>> fib(10)
55
```

Or if you are concerned about performing package maintainer tasks, make sure to have `tox` installed and see what we have prepared for you out of the box:

```
tox -e docs  # to build your documentation
 tox -e build  # to build your package distribution
 tox -e publish  # to test your project uploads correctly in test.pypi.org
 tox -e publish -- --repository pypi  # to release your package to PyPI
 tox -av  # to list all the tasks available
```

The following figure demonstrates the usage of `putup` with the new experimental interactive mode for setting up a simple project. It uses the `--cirrus` flag to add CI support (via Cirrus CI), and `tox` to run automated project tasks like building a package file for distribution (or publishing).
Type `putup -h` to learn about other things PyScaffold can do for your project, and if you are not convinced yet, have a look on these reasons to use PyScaffold.

There is also a video tutorial on how to develop a command-line application with the help of PyScaffold.

### 3.1.1 Notes

1. PyScaffold’s project template makes use of a dedicated `src` folder to store all the package files meant for distribution (additional files like tests and documentation are kept in their own separated folders). You can find some comments and useful links about this design decision in our FAQ.

2. The `pip install -e .` command installs your project in editable mode, making it available in import statements as any other Python module. It might fail if you have an old version of Python's package manager and tooling in your current environment. Please make sure you are using the intended environment (either a virtual environment [recommended] or the default installation of Python in the operating system) and try to update them with `python -m pip install -U pip setuptools`.

3. If you are using a virtual environment, please remember to re-activate it every time you close your shell, otherwise you will not be able to import your project in the REPL. To check if you have already activated it you can run `which python` on Linux and OSX, `where python` on the classical Windows command prompt, or `Get-Command python` on PowerShell.

### 3.2 Examples

Just a few examples to get you an idea of how easy PyScaffold is to use:

```bash
putup my_little_project
```

The simplest way of using PyScaffold. A directory `my_little_project` is created with a Python package named exactly the same. The MIT license will be used.

```bash
putup -i my_little_project
```

If you are unsure on how to use PyScaffold, or keep typing `putup --help` all the time, the experimental `--interactive` (or simply `-i`), is your best friend. It will open your default text editor with a file containing examples and explanations on how to use `putup` (think of it as an “editable” `--help` text, once the file is saved and closed all the values you leave there are processed by PyScaffold). You might find some similarities in the way this option works with `git rebase -i`, including the capacity of choosing a different text editor by setting the EDITOR (or VISUAL) environment variable in your terminal.

```bash
putup skynet -l GPL-3.0-only -d "Finally, the ultimate AI!" -u https://sky.net
```

This will create a project and package named `skynet` licensed under the GPL3. The description inside `setup.cfg` is directly set to “Finally, the ultimate AI!” and the homepage to https://sky.net.

```bash
putup Scikit-Gravity -p skgravity -l BSD-3-Clause
```

This will create a project named `Scikit-Gravity` but the package will be named `skgravity` with license new-BSD1.

```bash
putup youtub --django --pre-commit -d "Ultimate video site for hot tub fans"
```

This will create a web project and package named `youtub` that also includes the files created by Django’s `django-admin`2. The description in `setup.cfg` will be set and a file `.pre-commit-config.yaml` is created with a default setup for pre-commit.

```bash
putup thoroughly_tested --cirrus
```

This will create a project and package `thoroughly_tested` with files `tox.ini` and `.cirrus.yml` for tox and Cirrus CI.

---

1. Notice the usage of SPDX identifiers for specifying the license in the CLI
2. Requires the installation of pyscaffoldext-django.
putup my_zope_subpackage --name my-zope-subpackage --namespace zope --package subpackage
This will create a project under the my_zope_subpackage directory with the installation name of
my-zope-subpackage (this is the name used by pip and PyPI), but with the following corresponding import statement:

```
from zope import subpackage
# zope is the namespace and subpackage is the package name
```

To be honest, there is really only the Zope project that comes to my mind which is using this exotic feature of
Python’s packaging system. Chances are high, that you will never ever need a namespace package in your life.
To learn more about namespaces in the Python ecosystem, check PEP 420.

### 3.3 Package Configuration

Projects set up with PyScaffold rely on setuptools, and therefore can be easily configured/customised via setup.cfg.
Check out the example below:

```
# Docs on setup.cfg:
# http://setuptools.readthedocs.io/en/latest/setuptools.html#configuring-setup-using-
# setup-cfg-files

[metadata]
name = my_project
description = A test project that was set up with PyScaffold
author = Florian Wilhelm
author_email = Florian.Wilhelm@blue-yonder.com
license = MIT
url = https://...
long_description = file: README.rst
platforms = any
classifiers =
    Development Status :: 5 - Production/Stable
    Topic :: Utilities
    Programming Language :: Python
    Programming Language :: Python :: 3
    Environment :: Console
    Intended Audience :: Developers
    License :: OSI Approved :: MIT License
    Operating System :: POSIX :: Linux
    Operating System :: Unix
    Operating System :: MacOS
    Operating System :: Microsoft :: Windows

[options]
zip_safe = False
packages = find_namespace:
python_requires = >=3.6
include_package_data = True
package_dir =
    =src
# Add here dependencies of your project (semicolon/line-separated)
install_requires =
```
(continues on next page)
```python
pandas
scikit-learn

[options.packages.find]
where = src
exclude =
    tests

[options.extras_require]
# Add here additional requirements for extra features, like:
# pdf = ReportLab>=1.2; RXP
# rest = docutils>=0.3; pack ==1.1, ==1.3
all = django; cookiecutter
# Add here test requirements (semicolon/line-separated)
testing =
    pytest
    pytest-cov

[options.entry_points]
# Add here console scripts like:
# console_scripts =
#    script_name = ${package}.module:function
# For example:
# console_scripts =
#    fibonacci = ${package}.skeleton:run
# And any other entry points, for example:
# pyscaffold.cli =
#    awesome = pyscaffoldext.awesome.extension:AwesomeExtension

[tool:pytest]
# Options for py.test:
# Specify command line options as you would do when invoking py.test directly.
# e.g. --cov-report html (or xml) for html/xml output or --junitxml junit.xml
# in order to write a coverage file that can be read by Jenkins.
addopts =
    --cov my_project --cov-report term-missing
    --verbose
norecursedirs =
    dist
    build
    .tox
testpaths = tests
markers =
    slow: mark tests as slow (deselect with '-m "not slow"')

[bdist_wheel]
universal = 1

[devpi:upload]
# Options for the devpi: PyPI server and packaging tool
# VCS export must be deactivated since we are using setuptools-scm
no_vcs = 1
```

(continues on next page)
You might also want to have a look on `pyproject.toml` for specifying dependencies required during the build:

```toml
[build-system]
# AVOID CHANGING REQUIRES: IT WILL BE UPDATED BY PYSCAFFOLD!
requires = ["setuptools>=46.1.0", "setuptools_scm[toml]~=5", "wheel"]
build-backend = "setuptools.build_meta"

[tool.setuptools_scm]
# For smarter version schemes and other configuration options,
# check out https://github.com/pypa/setuptools_scm
version_scheme = "no-guess-dev"
```

Please note PyScaffold will add some internal information to `setup.cfg`, we do that to make updates a little smarter.

**Note:** To avoid splitting the configuration and build parameters among several files, PyScaffold uses the same file as `setuptools` (`setup.cfg`). Storing configuration in `pyproject.toml` is not supported. In the future, if the default build metadata location changes (as proposed by PEP 621), PyScaffold will follow the same pattern.
3.4 PyScaffold’s Own Configuration

PyScaffold also allows you to save your favourite configuration to a file that will be automatically read every time you run putup, this way you can avoid always retyping the same command line options.

The locations of the configuration files vary slightly across platforms, but in general the following rule applies:

- Linux:  
  $XDG_CONFIG_HOME/pyscaffold/default.cfg  with fallback to  ~/.config/pyscaffold/default.cfg

- OSX:  
  ~/Library/Application Support/pyscaffold/default.cfg

- Windows(7): %APPDATA%\pyscaffold\pyscaffold\default.cfg

The file format resembles the setup.cfg generated automatically by PyScaffold, but with only the metadata and pyscaffold sections, for example:

```
[metadata]
author = John Doe
author-email = john.joe@gmail.com
license = MPL-2.0

[pyscaffold]
extensions =
cirrus
pre-commit
```

With this file in place, typing only:

```
$ putup myproj
```

will have the same effect as if you had typed:

```
$ putup --license MPL-2.0 --cirrus --pre-commit myproj
```

**Note:** For the time being, only the following options are allowed in the config file:

- metadata section: author, author-email and license
- pyscaffold section: extensions (and associated opts)

Options associated with extensions are the ones prefixed by an extension name.

To prevent PyScaffold from reading an existing config file, you can pass the --no-config option in the CLI. You can also save the given options when creating a new project with the --save-config option. Finally, to read the configurations from a location other than the default, use the --config PATH option. See putup --help for more details.

**Warning:** Experimental Feature - We are still evaluating how this new and exciting feature will work, so its API (including file format and name) is not considered stable and might change between minor versions. As previously stated, if the configuration file for setuptools changes (e.g. with PEP 621), PyScaffold will follow that and change its own configuration.

This means that in future versions, PyScaffold will likely adopt a more pyproject.toml-style configuration (and as a consequence the file name and extension might change).
4.1 Dependency Management

Warning: Experimental Feature - PyScaffold support for virtual environment management is experimental and might change in the future.

4.1.1 Foundations

The greatest advantage in packaging Python code (when compared to other forms of distributing programs and libraries) is that packages allow us to stand on the shoulders of giants: you don’t need to implement everything by yourself, you can just declare dependencies on third-party packages and setuptools, pip, PyPI and their friends will do the heavy lifting for you.

Of course, with great power comes great responsibility. Package authors must be careful when declaring the versions of the packages they depend on, so the people consuming the final work can do reliable installations, without facing dependency hell. In the opensource community, two main strategies have emerged in the last few years:

- the first one is called abstract and consists of having permissive, minimal and generic dependencies, with versions specified by ranges, so anyone can install the package without many conflicts, sharing and reusing as much as possible dependencies that are already installed or are also required by other packages
- the second, called concrete, consists of having strict dependencies, with pinned versions, so all the users will have repeatable installations

Both approaches have advantages and disadvantages, and usually are used together in different phases of a project. As a rule of thumb, libraries tend to emphasize abstract dependencies (but can still have concrete dependencies for the development environment), while applications tend to rely on concrete dependencies (but can still have abstract dependencies specially if they are intended to be distributed via PyPI, e.g. command line tools and auxiliary WSGI apps/middleware to be mounted inside other domain-centric apps). For more information about this topic check Donald Stufl post.

Since PyScaffold aims the development of Python projects that can be easily packaged and distributed using the standard PyPI and pip flow, we adopt the specification of abstract dependencies using setuptools' install_requires. This basically means that if PyScaffold generated projects specify dependencies inside the setup.cfg file (using general version ranges), everything will work as expected.
4.1.2 Test Dependencies

While specifying the final dependencies for packages is pretty much straightforward (you just have to use `install_requires` inside `setup.cfg`), dependencies for running the tests can be a little bit trick.

Historically, setuptools provides a `tests_require` field that follows the same convention as `install_requires`, however this field is not strictly enforced, and setuptools doesn’t really do much to enforce the packages listed will be installed before the test suite runs.

PyScaffold’s recommendation is to create a `testing` field (actually you can name it whatever you want, but let’s be explicit!) inside the `[options.extras_require]` section of `setup.cfg`. This way multiple test runners can have a centralised configuration and authors can avoid double bookkeeping.

If you use tox (recommended), you can list `testing` under the the `extras` configuration field option (PyScaffold template for `tox.ini` already takes care of this configuration for you).

If running pytest directly, you will have to install those dependencies manually, or do a editable install of your package with `pip install -e .[testing].`

**Tip:** If you prefer to use just tox and keep everything inside `tox.ini`, please go ahead and move your test dependencies. Every should work just fine :)

**Note:** PyScaffold strongly advocates the use of test runners to guarantee your project is correctly packaged/works in isolated environments. New projects will ship with a default `tox.ini` file that is a good starting point, with a few useful tasks. Run `tox -av` to list all the available tasks.

4.1.3 Basic Virtualenv

As previously mentioned, PyScaffold will get you covered when specifying the abstract or test dependencies of your package. We provide sensible configurations for setuptools and tox out-of-the-box. In most of the cases this is enough, since developers in the Python community are used to rely on tools like virtualenv and have a workflow that take advantage of such configurations. As an example, you could do:

```
$ pip install pyscaffold
$ putup myproj
$ cd myproj
$ virtualenv .venv
  # OR python -m venv .venv
$ source .venv/bin/activate
$ pip install -U pip setuptools setuptools_scm tox
  # ... edit setup.cfg to add dependencies ...
$ pip install -e .
$ tox
```

However, someone could argue that this process is pretty manual and laborious to maintain specially when the developer changes the abstract dependencies.

PyScaffold can alleviate this pain a little bit with the venv extension:

```
$ putup myproj --venv --venv-install PACKAGE
  # Is equivalent of running:
  #
```

(continues on next page)
But it is still desirable to keep track of the version of each item in the dependency graph, so the developer can have environment reproducibility when trying to use another machine or discuss bugs with colleagues.

In the following sections, we describe how to use a few popular command line tools, supported by PyScaffold, to tackle these issues.

**Tip:** When called with the `--venv` option, PyScaffold will try first to use virtualenv (there are some advantages on using it, such as being faster), and if it is not installed, will fallback to Python stdlib’s venv. Please notice however that even venv might not be available by default in your system: some OS/distributions split Python’s stdlib in several packages and require the user to explicitly install them (e.g. Ubuntu will require you to do `apt install python3-venv`). If you run into problems, try installing virtualenv and run the command again.

### 4.1.4 Integration with Pipenv

We can think in Pipenv as a virtual environment manager. It creates per-project virtualenvs and generates a Pipfile.lock file that contains a precise description of the dependency tree and enables re-creating the exact same environment elsewhere.

Pipenv supports two different sets of dependencies: the default one, and the dev set. The default set is meant to store runtime dependencies while the dev set is meant to store dependencies that are used only during development.

This separation can be directly mapped to PyScaffold strategy: basically the default set should mimic the `install_requires` option in `setup.cfg`, while the dev set should contain things like tox, sphinx, pre-commit, ptptpython or any other tool the developer uses while developing.

**Tip:** Test dependencies are internally managed by the test runner, so we don’t have to tell Pipenv about them.

The easiest way of doing so is to add a `-e` dependency (in resemblance with the non-automated workflow) in the default set, and all the other ones in the dev set. After using Pipenv, you should add both Pipfile and Pipfile.lock to your git repository to achieve reproducibility (maintaining a single Pipfile.lock shared by all the developers in the same project can save you some hours of sleep).

In a nutshell, PyScaffold+Pipenv workflow looks like:

```
$ pip install pyscaffold pipenv
$ putup myproj
$ cd myproj
# ... edit setup.cfg to add dependencies ...
$ pipenv install
$ pipenv install -e  # proxy setup.cfg install_requires
$ pipenv install --dev tox sphinx  # etc
$ pipenv run tox      # use 'pipenv run' to access tools inside env
$ pipenv lock         # to generate Pipfile.lock
$ git add Pipfile Pipfile.lock
```

After adding dependencies in `setup.cfg`, you can run `pipenv update` to add them to your virtual environment.
4.1.5 Integration with pip-tools

Contrary to Pipenv, **pip-tools** does not replace entirely the aforementioned “manual” workflow. Instead, it provides lower level command line tools that can be integrated to it, in order to achieve better reproducibility.

The idea here is that you have two types files describing your dependencies: `*requirements.in` and `*requirements.txt`. The `.in` files are the ones used to list **abstract** dependencies, while the `.txt` files are generated by running `pip-compile`.

Again the easiest way of having the `requirements.in` file to mimic `setup.cfg`'s `install_requires` is to add **something like** `-e .` to it.

<table>
<thead>
<tr>
<th>Warning: For the time being adding <code>-e file:</code> is a working solution that is tested by <strong>pip-tools</strong> team (<code>-e .</code> will generate absolute file paths in the compiled file, which will make it impossible to share). However this situation might change in the near future. You can find more details about this topic and monitor any changes in <a href="https://github.com/jazzband/pip-tools/issues/204">https://github.com/jazzband/pip-tools/issues/204</a>.</th>
</tr>
</thead>
</table>

When using `-e file:` in your `requirements.in` file, the compiled `requirements.txt` needs to be installed via `pip-sync` instead of `pip install -r requirements.txt`.

You can also create multiple environments and have multiple “**profiles**”, by using different files, e.g. `dev-requirements.in` or `ci-requirements.in`, but keeping it simple and using `requirements.in` to represent all the tools you need to run common tasks in a development environment is a good practice, since you can omit the arguments when calling `pip-compile` and `pip-sync`. After all, if you need to have a separated test environment you can use `tox`, and the minimal dependencies of your packages are already listed in `setup.cfg`.

<table>
<thead>
<tr>
<th>Note: The existence of a <code>requirements.txt</code> file in the root of your repository does not imply all the packages listed there will be considered direct dependencies of your package. This was valid for older versions of PyScaffold (3), but is no longer the case. If the file exists, it is completely ignored by PyScaffold and setuptools.</th>
</tr>
</thead>
</table>

A simple a PyScaffold + **pip-tools** workflow looks like:

```
$ putup myproj --venv --venv-install pip-tools setuptools_scm && cd myproj
$ source .venv/bin/activate
# ... edit setup.cfg to add dependencies ...
$ echo '-e file:' > requirements.in
$ echo -e 'tox\nsphinx\nptpython' >> requirements.in # etc
$ pip-compile
$ pip-sync
$ tox
# ... do some debugging/live experimentation running Python in the terminal
$ ptpython
$ git add *requirements.{in,txt}
```

After adding dependencies in `setup.cfg` (or to `requirements.in`), you can run `pip-compile` & `pip-sync` to add them to your virtual environment. If you want to add a dependency to the dev environment only, you can also:
Warning: Experimental Feature - the methods described here for integrating pip-tools and PyScaffold in a single workflow are tested to a certain degree and not considered stable. The usage of relative paths in the compiled requirements.txt file is a feature that have being several years in the making and still is under discussion. As everything in Python’s packaging ecosystem right now, the implementation, APIs and specs might change in the future so it is up to the user to keep an eye on the official docs and use the logic explained here to achieve the expected results with the most up-to-date API pip-tools have to offer.

The issue https://github.com/jazzband/pip-tools/issues/204 is worth following.

If you find that the procedure here no longer works, please open an issue on https://github.com/pyscaffold/pyscaffold/issues.

4.1.6 Integration with conda

Conda is an open-source package manager very popular in the Python ecosystem that can be used as an alternative to pip. It is especially helpful when distributing packages that rely on compiled libraries (e.g. when you need to use some C code to achieve performance improvements) and uses Anaconda as its standard repository (the PyPI equivalent in the conda world).

The main advantage of conda compared to virtualenv/venv based tools is that it unifies several different tools and has a deeper isolation than the pip package manager. For instance conda allows you to create isolated environments by specifying also the Python version and even system libraries like glibc. In the pip ecosystem, one needs a tool like pyenv to choose the Python version and the installation of system libraries besides the current ones is not possible at all.

Note: Unfortunately, since conda environments are more complex and feature-rich than the ones produced by virtualenv/venv based tools, package installations usually take longer. If all your dependencies are pure Python packages and you don’t need to use any compiled libraries, virtualenv/venv might provide a faster dev experience.

To use conda with a project setup generated by PyScaffold just:

1. Create a file environment.yml, e.g. like this example for data science projects. Note that name: my_conda_env defines the name of the environment. Also note that besides the conda dependencies you can still add pip-installable packages by adding - pip as dependency and a section defining additional packages as well as the project setup itself:

   - pip:
     - -e .
     - other-pip-based-package

   This will install your project as well as other-pip-based-package within the conda environment. Be careful though that some pip-based packages might not work perfectly within a conda environment but this concerns only certain packages that tamper with the environment itself like tox for instance. As a rule of thumb, always define a requirement as conda package if available and only resort to pip packages if not available as conda package.

2. Create an environment based on this file with:

   conda env create -f environment.yml
**Tip:** Mamba is a new and much faster drop-in replacement for conda. For large environments, conda often requires several minutes or hours to solve dependencies while mamba normally completes within seconds.

To create an environment with mamba, you can run the following command:

```
mamba env create -f environment.yml
```

3. Activate the environment with:

```
conda activate my_conda_env
```

You can read more about conda in the excellent guide written by WhiteBox. Also checkout the PyScaffold’s dsproject extension that already comes with a proper environment.yml.

**Creating a conda package**

The process of creating conda packages consists basically in creating some extra files that describe general recipe to build your project in different operating systems. These recipe files can in theory coexist within the same repository as generated by PyScaffold.

While this approach is completely fine and works well, a package uploaded by a regular user to Anaconda will not be available if someone simply try to install it via `conda install <pkg name>`. This happens because Anaconda and conda are organised in terms of channels and regular users cannot upload packages to the default channel. Instead, separated personal channels need to be used for the upload and explicitly selected with the `-c <channel name>` option in `conda install`.

It is important however to consider that mixing many channels together might create clashes in dependencies (although conda tries very hard to avoid clashes by using channel preference ordering and a clever resolution algorithm).

A general practice that emerged in the conda ecosystem is to organise packages in large communities that share a single and open repository in Anaconda, that rely on specific procedures and heavy continuous integration for publishing cohesive packages. These procedures, however, might involve creating a second repository (separated from the main code base) to just host the recipe files. For that reason, PyScaffold does not currently generate conda recipe files when creating new projects.

Instead, if you are an open-source developer and are interested in distributing packages via conda, our recommendation is to try publishing your package on conda-forge (unless you want to target a specific community such as bioconda). conda-forge is one of the largest channels in Anaconda and works as the central hub for the Python developers in the conda ecosystem.

Once you have your package published to PyPI using the project generated by PyScaffold, you can create a conda-forge feedstock\(^1\) using a special tool called grayskull and following the documented instructions. Please make sure to check PyScaffold community tips in discussion #422.

If you still need to use a personal custom channel in Anaconda, please checkout conda-build tutorials for further information.

**Tip:** It is not strictly necessary to publish your package to Anaconda for your users to be able to install it if they are using `conda -pip install` can still be used from a conda environment. However, if you have dependencies that are also published in Anaconda and are not pure Python projects (e.g. numpy or matplotlib), or that rely on virtual environments, it is generally advisable to do so.

\(^1\) feedstock is the term used by conda-forge for the companion repository with recipe files
4.2 Migration to PyScaffold

Migrating your existing project to PyScaffold is in most cases quite easy and requires only a few steps. We assume your project resides in the Git repository my_project and includes a package directory my_package with your Python modules.

Since you surely don’t want to lose your Git history, we will just deploy a new scaffold in the same repository and move as well as change some files. But before you start, please make sure that your working tree is not dirty, i.e. all changes are committed and all important files are under version control.

Let’s start:

1. Change into the parent folder of my_project and type:
   
   ```bash
   putup my_project --force --no-skeleton -p my_package
   ```
   
in order to deploy the new project structure in your repository.

2. Now change into my_project and move your old package folder into src (if your existing project does not follow a src layout yet):

   ```bash
   git mv my_package/* src/my_package/
   ```

   Use the same technique if your project has a test folder other than tests or a documentation folder other than docs.

3. Use `git status` to check for untracked files and add them with `git add`.

4. Potentially, use `git difftool` to check all overwritten files for changes that need to be transferred. Most important is that all configuration that you may have done in `setup.py` by passing parameters to `setup(...)` need to be moved to `setup.cfg`. You will figure that out quite easily by putting your old `setup.py` and the new `setup.cfg` template side by side. Checkout the documentation of setuptools for more information about this conversion. In most cases you will not need to make changes to the new `setup.py` file provided by PyScaffold. The only exceptions are if your project uses compiled resources, e.g. Cython.

5. In order to check that everything works, run `pip install .` and `tox -e build` (or `python -m build --wheel after installing build`). If those two commands don’t work, check `pyproject.toml`, `setup.cfg`, `setup.py` as well as your package under `src` again. Were all modules moved correctly? Is there maybe some `__init__.py` file missing? Be aware that projects containing a `pyproject.toml` file will build in a different, and sometimes non backwards compatible, way. If that is your case, you can try to keep the legacy behaviour by deleting `pyproject.toml` and building the distributions exclusively with `setup.py`. Please see our updating guide for some extra steps you might want to execute manually. Finally, try also to run `make -C docs html` and `pytest` (or preferably their tox equivalents) to check that Sphinx and PyTest run correctly.

4.3 Updating from Previous Versions

When updating a project generated with the same major version of PyScaffold\(^1\), running `putup --update` should be enough to get you going. However updating from previous major versions of PyScaffold will probably require some manual adjustments. The following sections describe how to update from one major version into the following one.

---

\(^1\) PyScaffold uses 3 numbers for its version: MAJOR, MINOR, PATCH (when the numbers on the right are missing, just assume them as being 0), so PyScaffold 3.1.2 has the same major version as PyScaffold 3.3.1, but not PyScaffold 4.
**4.3.1 Updates from PyScaffold 2 to PyScaffold 3**

Since the overall structure of a project set up with PyScaffold 2 differs quite much from a project generated with PyScaffold 3 it is not possible to just use the \texttt{--update} parameter. Still with some manual efforts an update from a scaffold generated with PyScaffold 2 to PyScaffold 3’s scaffold is quite easy. Assume the name of our project is \texttt{old\_project} with a package called \texttt{old\_package} and no namespaces then just:

1) **make sure your worktree is not dirty, i.e. commit all your changes,**

2) **run putup old\_project \texttt{--force \texttt{--no-skeleton -p old\_package} to generate the new structure inplace and cd into your project,**

3) **move with git mv old\_package/* src/old\_package/ \texttt{--force} your old package over to the new src directory,**

4) **check git status and add untracked files from the new structure,**

5) **use git difftool to check all overwritten files, especially setup.cfg, and transfer custom configurations from the old structure to the new,**

6) **check if python setup.py test sdist works and commit your changes.**

**4.3.2 Updates from PyScaffold 3 to PyScaffold 4**

Most of the time, **updating from PyScaffold 3 should be completely automatic.** However, since in version 4 we have adopted Python’s new standards for packaging (PEP 517/PEP 518), you might find the new build process incompatible.

If that is the case, you might want to try reverting to the legacy behaviour and preventing the build tools from using isolated builds (PEP 517). That can be easily done by deleting the \texttt{pyproject.toml} file from your package root.

You will need, though, to manually follow a few extra steps to make sure everything works:

1) **Remove PyScaffold from your build dependencies (**\texttt{setup.requires} in setup.cfg**) and add setuptools-scm.**

   \begin{center}
   \textbf{Note:} The use of \texttt{setup.requires} is discouraged. When updating to v4 PyScaffold will remove this field automatically and transfer the dependencies to the pyproject.toml :: build-system.requires field, which means you may need to manually place them back when deleting pyproject.toml. Alternatively you can ditch \texttt{setup.requires} completely and rely on other tools like tox or make to build your project with the correct dependencies in place inside a virtual environment. This have the advantage of increasing reproducibility. With tox you can specify a \texttt{build testenv} with the \texttt{skip_install} option and the required build time dependencies listed in \texttt{deps}. \end{center}

2) **Migrate any configuration options for tools that might be using pyproject.toml to alternative files.** For example if you have \texttt{isort} and \texttt{coverage} configurations in your pyproject.toml, you might want to rewrite them in the .isort.cfg and .coveragerc files respectively.

3) **Please open an issue with PyScaffold so we understand with kind of backward incompatibilities PEP 517 and PEP 518 might be causing and try to help.** Similarly you might also consider opening an issue with setuptools.

   \begin{center}
   \textbf{Warning:} For the time being you can use the \texttt{transitional --no-pyproject} option, when running putup, but have in mind that this option will be removed in future versions of PyScaffold. \end{center}
PyScaffold 4 also adopts the PEP 420 scheme for implicit namespaces and will automatically migrate existing packages. This is incompatible with the previously adopted pkg_resources methodology. Fortunately, this will not affect you if you are not using namespaces, but in the case you are, installing a new PEP 420-compliant package in an environment that already contains other packages with the same namespace but that use the pkg_resources methodology, will likely result in errors (please check the official packaging namespace packages guides for more information).

To solve this problem you will need to either migrate the existing packages to PEP 420 or revert some specific configurations in setup.cfg after the update. In particular packages = find_namespace: should be converted back to packages = find: in the [options] section (use a git difftool to help you with that). If using Sphinx for the documentation, you can also remove the --implicit-namespaces option in the cmd_line_template variable in the docs/conf.py file.

**Tip:** Existing regular Python files (or other directories containing Python files) that do not belong to the package distribution but are placed inside the src folder (such as example files not meant to be packaged), can cause problems when building your package.

Please move these files if necessary to their own separated folders (e.g. the docs folder or a new examples folder in the root of the repository), or revert back to the pkg_resources implementation. Just have in mind that PyScaffold, considers the src directory to be exclusively dedicated to store files meant to be distributed, and will rely on that assumption on its future versions and updates.

## 4.4 Extending PyScaffold

PyScaffold is carefully designed to cover the essentials of authoring and distributing Python packages. Most of time, tweaking putup options is enough to ensure proper configuration of a project. However, for advanced use cases PyScaffold can be extended at runtime by other Python packages, providing a deeper level of programmability and customization.

From the standpoint of PyScaffold, an extension is just an class inheriting from Extension overriding and implementing certain methods that allow the manipulation of a in-memory project structure representation via PyScaffold’s internal action pipeline mechanism. The following sections describe these two key concepts in detail and present a comprehensive guide about how to create custom extensions.

**Tip:** A perfect start for your own custom extension is the extension custom_extension for PyScaffold. Just install it with pip install pyscaffoldext-custom-extension and then create your own extension template with putup --custom-extension pyscaffoldext-my-own-extension.

### 4.4.1 Project Structure Representation

Each Python package project is internally represented by PyScaffold as a tree data structure, that directly relates to a directory entry in the file system. This tree is implemented as a simple (and possibly nested) dict in which keys indicate the path where files will be generated, while values indicate their content. For instance, the following dict:

```json
{
    "folder": {
        "file.txt": "Hello World!",
        "another-folder": {
            "empty-file.txt": ""
        }
    }
}
```

(continues on next page)
represents a project directory in the file system that contains a single directory named `folder`. In turn, `folder` contains two entries. The first entry is a file named `file.txt` with content `Hello World!` while the second entry is a sub-directory named `another-folder`. Finally, `another-folder` contains an empty file named `empty-file.txt`.

**Note:** Changed in version 4.0: Prior to version 4.0, the project structure included the top level directory of the project. Now it considers everything **under** the project folder.

Additionally, tuple values are also allowed in order to specify a **file operation** (or simply **file op**) that will be used to produce the file. In this case, the first element of the tuple is the file content, while the second element will be a function (or more generally a **callable** object) responsible for writing that content to the disk. For example, the dict:

```python
from pyscaffold.operations import create

{
    "src": {
        "namespace": {
            "module.py": ('print("Hello World!")', create)
        }
    }
}
```

represents a `src/namespace/module.py` file, under the project directory, with content `print("Hello World!")`, that will written to the disk. When no operation is specified (i.e. when using a simple string instead of a tuple), PyScaffold will assume `create` by default.

**Note:** The `create` function simply creates a text file to the disk using UTF-8 encoding and the default file permissions. This behaviour can be modified by wrapping `create` within other functions/callables, for example:

```python
from pyscaffold.operations import create, no_overwrite

{"file": ("content", no_overwrite(create))}
```

will prevent the file to be written if it already exists. See `pyscaffold.operations` for more information on how to write your own file operation and other options.

Finally, while it is simple to represent file contents as a string directly, most of the times we want to **customize** them according to the project parameters being created (e.g. package or author’s name). So PyScaffold also accepts **string. Template** objects and functions (with a single **dict** argument and a **str** return value) to be used as contents. These templates and functions will be called with `PyScaffold's options` when its time to create the file to the disk.

**Note:** `string.Template` objects will have `safe_substitute` called (not simply `substitute`).

This tree representation is often referred in this document as **project structure** or simply **structure**.
4.4.2 Action Pipeline

PyScaffold organizes the generation of a project into a series of steps with well defined purposes. As shown in the figure below, each step is called action and is implemented as a simple function that receives two arguments: a project structure and a dict with options (some of them parsed from command line arguments, other from default values).

An action **MUST** return a tuple also composed by a project structure and a dict with options. The return values, thus, are usually modified versions of the input arguments. Additionally an action can also have side effects, like creating directories or adding files to version control. The following pseudo-code illustrates a basic action:

```python
def action(project_structure, options):
    new_struct, new_opts = modify(project_structure, options)
    some_side_effect()
    return new_struct, new_opts
```

The output of each action is used as the input of the subsequent action, forming a pipeline. Initially the structure argument is just an empty dict. Each action is uniquely identified by a string in the format `<module name>:<function name>`, similarly to the convention used for a setuptools entry point. For example, if an action is defined in the action function of the extras.py file that is part of the pyscaffoldext.contrib project, the **action identifier** is pyscaffoldext.contrib.extras:action.

By default, the sequence of actions taken by PyScaffold is:

1. `pyscaffold.actions:get_default_options`
2. `pyscaffold.actions:verify_options_consistency`
3. `pyscaffold.structure:define_structure`
4. `pyscaffold.actions:verify_project_dir`
5. `pyscaffold.update:version_migration`
6. `pyscaffold.structure:create_structure`
7. `pyscaffold.actions:init_git`
8. `pyscaffold.actions:report_done`

(as given by `pyscaffold.actions.DEFAULT`)

The project structure is usually empty until `define_structure` This action just loads the in-memory dict representation, that is only written to disk by the `create_structure` action.

Note that, this sequence varies according to the command line options. To retrieve an updated list, please use putup --list-actions or putup --dry-run.

4.4.3 Creating an Extension

In order to create an extension it is necessary to write a class that inherits from `Extension` and implements the method `activate` that receives a list of actions (interpret this argument as a sequence of actions to be executed, or pipeline), registers a custom action that will be called later and returns a modified version of the list of actions:

```python
from pyscaffold import actions
from pyscaffold.extensions import Extension

class MyExtension(Extension):
    (continues on next page)
```
def activate(self, pipeline):
    """Activate extension"

    Args:
    pipeline (list): list of actions to perform

    Returns:
    list: updated list of actions

    pipeline = actions.register(pipeline, self.action, after="create_structure")
    pipeline = actions.unregister(pipeline, "init_git")
    return actions

def action(self, struct, opts):
    """Perform some actions that modifies the structure and options"

    Args:
    struct (dict): project representation as (possibly) nested :obj:`dict`
    opts (dict): given options, see :obj:`create_project` for an extensive list.

    Returns:
    new_struct, new_opts: updated project representation and options

    ... return new_struct, new_opts

Tip:  The register and unregister methods implemented in the module pyscaffold.actions basically create modified copies of the action list by inserting/removing the specified functions, with some awareness about their execution order.

Action List Helper Methods

As implied by the previous example, the pyscaffold.actions module provides a series of useful functions and makes it easier to manipulate the action list, by using register and unregister.

Since the action order is relevant, the first function accepts special keyword arguments (before and after) that should be used to place the extension actions precisely among the default actions. The value of these arguments can be presented in 2 different forms:

actions.register(action_sequence, hook1, before="define_structure")
actions.register(action_sequence, hook2, after="pyscaffold.structure:create_structure")

The first form uses as a position reference the first action with a matching name, regardless of the module. Accordingly, the second form tries to find an action that matches both the given name and module. When no reference is given, register assumes as default position after="pyscaffold.structure:define_structure". This position is special since most extensions are expected to create additional files inside the project. Therefore, it is possible to easily amend the project structure before it is materialized by create_structure.
The `unregister` function accepts as second argument a position reference which can similarly present the module name:

```python
actions.unregister(action_sequence, "init_git")
actions.unregister(action_sequence, "pyscaffold.api:init_git")
```

**Note:** These functions **DO NOT** modify the actions list, instead they return a new list with the changes applied.

**Tip:** For convenience, the functions `register` and `unregister` are aliased as instance methods of the `Extension` class.

Therefore, inside the `activate` method, one could simply call `action_sequence = self.register(action_sequence, self.my_action)`.

### Structure Helper Methods

PyScaffold also provides extra facilities to manipulate the project structure. The following functions are accessible through the `structure` module:

- `merge`
- `ensure`
- `reject`
- `modify`

The first function can be used to deep merge a dictionary argument with the current representation of the to-be-generated directory tree, automatically considering any file op present in tuple values. On the other hand, the second and third functions can be used to ensure a single file is present or absent in the current representation of the project structure, automatically handling parent directories. Finally, `modify` can be used to change the contents of an existing file in the project structure and/or the assigned file operation (for example wrapping it with `no_overwrite`, `skip_on_update` or `add_permissions`).

**Note:** Similarly to the actions list helpers, these functions also **DO NOT** modify the project structure. Instead they return a new structure with the changes applied.

The following example illustrates the implementation of a `AwesomeFiles` extension which defines the `define_awesome_files` action:

```python
from pathlib import Path
from string import Template
from textwrap import dedent

from pyscaffold import structure
from pyscaffold.extensions import Extension
from pyscaffold.operations import create, no_overwrite, skip_on_update

def my_awesome_file(opts):
    return dedent(
        "")
```

(continues on next page)
```python
__author__ = "{author}"
__copyright__ = "{author}"
__license__ = "{license}"

def awesome():
    return "Awesome!"

class AwesomeFiles(Extension):
    """Adding some additional awesome files""

    def activate(self, actions):
        return self.register(actions, self.define_awesome_files)

    def define_awesome_files(self, struct, opts):
        struct = structure.merge(
            struct,
            {
                "src": {
                    opts["package"]: {"awesome.py": my_awesome_file},
                },
                "tests": {
                    "awesome_test.py": (MY_AWESOME_TEST, no_overwrite(create)),
                    "other_test.py": ("# not so awesome", no_overwrite(create)),
                },
            },
        )

        struct[".python-version"] = ("3.6.1", no_overwrite(create))

        for filename in ["awesome_file1", "awesome_file2"]:
            struct = structure.ensure(
                struct,
                f"src/{opts["package"]}/{filename}",
                content="AWESOME!",
                file_op=skip_on_update(create),
            )
```

(continues on next page)
# The second argument is the file path, represented by a
# os.PathLike object or string.
# Alternatively in this example:
# Path("src", opts["package"], filename),

# The `reject` can be used to avoid default files being generated.
struct = structure.reject(struct, Path("src", opts["package"], "skeleton.py"))

# `modify` can be used to change contents in an existing file
# and/or change the assigned file operation
def append_pdb(prev_content, prev_op):
    return (prev_content + "\nimport pdb", skip_on_update(prev_op))

struct = structure.modify(struct, "tests/other_test.py", append_pdb)

# It is import to remember the return values
return struct, opts

As shown by the previous example, the operations module also contains file operation modifiers that can be used to change the assigned file op. These modifiers work like standard Python decorators: instead of being a file op themselves, they receive a file operation as argument and return a file operation, and therefore can be used to wrap the original file operation and modify its behaviour.

**Tip:** By default, all the file op modifiers in the pyscaffold.operations package don’t even need an explicit argument, when called with zero arguments create is assumed.

no_overwrite avoids an existing file to be overwritten when putup is used in update mode. Similarly, skip_on_update avoids creating a file from template in update mode, even if it does not exist. On the other hand, add_permissions will change the file access permissions if it is created or already exists in the disk.

**Note:** See pyscaffold.operations for more information on how to write your own file operation or modifiers.

### Activating Extensions

PyScaffold extensions are not activated by default. Instead, it is necessary to add a CLI option to do it. This is possible by setting up a setuptools entry point under the pyscaffold.cli group. This entry point should point to our extension class, e.g. AwesomeFiles like defined above. If you for instance use a scaffold generated by PyScaffold to write a PyScaffold extension (we hope you do ;-), you would add the following to the options.entry_points section in setup.cfg:

```
[options.entry_points]
pyscaffold.cli =
    awesome_files = your_package.your_module:AwesomeFiles
```

**Tip:** In order to guarantee consistency and allow PyScaffold to unequivocally find your extension, the name of the entry point should be a “underscore” version of the name of the extension class (e.g. an entry point awesome_files for the AwesomeFiles class). If you really need to customize that behaviour, please overwrite the name property of
your class to match the entry point.

By inheriting from `pyscaffold.extensions.Extension`, a default CLI option that already activates the extension will be created, based on the dasherized version of the name in the `setuptools entry point`. In the example above, the automatically generated option will be `--awesome-files`.

For more sophisticated extensions which need to read and parse their own command line arguments it is necessary to override `augment_cli` that receives an `argparse.ArgumentParser` argument. This object can then be modified in order to add custom command line arguments that will later be stored in the `opts` dictionary. Just remember the convention that after the command line arguments parsing, the extension function should be stored under the `extensions` attribute (a list) of the `argparse` generated object. For reference check out the implementation of the namespace extension. Another convention is to avoid storing state/parameters inside the extension class, instead store them as you would do regularly with `argparse` (inside the `argparse.Namespace` object).

### Persisting Extensions for Future Updates

PyScaffold will save the name of your extension in a `pyscaffold` section inside the `setup.cfg` files and automatically activate it again every time the user runs `putup --update`. To prevent it from happening you can set `persist = False` in your extension instances or class.

PyScaffold can also save extension-specific options if the names of those options start with an “underscore” version of your extension’s name (and `setuptools entry point`). For example, the namespace extension stores the `namespace` option in `setup.cfg`.

If the name of your extension class is `AwesomeFiles`, then anything like `opts["awesome_files"], opts["awesome_files1"], opts["awesome_files_SOMETHING"]` would be stored. Please ensure you have in mind the limitations of the `configparser` serialisation mechanism and supported data types to avoid errors (it should be safe to use string values without line breaks).

### Extra Configurations

Similarly to `persist = False`, existing extensions might accept some sort of metadata to be defined by new extensions.

This is the case of the `pyscaffold.extensions.interactive`, that allows users to interactively choose PyScaffold’s parameters by editing a file containing available options alongside a short description (similarly to `git rebase -i`). The `interactive` extension accepts a `interactive` attribute defined by extension instances or classes. This attribute might define a dictionary with keys: “ignore” and “comment”. The value associated with the key “ignore” should be a list of CLI options to be simply ignored when creating examples (e.g. `['--help']`). The value associated with the key “comment” should be a list of CLI options to be commented in the created examples, even if they appear in the original `sys.argv`.

**Warning:** The `interactive` extension is still experimental and might not work exactly as expected. More importantly, due to limitations on the way `argparse` is implemented, there are several limitations and complexities on how to manipulate command line options when not using them directly. This means that the interactive extension might render your extension’s options in a sub-optimal way. If you ever encounter this challenge we strongly encourage you to open a pull request (or at least an issue or discussion).

If your extension accepts metadata and interact with other extensions, you can also rely in informative attributes, but please be sure to make these optional with good fallback values and a comprehensive documentation.
4.4.4 Examples

Some options for the `putup` command are already implemented as extensions and can be used as reference implementation, such as:

- no-skeleton
- no-tox
- cirrus
- gitlab

For more advanced extensions, please check:

- namespace
- pre-commit

4.4.5 Public API

The following methods, functions and constants are considered to be part of the public API of PyScaffold for creating extensions and will not change signature and described overall behaviour (although implementation details might change) in a backwards incompatible way between major releases (semantic versioning):

- `pyscaffold.actions.register`
- `pyscaffold.actions.unregister`
- `pyscaffold.extensions.Extension.__init__`
- `pyscaffold.extensions.Extension.persist`
- `pyscaffold.extensions.Extension.name`
- `pyscaffold.extensions.Extension.augment_cli`
- `pyscaffold.extensions.Extension.activate`
- `pyscaffold.extensions.Extension.register`
- `pyscaffold.extensions.Extension.unregister`
- `pyscaffold.extensions.include`
- `pyscaffold.extensions.store_with`
- `pyscaffold.operations.create`
- `pyscaffold.operations.no_overwrite`
- `pyscaffold.operations.skip_on_update`
- `pyscaffold.structure.ensure`
- `pyscaffold.structure.merge`
- `pyscaffold.structure.modify`
- `pyscaffold.structure.reject`
- `pyscaffold.templates.get_template`

In addition to these, the definition of action (given by `pyscaffold.actions.Action`), project structure (given by `pyscaffold.structure.Structure`), and operation (given by `pyscaffold.operation.FileOp`) are also part of the public API. The remaining functions and methods are no guaranteed to be stable and are subject to incompatible changes even in minor/patch releases.
4.4.6 Conventions for Community Extensions

In order to make it easy to find PyScaffold extensions, community packages should be namespaced as in `pyscaffoldext.${EXT_NAME}` (where `{EXT_NAME}` is the name of the extension being developed). Although this naming convention slightly differs from PEP423, it is close enough and shorter.

Similarly to `sphinxcontrib-*` packages, names registered in PyPI should contain a dash `-`, instead of a dot `. This way, third-party extension development can be easily bootstrapped with the command:

```
putup pyscaffoldext-${EXT_NAME} -p ${EXT_NAME} --namespace pyscaffoldext --no-skeleton
```

If you put your extension code in the module `extension.py` then the options.entry_points section in `setup.cfg` looks like:

```
[options.entry_points]
pyscaffold.cli =
    awesome_files = pyscaffoldext.${EXT_NAME}.extension:AwesomeFiles
```

In this example, `AwesomeFiles` represents the name of the class that implements the extension and `awesome_files` is the string used to create the flag for the `putup` command (`--awesome-files`).

Tip: If you want to write a PyScaffold extension, check out our `custom_extension` generator. It can get you pretty far in just a few minutes.

4.4.7 Final Considerations

1. When writing extensions, it is important to be consistent with the default PyScaffold behavior. In particular, PyScaffold uses a `pretend` option to indicate when the actions should not run but instead just indicate the expected results to the user, that **MUST** be respected.

   The `pretend` option is automatically observed for files registered in the project structure representation, but complex actions may require specialized coding. The `log` module provides a special `logger` object useful in these situations. Please refer to `pyscaffoldext-cookiecutter` for a practical example.

   Other options that should be considered are the update and force flags. See `pyscaffold.api.create_project` for a list of available options.

2. Don’t forget that packages can be created inside namespaces. To be on the safe side when writing templates prefer explicit relative import statements (e.g. `from . import module`) or use the template variable `$qual_pkg` provided by PyScaffold. This variable contains the fully qualified package name, including possible namespaces.

```python
# Yes:
import $qual_pkg
from . import module
from .module import function
from $qual_pkg import module
from $qual_pkg.module import function

# No:
import $package
from $package import module
from $package.module import function
```
WHY PYSCAFFOLD?

Stable and battle-tested
PyScaffold was created in 2014 to make the lives of developers easier. Since then it has been used to create many awesome Python packages for data science, industrial automation, academic research, telecom, web development and many other sectors.

Constantly evolving
The stability of PyScaffold does not come at the price of stagnation. Throughout its existence, PyScaffold has adapted itself to better solve the needs of its users and evolved to accommodate the best practices and standards of the Python ecosystem. In every single major release, we offered a clear update path for our users, automating things as much as possible, so everyone can benefit from PyScaffold’s improvements without being afraid of breaking things.

Thoroughly tested
PyScaffold has an extensive automated test suite that runs for all major operating systems and versions of Python for every commit or pull request. Moreover, PyScaffold is used by its maintainers in their day-to-day programming and for all PyScaffold’s extensions, so we also have people constantly keeping an eye on it.

Do one thing and do it well
It might sound old-fashioned, but we like this piece of good old UNIX wisdom. PyScaffold creates a perfect project structure that compiles the best practices for Python packaging and has tons of useful defaults... that is it!

It does not attempt to do dependency management or build a distribution, because there are dedicated tools exactly for that purpose which have survived the test of time and are well-established within the Python community.

Instead of reinventing the wheel, we spent all these years curating a incredibly smart project template that ships with ready-to-use configuration for all the tools needed by the vast majority of Python developers.

Standing on the shoulder of giants
PyScaffold incentives its users to use the best tools and practices available in the Python ecosystem.

A generated project will contain sane default configurations for setup tools (the de facto standard for building Python packages), Sphinx (the one & only Python documentation tool), pytest and tox (most commonly used Python testing framework & task runner), so the users can run these common tasks using e.g. tox -e build, tox -e docs, or tox -e publish.

For those who want to go the extra mile, PyScaffold can also bring pre-commit into the mix to run a set of prolific linters and automatic formatters in each commit in order to adhere to common coding standards like pep8 and black.

Composable
PyScaffold shows its strengths when combined with other tools, and indeed we bring configurations for lots of
them by default. In the end of the day, a project generated by PyScaffold is just a plain, standard Python package, and will interoperate well with the majority of the tools you might want to use in your development environment.

**Extensible**

*Don’t like something about PyScaffold? Wish the templates were a little different? Particular workflow? Different tools? Have you got a nice set of templates that you would like to re-use?*

Well, go ahead and make PyScaffold yours... We have developed a powerful extension system that allows users to make the most out of PyScaffold. In fact, PyScaffold’s core is very minimal and several of the options are implemented themselves as extensions and shipped by default.

**Easy and yet powerful**

PyScaffold provides you one simple, yet powerful, command with intuitive options. Newcomers can achieve a lot by just running `putup your_project_name`, while power users can dig into our docs/help and discover all our Features.

**It works with existing projects too**

PyScaffold is useful not only for starting new projects from scratch. If you have existing code that you have been playing around, or that was generated by other tools, you can convert it with PyScaffold’s `putup --force your_project_folder` command. Check our Migration to PyScaffold guides.

**No lock-in**

Once you have generated your project with PyScaffold you can later come back to use the update features. Other than that, there are no ties to PyScaffold at all! Meaning that PyScaffold will be no install dependency of your project and starting from version 4.0 on not even a development dependency. If you would want to erase all traces of the fact that you used PyScaffold to set up your project, we got you, and have documented even that...

**Batteries included**

PyScaffold offers a lot out of the box: we have everything a Python developer needs to start coding right away and be 100% productive from the start.

Have a look in our extensive list of Features. Using PyScaffold is like having a Python Packaging Guru, who has spent a lot of time researching how to create the best project setups, as a friend that is helping you with your project.

Curious? Checkout out our demo project, or install PyScaffold and type `putup -h` to get started.
FREQUENTLY ASKED QUESTIONS

In case you have a general question that is not answered here, please have a look at our discussions and consider submitting a new one for the Q&A.

6.1 PyScaffold Usage

Does my project depend on PyScaffold when I use it to set my project up?
Starting from version 4, your package is completely independent from PyScaffold, we just kick-start your project and take care of the boilerplate. However, we do include some build-time dependencies that make your life easier, such as setuptools-scm. But don’t worry, if you distribute your project in the recommended wheel format those dependencies will not affect the final users, they are just required during development to assembling the package file.
That means if someone clones your repository and tries to build it, the dependencies in pyproject.toml will be automatically pulled. This mechanism is described by PEP 517/PEP 518 and definitely beyond the scope of this answer.

Can I use PyScaffold 3 to develop a Python package that is Python 2 & 3 compatible?
Python 2 reached end-of-life in 2020, which means that no security updates will be available, and therefore any software running on Python 2 is potentially vulnerable. PyScaffold strongly recommends all packages to be ported to the latest supported version of Python.
That being said, Python 3 is actually only needed for the putup command and whenever you use setup.py. This means that with PyScaffold 3 you have to use Python 3 during the development of your package for practical reasons. If you develop the package using six you can still make it Python 2 & 3 compatible by creating a universal bdist_wheel package. This package can then be installed and run from Python 2 and 3. Just have in mind that no support for Python 2 will be provided.

How can I get rid of PyScaffold when my project was set up using it?
First of all, I would really love to understand why you want to remove it and what you don’t like about it. You can create an issue for that or just text me on Twitter. But the good news is that your project is completely independent of PyScaffold, even if you uninstall it, everything will be fine.
If you still want to remove setuptools-scm (a build-time dependency we add by default), it’s actually really simple:
• Within setup.py remove the use_scm_version argument from the setup()
• Remove the [tool.setuptools_scm] section of pyproject.toml.
This will deactivate the automatic version discovery. In practice, following things will no longer work:
• python setup.py --version and the dynamic versioning according to the git tags when creating distributions, just put e.g. version = 0.1 in the metadata section of setup.cfg instead,
That’s already everything you gonna lose. Not that much. You will still benefit from:
• the smart project layout,
• the declarative configuration with setup.cfg which comes from setuptools,
• some sane defaults in Sphinx’ conf.py,
• .gitignore with some nice defaults and other dot files depending on the flags used when running putup,
• some sane defaults for pytest.

For further cleanups, feel free to remove the dependencies from the requires key in pyproject.toml as well as the complete [pyscaffold] section in setup.cfg.

Why would I use PyScaffold instead of Cookiecutter?

PyScaffold is focused on a good out-of-the-box experience for developing distributable Python packages (exclusively). The idea is to standardize the structure of Python packages. Thus, PyScaffold sticks to

“There should be one—and preferably only one—obvious way to do it.”

from the Zen of Python. The long-term goal is that PyScaffold becomes for Python what Cargo is for Rust. Still, with the help of PyScaffold’s extension system customizing a project scaffold is possible.

Cookiecutter on the other hand is a really flexible templating tool that allows you to define own templates according to your needs. Although some standard templates are provided that will give you quite similar results as PyScaffold, the overall goal of the project is quite different.

Still, if you so desire, PyScaffold allows users to augment PyScaffold projects with certain types of cookiecutter templates, through its pyscaffoldext-cookiecutter extension.

How can I embed PyScaffold into another application?

PyScaffold is expected to be used from terminal, via putup command line application. It is, however, possible to write an external script or program that embeds PyScaffold and use it to perform some custom actions.

The public Python API for embedding PyScaffold is composed by the main function pyscaffold.api.create_project in addition to pyscaffold.api.NO_CONFIG, pyscaffold.log.DEFAULT_LOGGER, pyscaffold.log.logger (partially, see details below), and the constructors for the extension classes belonging to the pyscaffold.extensions module (the other methods and functions are not considered part of the API). This API, as explicitly listed, follows Semantic Versioning and will not change in a backwards incompatible way between releases. The remaining methods and functions are not guaranteed to be stable.

The following example illustrates a typical embedded usage of PyScaffold:

```python
import logging

from pyscaffold.api import create_project
from pyscaffold.extensions.cirrus import Cirrus
from pyscaffold.extensions.namespace import Namespace
from pyscaffold.log import DEFAULT_LOGGER as LOGGER_NAME

logging.getLogger(LOGGER_NAME).setLevel(logging.INFO)

create_project(
    project_path="my-proj-name",
    author="Your Name",
    namespace="some.namespace",
    license="MIT",
    extensions=[Cirrus(), Namespace()],
)
```

Note that no built-in extension (e.g. cirrus and namespace) is activated by default. The extensions option should be manually populated when convenient.
PyScaffold uses the logging infrastructure from Python standard library, and emits notifications during its execution. Therefore, it is possible to control which messages are logged by properly setting the log level (internally, most of the messages are produced under the `INFO` level). By default, a `StreamHandler` is attached to the logger, however it is possible to replace it with a custom handler using `logging.Logger.removeHandler` and `logging.Logger.addHandler`. The logger object is available under the `logger` variable of the `pyscaffold`. `log` module. The default handler is available under the `handler` property of the `logger` object.

**How can I use PyScaffold if my project is nested within a larger repository, e.g. in a monorepo?**

If you use PyScaffold to create a Python project within another larger repository, you will see the following error when building your package:

```
LookupError: setuptools-scm was unable to detect version for '/path/to/your/project'
```

This is due to the fact that `setuptools-scm` assumes that the root of your repository is where `pyproject.toml` resides. In order to tell `setuptools-scm` where the actual root is some changes have to be made. In the example below we assume that the root of the repository is the parent directory of your project, i.e. `..` as relative path. In any case you need to specify the root of the repository relative to the root of your project.

1. `pyproject.toml`:

   ```toml
   [tool.setuptools_scm]
   # See configuration details in https://github.com/pypa/setuptools_scm
   version_scheme = "no-guess-dev"
   # ADD THE TWO LINES BELOW
   root = ".."
   relative_to = "setup.py"
   ```

2. `setup.py`:

   ```python
   setup(use_scm_version={"root": ".", # ADD THIS...
   "relative_to": __file__, # ... AND THAT!
   "version_scheme": "no-guess-dev"})
   ```

In future versions of PyScaffold this will be much simpler as `pyproject.toml` will completely replace `setup.py`.

**What is the license of the generated project scaffold? Is there anything I need to consider?**

The source code of PyScaffold itself is MIT-licensed with the exception of the `*.template` files under the `pyscaffold.templates` subpackage, which are licensed under the BSD 0-Clause license (0BSD). Thus, also the generated boilerplate code for your project is 0BSD-licensed and consequently you have no obligations at all and can do whatever you want except of suing us ;-)

**Why my file is not being included in the sdist/wheel distribution?**

By default projects generated with PyScaffold rely on `setuptools-scm` to populate the generated sdist or wheel, which in turn uses `git` to list all the `non-transient project files`. Therefore, if you create non-Python files, you need to make sure they are being tracked by `git` before building your project.

You can check if a file is being tracked by running `git ls-files` and `setuptools-scm`:

```
$ git ls-files
$ python -m setuptools_scm ls
```

Note that non-Python files depend on the `include_package_data` configuration parameter being set to True. If you want to include `transient` files in your distributions, please check `setuptools` docs on data files.
How can I change Git's default branch when creating a new project setup with PyScaffold?

The default branch in Git used to be master (and still is at least until version 2.32) but nowadays main is a preferred name. When you use PyScaffold's putup to set up your project and want to explicitly set the default branch name, just configure this using git config, e.g.:

```bash
$ git config --global init.defaultBranch main
```

In case you already created the project scaffold, you can just rename the branch, e.g. with git branch -m master main.

6.2 File Organisation and Directory Structure

Why does PyScaffold 3 have a src folder which holds the actual Python package?

This avoids quite many problems compared to the case when the actual Python package resides in the same folder as your configuration and test files. A nice blog post by Ionel gives a thorough explanation why this is so. In a nutshell, the most severe problem comes from the fact that Python imports a package by first looking at the current working directory and then into the PYTHONPATH environment variable. If your current working directory is the root of your project directory you are thus not testing the installation of your package but the local package directly. Eventually, this always leads to huge confusion ("But the unit tests ran perfectly on my machine!").

Moreover, having a dedicated src directory to store the package files, makes it easy to comply with recent standards in the Python community (for example PEP 420).

Please notice that PyScaffold assumes all the files inside src are meant to be part of the package.

Can I have other files inside the src folder that are not meant for distribution?

PyScaffold considers the src directory to be exclusively dedicated to store files meant to be distributed, and relies on this assumption to generate configuration for the several aspects of your project. Therefore it is not recommended to include any file not meant to distribution inside the src folder. (Temporary files and directories automatically generated by setuptools might appear from times to times though).

Where should I put extra files not meant for distribution?

You can use the docs folder (if applicable) or create another dedicated folder in the root of your repository (e.g. examples). The additional project structure created by the pyscaffoldext-dsproject is a good example on how to use extra folders to achieve good project organisation.

6.3 Namespaces

How can I get rid of the implicit namespaces (PEP 420)?

PyScaffold uses setup.cfg to ensure setuptools will follow PEP 420. If this configuration particularly messes up with your package, or you simply want to follow the old behavior, please replace packages = find_namespace: with packages = find: in the [options] section of that file.

You should also remove the --implicit-namespaces option in the cmd_line_template variable in the docs/conf.py file.

Finally, if want to keep a namespace but use an explicit implementation (old behavior), make sure to have a look on the packaging namespace packages official guide. If there are already other projects with packages registered in the same namespace, chances are you just need to copy from them a sample of the __init__.py file for the umbrella folder working as namespace.

How can I fix problems with my namespace package after an upgrade to PyScaffold 4?

That is likely to be happening because PyScaffold 4 removed support for pkg_resources namespaces in favour of PEP 420. Unfortunately these two methodologies for creating namespaces are not compatible, as documented in
the packaging namespace packages official guide. To fix this problem you (or other maintainers) will need to ei-
ther (a) update all the existing "subpackages" in the same namespace to be implicit (PEP 420-style), or (b) get rid 
of the implicit namespace configuration PyScaffold automatically sets up during project creation/update. Please 
check the answers for these other questions about removing or adding implicit namespaces and the updating 
guides for some tips on how to achieve that.

How can I convert an existing package to use implicit namespaces (PEP 420)?
The easiest answer for that question is to (a) convert the existing package to a PyScaffold-enabled project (if it 
isn’t yet; please check our guides for instructions) and (b) update your existing project to the latest version of 
PyScaffold passing the correct --namespace option.

The slightly more difficult answer for that question is to (a) make sure your project uses a src layout, (b) remove 
the __init__.py file from the umbrella folder that is serving as namespace for your project, (c) configure 
setup.cfg to include your namespace – have a look on setuptools, for packages that use the src-layout that 
basically means that you want to have something similar to:

```configuration
[options]
  # ...
  packages = find_namespace:
  package_dir =
      =src
  # ...

[options.packages.find]
  where = src
```

in your setup.cfg – and finally, (d) configure your documentation to include the implicit namespace (for Sphinx 
users, in general that will mean that you want to run sphinx-apidoc with the --implicit-namespaces flag 
after extending the PYTHONPATH with the src folder).

The previous steps assume your existing package uses setuptools and you are willing to have a src layout, if that 
is not the case refer to the documentation of your package creator (or the software you use to package up your 
Python projects) and the PEP 420 for more information.

6.4 pyproject.toml

Can I modify requires despite the warning in pyproject.toml to avoid doing that?
You can definitely modify pyproject.toml, but it is good to understand how PyScaffold uses it. If you are just 
adding a new build dependency (e.g. Cython), there is nothing to worry. However, if you are trying to remove 
or change the version of a dependency PyScaffold included there, PyScaffold will overwrite that change if you 
ever run putup --update in the same project (in those cases git diff is your friend, and you should be able 
to manually reconcile the dependencies).

What should I do if I am not using pyproject.toml or if it is causing me problems?
If you prefer to have legacy builds and get the old behavior, you can remove the pyproject.toml file and run python setup.py bdist_wheel, but we advise to install the build requirements (as the ones specified in the 
requires field of pyproject.toml) in an isolated environment and use it to run the setup.py commands 
(tox can be really useful for that). Alternatively you can use the setup_requires field in setup.cfg, however, 
this method is discouraged and might be invalid in the future.

Note: For the time being you can use the transitional --no-pyproject option, when running putup, but have 
in mind that this option will be removed in future versions of PyScaffold.
Please check our updating guide for extra steps you might need to execute manually.

6.5 Best Practices and Common Errors with Version Numbers

How do I get a clean version like 3.2.4 when I have 3.2.3.post0.dev9+g6817bd7?

Just commit all your changes and create a new tag using `git tag v3.2.4`. In order to build an old version checkout an old tag, e.g. `git checkout -b v3.2.3 v3.2.3` and run `tox -e build` (or install the build package and run `python -m build --wheel`).

Why do I see unknown as version?

In most cases this happens if your source code is no longer a proper Git repository, maybe because you moved or copied it or Git is not even installed. In general using `pip install -e` to install your package is only recommended for developers of your Python project, which have Git installed and use a proper Git repository anyway. Users of your project should always install it using the distribution you built for them e.g. `pip install my_project-3.2.3-py3-none-any.whl`. You build such a distribution by running `tox -e build` (or `python -m build --wheel`) and then find it under `.dist`.

Is there a good versioning scheme I should follow?

The most common practice is to use Semantic Versioning. Following this practice avoids the so called dependency hell for the users of your package. Also be sure to set attributes like `python_requires` and `install_requires` appropriately in setup.cfg.

Is there a best practice for distributing my package?

First of all, cloning your repository or just copying your code around is a really bad practice which comes with tons of pitfalls. The clean way is to first build a distribution and then give this distribution to your users. This can be done by just copying the distribution file or uploading it to some artifact store like PyPI for public packages or devpi, Nexus, etc. for private packages. Also check out this article about packaging, versioning and continuous integration.

Using some CI service, why is the version unknown or my_project-0.0.post0.dev50?

Some CI services use shallow git clones, i.e. `--depth N`, or don’t download git tags to save bandwidth. To verify that your repo works as expected, run:

```
$ git describe --dirty --tags --long --first-parent
```

which is basically what setuptools-scm does to retrieve the correct version number. If this command fails, tweak how your repo is cloned depending on your CI service and make sure to also download the tags, i.e. `git fetch origin --tags`.

How can I build a distribution if I have only the source code without a proper git repo?

If you see an error message like:

```
setuptools-scm was unable to detect version for 'your/project'.
```

This means that setuptools-scm could not find an intact git repository. If you still want to build a distribution from the source code there is a workaround: you can try setting `setuptools-scm` environment variables, e.g. `SETUPTOOLS_SCM_PRETEND_VERSION=1.0`. If that is not enough, try completely removing it. In setup.cfg in the section [metadata] define a version manually with e.g. `version = 1.0`. Now remove from pyproject.toml the setuptools_scm build requirement and the [tool.setuptools_scm] table. Also remove `use_scm_version={"version_scheme": "no-guess-dev"}` from setup.py.

How can I configure and debug the exact version exported by my package?

PyScaffold will include a default configuration for your project that uses the name of the latest git tag and the status of your working tree to create a suitable version string.
You can tweak this configuration to change how this string is produced. The details on how to do this are described in `setuptools-scm`.

To preview (or debug) what is the version string being exported you can run:

```
python -m setuptools_scm
```

(This requires the `setuptools-scm` package is installed in your environment)
PyScaffold was started by Blue Yonder developers to help automating and standardizing the process of project setups. Nowadays it is a pure community project driven by volunteer work. Every little gesture is really appreciated (including issue reports!), and if you are interested in joining our continuous effort for making PyScaffold better, welcome aboard! We are pleased to help you in this journey.

Note: This document is an attempt to get any potential contributor familiarized with PyScaffold’s community processes, but by no means is intended to be a complete reference.

Please feel free to contact us for help and guidance in our GitHub discussions page.

Please notice, all the members of the PyScaffold community (and in special contributors) are expected to be open, considerate, reasonable, and respectful. and follow the Python Software Foundation’s Code of Conduct when interacting with PyScaffold’s codebases, issue trackers, chat rooms and mailing lists (or equivalent).

Tip: If you are new to open source or have never contributed before to a software project, please have a look at contribution-guide.org and the How to Contribute to Open Source guide. Other resources are also listed in the excellent guide created by FreeCodeCamp.

7.1 How to contribute to PyScaffold?

This guide focus on issue reports, documentation improvements, and code contributions, but there are many other ways to contribute to PyScaffold, even if you are not an experienced programmer or don’t have the time to code. Skills like graphical design, event planning, teaching, mentoring, public outreach, tech evangelism, code review, between many others are greatly appreciated. Please reach us out, we would love to have you on board and discuss what can be done!

7.1.1 Issue Reports

If you experience bugs or general issues with PyScaffold, please have a look on our issue tracker.

Note: Please don’t forget to include the closed issues in your search. Sometimes another person has already experienced your problem and reported a solution. If you don’t see anything useful there, feel free to fire a new issue report.

New issue reports should include information about your programming environment (e.g., operating system, Python version) and steps to reproduce the problem. Please try also to simplify the reproduction steps to a very minimal
example that still illustrates the problem you are facing. By removing other factors, you help us to identify the root cause of the issue.

### 7.1.2 Documentation Improvements

You can help us improve our docs by making them more readable and coherent, or by adding missing information and correcting mistakes (including spelling and grammar errors).

Already known and discussed documentation issues that would benefit from contributions are marked in our issue tracker with the documentation label (we also do the same for all existing extensions under the PyScaffold organization on GitHub). But you are also welcomed to propose completely new changes (e.g., if you find new problems or would like to see a complicated topic better explained).

PyScaffold’s documentation is written in reStructuredText and uses Sphinx as its main documentation compiler¹. This means that the docs are kept in the same repository as the project code, and that any documentation update is done via GitHub pull requests, as if it was a code contribution.

While that might be scary for new programmers, it is actually a very nice way of getting started in the open source community, since doc contributions are not as difficult to make as other code contributions (for example, they don’t require any automated testing).

Please have a look in the steps described below and in case of doubts, contact us at the GitHub discussions page for help.

When working on changes to PyScaffold’s docs in your local machine, you can compile them using tox:

```
tox -e docs
```

and use Python’s built-in web server for a preview in your web browser (http://localhost:8000):

```
python3 -m http.server --directory 'docs/_build/html'
```

**Tip:** Please notice that the GitHub web interface provides a quick way of propose changes in PyScaffold’s files, that do not require you to have a lot of experience with git or programming in general. While this mechanism can be tricky for normal code contributions, it works perfectly fine for contributing to the docs, and can be quite handy.

If you are interested in trying this method out, please navigate to PyScaffold’s docs folder in the main repository, find which file you would like to propose changes and click in the little pencil icon at the top, to open GitHub’s code editor. Once you finish editing the file, please write a nice message in the form at the bottom of the page describing which changes have you made and what are the motivations behind them and submit your proposal.

### 7.1.3 Code Contributions

PyScaffold uses GitHub’s fork and pull request workflow for code contributions, which means that anyone can propose changes in the code base.

Once proposed changes are submitted, our continuous integration (CI) service, Cirrus-CI, will run a series of automated checks to make sure everything is OK and the pull request (PR) itself will be reviewed by one of PyScaffold maintainers, before being merged in the code base. In some cases, changes might be required to fix problems pointed out by the CI, or the maintainers might want to discuss a bit about the PR and suggest adjustments. Please don’t worry if that happens, this kind of iterative development is very common in the open source community and usually makes the software better. Besides, we will do our best to provide feedback (and support for eventual doubts) as soon as we can.

¹ The same is valid for the extensions under the PyScaffold organization on GitHub, although some extension, like pyscaffoldext-markdown and pyscaffoldext-dsproject use CommonMark with MyST extensions as an alternative to reStructuredText.
If you are unsure about what to contribute, please have a look in our issue tracker (or the issue tracker of any extension under the PyScaffold organization on GitHub). Contributions on issues marked with the help wanted label are particularly appreciated. Moreover, the good first issue label marks issues that do not require a huge understanding on how the project works and therefore can be tackled by new members of the community. Please also notice that some issues are not ready yet for a follow up implementation or bug fix, these are usually signed with other labels, such as needs discussion and waiting response. When in doubt, please engage in the conversation by posting a message to the open issue.

Understanding how PyScaffold works

If you have a change in mind, but don’t know how to implement it, please have a look in our Developer Guide. It explains the main aspects of PyScaffold internals and provide a brief overview of how the project is organized.

Submit an issue

Before you work on any non-trivial code contribution it’s best to first create an issue report to start a discussion on the subject. This often provides additional considerations and avoids unnecessary work.

Create an environment

Before you start coding, we recommend creating an isolated virtual environment to avoid any problems with your installed Python packages. This can easily be done via either virtualenv:

```
virtualenv -P NAME TO VENV
source -P NAME TO VENV>/bin/activate
```

or Miniconda:

```
conda env create -d environment.yml
conda activate pyscaffold
```

Clone the repository

1. Create a GitHub account if you do not already have one.
2. Fork the project repository: click on the Fork button near the top of the page. This creates a copy of the code under your account on the GitHub server.
3. Clone this copy to your local disk:

```
git clone git@github.com:YourLogin/pyscaffold.git
cd pyscaffold
```
4. You should run:

```
pip install -U pip setuptools -e .
```

to be able run putup --help.

5. Install pre-commit:

```
pip install pre-commit
pre-commit install
```

7.1. How to contribute to PyScaffold?
PyScaffold Documentation, Release 4.2.3

PyScaffold project comes with a lot of hooks configured to automatically help the developer to check the code being written.

**Implement your changes**

1. Create a branch to hold your changes:
   ```
   git checkout -b my-feature
   ```
   and start making changes. Never work on the master branch!

2. Start your work on this branch. Don’t forget to add docstrings to new functions, modules and classes, especially if they are part of public APIs.

3. Add yourself to the list of contributors in `AUTHORS.rst`.

4. When you’re done editing, do:
   ```
   git add <MODIFIED FILES>
   git commit
   ```
   to record your changes in git. Please make sure to see the validation messages from `pre-commit` and fix any eventual issues. This should automatically use `flake8/black` to check/fix the code style in a way that is compatible with PyScaffold.

   **Important:** Don’t forget to add unit tests and documentation in case your contribution adds an additional feature and is not just a bugfix.

   Moreover, writing a descriptive commit message is highly recommended. In case of doubt, you can check the commit history with:
   ```
   git log --graph --decorate --pretty=oneline --abbrev-commit --all
   ```
   to look for recurring communication patterns.

5. Please check that your changes don’t break any unit tests with:
   ```
   tox
   ```
   (after having installed `tox` with `pip install tox` or `pipx`).

   To speed up running the tests, you can try to run them in parallel, using `pytest-xdist`. This plugin is already added to the test dependencies, so everything you need to do is adding `-n auto` or `-n <NUMBER OF PROCESSES>` in the CLI. For example:
   ```
   tox -- -n 15
   ```

   Please have in mind that PyScaffold test suite is IO intensive, so using a number of processes slightly bigger than the available number of CPUs is a good idea. For quicker feedback you can also try:
   ```
   tox -e fast
   ```
   or select individual tests using the `-k` flag from `pytest`:
   ```
   tox -- -k <NAME OF THE TEST FUNCTION>
   ```
You can also use `tox` to run several other pre-configured tasks in the repository. Try `tox -av` to see a list of the available checks.

**Submit your contribution**

1. If everything works fine, push your local branch to GitHub with:

   ```
   git push -u origin my-feature
   ```

2. Go to the web page of your PyScaffold fork and click “Create pull request” to send your changes to the maintainers for review. Find more detailed information in creating a PR. You might also want to open the PR as a draft first and mark it as ready for review after the feedbacks from the continuous integration (CI) system or any required fixes.

3. If you are submitting a change related to an existing CI system template (e.g., travis, cirrus, or even tox and pre-commit), please consider first submitting a companion PR to PyScaffold’s `ci-tester`, with the equivalent files changes, so we are sure it works.

   If you are proposing a new CI system template, please send us a link of a simple repository generated with your templates (a simple `putup --<YOUR EXTENSION> ci-tester` will do) and the CI logs for that repository.

   This helps us a lot to control breaking changes that might appear in the future.

**Troubleshooting**

I’ve got a strange error related to versions in `test_update.py` when executing the test suite or about an `entry_point` that cannot be found.

Make sure to fetch all the tags from the upstream repository, the command `git describe --abbrev=0 --tags` should return the version you are expecting. If you are trying to run the CI scripts in a fork repository, make sure to push all the tags. You can also try to remove all the egg files or the complete egg folder, i.e., `.eggs`, as well as the `*.egg-info` folders in the `src` folder or potentially in the root of your project.

I’ve got a strange syntax error when running the test suite. It looks like the tests are trying to run with Python 2.7 ...

Try to create a dedicated virtual environment using Python 3.6+ (or the most recent version supported by PyScaffold) and use a `tox` binary freshly installed. For example:

```
virtualenv .venv
source .venv/bin/activate
.venv/bin/pip install tox
.venv/bin/tox -e all
```

I have found a weird error when running `tox`. It seems like some dependency is not being installed.

Sometimes `tox` misses out when new dependencies are added, especially to `setup.cfg` and `docs/requirements.txt`. If you find any problems with missing dependencies when running a command with `tox`, try to recreate the `tox` environment using the `-r` flag. For example, instead of:

```
tox -e docs
```

Try running:

```
tox -r -e docs
```

I am trying to debug the automatic test suite, but it is very hard to understand what is happening.
Pytest can drop you in an interactive session in the case an error occurs. In order to do that you need to pass a `--pdb` option (for example by running `tox -- -k <NAME OF THE FALLING TEST> --pdb`). While pdb does not have the best user interface in the world, if you feel courageous, it is possible to use an alternate implementation like ptpdb and bpdb (please notice some of them might require additional options, such as `--pdbcls ptpdb:PtPdb`/`--pdbcls bpdb:BPdb`). You will need to temporarily add the respective package as a dependency in your `tox.ini` file. You can also setup breakpoints manually instead of using the `--pdb` option.

### 7.1.4 Code Reviews and Issue Triage

If you are an experienced developer and wants to help, but do not have the time to create complete pull requests, you can still help by reviewing existing open pull requests, or going through the open issues and evaluating them according to our labels and even suggesting possible solutions or workarounds.

### 7.1.5 Maintainer tasks

PyScaffold maintainers not only carry out most of the source code development, but also are responsible for planning new releases, reviewing pull requests, and managing CI tools between many other tasks. If you are interested in becoming a maintainer, the best is to keep “hanging out” in the community, helping with the issues, proposing PRs and doing some code review (either in the main repository or the extensions under the PyScaffold organization on GitHub). Eventually, one of the existing maintainers will approach you and ask you to join.

This section describes some technical aspects of recurring tasks and is meant as a guide for new maintainers (or old ones that need a memory refresher).

#### Releases

New PyScaffold releases should be automatically uploaded to PyPI by one of our GitHub actions every time a new tag is pushed to the repository. Therefore, as a PyScaffold maintainer, the following steps are all you need to release a new version:

1. Make sure all unit tests on Cirrus-CI are green.
2. Tag the current commit on the master branch with a release tag, e.g., `v1.2.3`.
3. Push the new tag to the upstream repository, e.g., `git push upstream v1.2.3`.
4. After a few minutes check if the new version was uploaded to PyPI.

If, for some reason, you need to manually create a new distribution file and upload to PyPI, the following extra steps can be used:

1. Clean up the `dist` and `build` folders with `tox -e clean` (or `rm -rf dist build`) to avoid confusion with old builds and Sphinx docs.
2. Run `tox -e build` and check that the files in `dist` have the correct version (no `.dirty` or `git hash`) according to the `git` tag. Also sizes of the distributions should be less than 500KB, otherwise unwanted clutter may have been included.
3. Run `tox -e publish -- --repository pypi` and check that everything was uploaded to PyPI correctly.

---

**Important:** When working in a new external extension, it is important that the first distribution is manually uploaded to PyPI, to make sure it will have the correct ownership.
After successful releases (especially of new major versions), it is a good practice to re-generate our example repository. To manually do that, please visit our GitHub actions page and run the Make Demo Repo workflow (please check if it was not automatically triggered already).

**Working on multiple branches and splitting complex changes**

PyScaffold follows semantic versioning. As a consequence, most of the times the master (or main) branch for either the main repository or the extensions under the PyScaffold organization on GitHub, should be pointing out to the latest published minor version, or the next minor version still under development. We also tend (but are not committed to) keep some level of support for the previous major version, which means that once a major version is superseded, the maintainers should create a new branch pointing to this previous version.

For this reason, Read the Docs should always be configured to show the stable version by default instead of latest. The stable version corresponds to the latest commit that received a git tag, while the latest version points to the master/main branch.

During the transition period between major versions, it is common practice to create a new development version that is kept apart from the master branch and will only be merged when everything is ready for release. For example, a v4.0.x branch was used for all the development related to PyScaffold v4, while the master branch was still being used for bug fixes to v3.

When working in complex features or refactoring, it might also be interesting to create a new long-living branch that will receive multiple PRs from other short-lived auxiliary branch splitting the changes into smaller steps. Please be aware that splitting complex changes into smaller PRs can be very tricky. Whenever possible, try to create independent PRs, i.e., PRs that can be merged independently into a long-living branch, without causing conflicts between themselves. When that is not possible, please coordinate a review and merge strategy with the other maintainers reviewing your code.

One possible strategy is to create a single PR, but ask your reviewers to consider each commit (that should be small) as if it was an independent PR. A different strategy is to use stacked PRs, as described by the following references:

- Timothy Andrew’s Blog
- Doctor McKayla’s Blog
- Div’s Blog
- LogRocket’s Blog

Please also notice that independently of the strategy you and the reviewers agree on, it might be worthy to ask them to just review the PRs without merging (so you are responsible for closing the PRs and bringing their code to the long-lived branch via git merge, pull or cherry-pick). This might avoid confusion since GitHub does not provide any special mechanism for dealing with dependencies between PRs. Moreover, the merging might be just easier via git CLI.

**Note:** PyScaffold’s repositories also contain archives/* branches. These branches correspond to old experiments and alternative feature implementations that, although not merged, are kept for reference as interesting (or very complex) pieces of code that might be useful in the future.
7.1.6 Spread the Word

Finally, another way to contribute to PyScaffold is to recommend it. You can speak about it with your work colleagues, in a conference, or even writing a blog post about the project.

If you need to pitch PyScaffold to your boss or co-workers, please check out our docs. We have enumerated a few *reasons for using PyScaffold* in our website, that can be handy to have around.
This document describes the internal architecture and the main concepts behind PyScaffold. It assumes the reader has some experience in using PyScaffold (specially its command line interface, `putup`) and some familiarity with Python’s package ecosystem.

Please notice this document does not target PyScaffold’s users, instead it provides internal documentation for those who are involved in PyScaffold’s development.

### 8.1 Architecture

As indicated in the figure below, PyScaffold can be divided in two main execution blocks: a pure Python API and the command line interface wrapping it as an executable program that runs on the shell.

The CLI is responsible for defining all arguments `putup` accepts and parsing the user input accordingly. The result is a `dict` that contains options expressing the user preference and can be fed into PyScaffold’s main API, `create_project`.

This function is responsible for combining the provided options `dict` with pre-existing project configurations that might be available in the project directory (the `setup.cfg` file, if present) and globally defined default values (via PyScaffold’s own configuration file). It will then create an (initially empty) in-memory representation of the project structure and run PyScaffold’s action pipeline, which in turn will (between other tasks) write customized versions of PyScaffold’s templates to the disk as project files, according to the combined scaffold options.

The project representation and the action pipeline are two key concepts in PyScaffold’s architecture and are described in detail in the following sections.

### 8.2 Project Structure Representation

Each Python package project is internally represented by PyScaffold as a tree data structure, that directly relates to a directory entry in the file system. This tree is implemented as a simple (and possibly nested) `dict` in which keys indicate the path where files will be generated, while values indicate their content. For instance, the following dict:

```json
{
    "folder": {
        "file.txt": "Hello World!",
        "another-folder": {
            "empty-file.txt": ""
        }
    }
}
```

(continues on next page)
represents a project directory in the file system that contains a single directory named `folder`. In turn, `folder` contains two entries. The first entry is a file named `file.txt` with content `Hello World!` while the second entry is a sub-directory named `another-folder`. Finally, `another-folder` contains an empty file named `empty-file.txt`.

Note: Changed in version 4.0: Prior to version 4.0, the project structure included the top level directory of the project. Now it considers everything under the project folder.

Additionally, tuple values are also allowed in order to specify a file operation (or simply file op) that will be used to produce the file. In this case, the first element of the tuple is the file content, while the second element will be a function (or more generally a callable object) responsible for writing that content to the disk. For example, the dict:

```python
from pyscaffold.operations import create

{  
    "src": {  
        "namespace": {  
            "module.py": ('print("Hello World!")', create)  
        }  
    }  
}
```

represents a `src/namespace/module.py` file, under the project directory, with content `print("Hello World!")`, that will written to the disk. When no operation is specified (i.e. when using a simple string instead of a tuple), PyScaffold will assume `create` by default.

Note: The `create` function simply creates a text file to the disk using UTF-8 encoding and the default file permissions. This behaviour can be modified by wrapping `create` within other functions/callables, for example:

```python
from pyscaffold.operations import create, no_overwrite

{"file": ("content", no_overwrite(create))}
```

will prevent the file to be written if it already exists. See `pyscaffold.operations` for more information on how to write your own file operation and other options.

Finally, while it is simple to represent file contents as a string directly, most of the times we want to customize them according to the project parameters being created (e.g. package or author’s name). So PyScaffold also accepts `string.Template` objects and functions (with a single `dict` argument and a `str` return value) to be used as contents. These templates and functions will be called with `PyScaffold's options` when its time to create the file to the disk.

Note: `string.Template` objects will have `safe_substitute` called (not simply `substitute`).

This tree representation is often referred in this document as project structure or simply structure.
8.3 Action Pipeline

PyScaffold organizes the generation of a project into a series of steps with well defined purposes. As shown in the figure below, each step is called action and is implemented as a simple function that receives two arguments: a project structure and a dict with options (some of them parsed from command line arguments, other from default values).

An action MUST return a tuple also composed by a project structure and a dict with options. The return values, thus, are usually modified versions of the input arguments. Additionally an action can also have side effects, like creating directories or adding files to version control. The following pseudo-code illustrates a basic action:

```python
def action(project_structure, options):
    new_struct, new_opts = modify(project_structure, options)
    some_side_effect()
    return new_struct, new_opts
```

The output of each action is used as the input of the subsequent action, forming a pipeline. Initially the structure argument is just an empty dict. Each action is uniquely identified by a string in the format `<module name>:<function name>`, similarly to the convention used for a setuptools entry point. For example, if an action is defined in the action function of the extras.py file that is part of the pyscaffoldext.contrib project, the action identifier is pyscaffoldext.contrib.extras:action.

By default, the sequence of actions taken by PyScaffold is:

1. `pyscaffold.actions:get_default_options`
2. `pyscaffold.actions:verify_options_consistency`
3. `pyscaffold.structure:define_structure`
4. `pyscaffold.actions:verify_project_dir`
5. `pyscaffold.update:version_migration`
6. `pyscaffold.structure:create_structure`
7. `pyscaffold.actions:init_git`
8. `pyscaffold.actions:report_done`

(as given by `pyscaffold.actions.DEFAULT`)

The project structure is usually empty until `define_structure` This action just loads the in-memory dict representation, that is only written to disk by the `create_structure` action.

Note that, this sequence varies according to the command line options. To retrieve an updated list, please use putup `--list-actions` or putup `--dry-run`.

8.4 Extensions

Extensions are a mechanism provided by PyScaffold to modify its action pipeline at runtime and the preferred way of adding new functionality. There are built-in extensions (e.g. `pyscaffold.extensions.cirrus`) and external extensions (e.g. `pyscaffoldext-dsproject`), but both types of extensions work exactly in the same way. This division is purely based on the fact that some of PyScaffold features are implemented as extensions that ship by default with the pyscaffold package, while other require the user to install additional Python packages.

Extensions are required to add at least one CLI argument that allow the users to opt-in for their behaviour. When putup runs, PyScaffold’s will dynamically discover installed extensions via setuptools entry points and add their defined
arguments to the main CLI parser. Once activated, a extension can use the helper functions defined in `pyscaffold.actions` to manipulate PyScaffold’s action pipeline and therefore the project structure.

For more details on extensions, please consult our *Extending PyScaffold* guide.

### 8.5 Code base Organization

PyScaffold is organized in a series of internal Python modules, the main ones being:

- **api**: top level functions for accessing PyScaffold functionality, by combining together the other modules
- **cli**: wrapper around the API to create a command line executable program
- **actions**: default action pipeline and helper functions for manipulating it
- **structure**: functions specialized in defining the in-memory project structure representation and in taking this representation and creating it as part of the file system.
- **update**: steps required for updating projects generated with old versions of PyScaffold
- **extensions**: main extension mechanism and subpackages corresponding to the built-in extensions

Additionally, a series of internal auxiliary libraries is defined in:

- **dependencies**: processing and manipulating of package dependencies and requirements
- **exceptions**: custom PyScaffold exceptions and exception handlers
- **file_system**: wrappers around file system functions that make them easy to be used from PyScaffold.
- **identification**: creating and processing of project/package/function names and other general identifiers
- **info**: general information about the system, user and package being generated
- **log**: custom logging infrastructure for PyScaffold, specialized in its verbose execution
- **operations**: file operations that can be embedded in the in-memory project structure representation
- **repo**: wrapper around the `git` command
- **shell**: helper functions for working with external programs
- **termui**: basic support for ANSI code formatting
- **toml**: thin adapter layer around third-party TOML parsing libraries, focused in API stability

For more details about each module and its functions and classes, please consult our *module reference*.

When contributing to PyScaffold, please try to maintain this overall project organization by respecting each module’s own purpose. Moreover, when introducing new files or renaming existing ones, please try to use meaningful naming and avoid terms that are too generic, e.g. `utils.py` (when in doubt, Peter Hilton has a great article about naming smells and a nice presentation about how to name things).
CHAPTER
NINE

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CHANGELOG

10.1 Current versions

10.1.1 Version 4.2.3, 2022-06-17

• Automatically create directory when saving config file, issue #648

10.2 Older versions

10.2.1 Version 4.2.2, 2022-05-26

• Update .github/workflows/ci.yml template, PR #637 and PR #640
• Update note in skeleton.py template clarifying file can be renamed, PR #641

10.2.2 Version 4.2.1, 2022-03-16

• Ensure .gitlab-ci.yml template works for GitLab Enterprise 14.7.4, PR #630

10.2.3 Version 4.2, 2022-03-14

• Added --github-actions extension, PR #619
• Updated and improved --gitlab extension, PR #622
• Updated and improved --cirrus extension, PR #625
• Fixed tox -e publish example in docs, PR #627
• Added colorama as a runtime dependency for Windows, PR #624
10.2.4 Version 4.1.5, 2022-02-22

• Added `.python-version` created by `pyenv` to `.gitignore`
• Added more `--very-verbose` logging to make clearer what’s going on, issue #562
• Replace internal dependency on `appdirs` with `platformdirs`, PR #584
• Fix coverage config for namespaced packages, PR #610

10.2.5 Version 4.1.4, 2022-01-13

• Ensure build configuration produces `sdist` as it is needed by `conda`, issue #570

10.2.6 Version 4.1.3, 2022-01-11

• Fix pre-commit error: The unauthenticated git protocol on port 9418 is no longer supported, issue #565

Note: PyScaffold 4.1 is the last release to support Python 3.6

10.2.7 Version 4.1.2, 2022-01-04

• Added verification to prevent users from creating projects nested inside existing repositories, unless `--force` is explicitly given, issue #544, PR #545.
• Fixed problem with Windows Shell when running git, PR #560.

10.2.8 Version 4.1.1, 2021-10-18

• Ensure required extensions are installed on `--update`, PR #512
• Prevent extension from crashing when persisting `None` in `setup.cfg`, PR #510
• Prevent multi-line descriptions to crash `putup`, PR #509
• Warn users about empty namespaces, PR #508
• Prevent parsing errors during dependency deduplication, PR #518
• Add `license_files` to `setup.cfg` template, issue #524

10.2.9 Version 4.1, 2021-09-22

• Added `linkcheck` task to `tox.ini`, PR #456
• Updated configuration for Sphinx and ReadTheDocs, PR #455
• Note that templates and the generated boilerplate code is 0BSD-licensed, PR #461
• Added 0BSD license template
• Added `CONTRIBUTING.rst` template, issue #376
• Added PyScaffold badge to README template, issue #473
• Updated Cirrus CI config and templates, including better `coveralls` integration, issue #449
• Adopted global _isolated_build_ for _tox_ configuration, issue #483, PR #491
• Loop counter explicitly marked as unused in _skeleton.py_ (flake8-bugbear B007), PR #495
• Ensure update include added extensions in _setup.cfg_, PR #496

### 10.2.10 Version 4.0.2, 2021-05-26

• Restructured docs
• Fix WSL2 installation problem, issue #440
• Fix for interactive mode under Windows, issue #430

### 10.2.11 Version 4.0.1, 2021-03-17

• Fix _tox_ -e _build_ issue when running on Conda, PR #417
• Ensure _snake_case_ for keys in _setup.cfg_, issue #418
• Update dependencies on _configupdater_ and _pyscaffoldext-django_
• Remove broken checks for old _setuptools_, issue #428

### 10.2.12 Version 4.0, 2021-03-04

• Cookiecutter, Django and Travis extensions extracted to their own repositories, issue #175 and issue #355
• Support for _Python 3.4_ and 3.5 dropped, issue #226
• Dropped deprecated _requirements.txt_ file, issue #182
• Added support for global configuration (avoid retyping common _putup_’s options), issue #236
• PyScaffold is no longer a build-time dependency, it just generates the project structure
• Removed _contrib_ subpackage, vendorized packages are now runtime dependencies, PR #290
• _setuptools_scm_ is included by default in _setup.cfg_, _setup.py_ and _pyproject.toml_
• API changed to use _pyscaffold.operations_ instead of integer flags, PR #271
• Allow _string.Template_ and _callable_ as file contents in project structure, PR #295
• Extract file system functions from _utils.py_ into _file_system.py_
• Extract identification/naming functions from _utils.py_ into _identification.py_
• Extract action related functions from _api/__init__.py_ to _actions.py_
• _helpers.{modify,ensure,reject}_ moved to _structure.py_
• _helpers.{register,unregister}_ moved to _actions.py_
• New extension for automatically creating virtual environments (_--venv_)
• Added instructions to use _pip-tools_ to docs
• _pre-commit_ extension now attempts to install hooks automatically
• A nice message is now displayed when PyScaffold finishes running (_actions.report_done_)
• Removed mutually exclusive _argparse_ groups for extensions, PR #315

### 10.2. Older versions
• Progressive type annotations adopted in the code base together with mypy linting
• Simplified isort config
• pyproject.toml and isolated builds adopted by default, issue #256
• Added comment to setup.cfg template instructing about extra links, issue #268
• Generate tox.ini by default, issue #296
• Replace pkg_resources with importlib.{metadata,resources} and packaging, issue #309
• Adopt PEP 420 for namespaces, issue #218
• Adopt SPDX identifiers for the license field in setup.cfg, issue #319
• Removed deprecated log.configure_logger
• Add links to issues and pull requests to changelog, PR #363
• Add an experimental --interactive mode (inspired by git rebase -i), issue #191 (additional discussion: PR #333, PR #325, PR #362)
• Reorganise the FAQ (including version questions previously in Features)
• Updated setuptools and setuptools_scm dependencies to minimal versions 46.1 and 5, respectively
• Adopted no-guess-dev version scheme from setuptools_scm (semantically all stays the same, but non-tag commits are now versioned LAST_TAG.post1.devN instead of LAST_TAG.post0.devN)
• Fix problem of not showing detailed log with --verbose if error happens when loading extensions issue #378

### 10.2.13 Version 3.3, 2020-12-24

• Code base changed to Black’s standards
• New docs about version numbers and git integration
• Updated pre-commit hooks
• Updated docs/Makefile to use Sphinx “make mode”
• deprecated setuptools extensions/commands python setup.py test/docs/doctests, issue #245
• New tox test environments for generating docs and running doctests
• New built-in extension for Cirrus CI, issue #251
• experimental get_template is now part of the public API and can be used by extensions, issue #252
• Updated setuptools_scm to version 4.1.2 in contrib
• Updated configupdater to version 1.1.2 in contrib
• precommit automatically fixes line endings by default
• deprecated log.configure_logger, use log.logger.reconfigure instead

**Note:** PyScaffold 3.3 is the last release to support Python 3.5
10.2.14 Version 3.2.3, 2019-10-12

• Updated configupdater to version 1.0.1
• Changed Travis to Cirrus CI
• Fix some problems with Windows

10.2.15 Version 3.2.2, 2019-09-12

• Write files as UTF-8, fixes codec can’t encode characters error

10.2.16 Version 3.2.1, 2019-07-11

• Updated pre-commit configuration and set max-line-length to 88 (Black’s default)
• Change build folder of Sphinx’s Makefile
• Fix creation of empty files which were just ignored before

10.2.17 Version 3.2, 2019-06-30

• deprecated use of lists with helpers.{modify, ensure, reject}, issue #211
• Add support for os.PathLike objects in helpers.{modify, ensure, reject}, issue #211
• Remove release alias in setup.cfg, use twine instead
• Set project-urls and long-description-content-type in setup.cfg, issue #216
• Added additional command line argument very-verbose
• Assure clean workspace when updating existing project, issue #190
• Show stacktrace on errors if --very-verbose is used
• Updated configupdater to version 1.0
• Use pkg_resources.resource_string instead of pkgutil.get_data for templates
• Update setuptools_scm to version 3.3.3
• Updated pytest-runner to version 5.1
• Some fixes regarding the order of executing extensions
• Consider GIT_AUTHOR_NAME and GIT_AUTHOR_EMAIL environment variables
• Updated tox.ini
• Switch to using tox in .travis.yml template
• Reworked all official extensions --pyproject, --custom-extension and --markdown

10.2. Older versions
10.2.18 Version 3.1, 2018-09-05

- Officially dropped Python 2 support, issue #177
- Moved entry_points and setup_requires to setup.cfg, issue #176
- Updated travis.yml template, issue #181
- Set install_requires to setuptools>=31
- Better isolation of unit tests, issue #119
- Updated tox template, issues issue #160 & issue #161
- Use pkg_resources.parse_version instead of old LooseVersion for parsing
- Use ConfigUpdater instead of ConfigParser
- Lots of internal cleanups and improvements
- Updated pytest-runner to version 4.2
- Updated setuptools_scm to version 3.1
- Fix Django extension problem with src-layout, issue #196
- experimental extension for MarkDown usage in README, issue #163
- experimental support for Pipenv, issue #140
- deprecated built-in Cookiecutter and Django extensions (to be moved to separated packages), issue #175

10.2.19 Version 2.5.11, 2018-04-14

- Updated pbr to version 4.0.2
- Fixes Sphinx version 1.6 regression, issue #152

10.2.20 Version 3.0.3, 2018-04-14

- Set install_requires to setuptools>=30.3.0

10.2.21 Version 3.0.2, 2018-03-21

- Updated setuptools_scm to version 1.17.0
- Fix wrong docstring in skeleton.py about entry_points, issue #147
- Fix error with setuptools version 39.0 and above, issue #148
- Fixes in documentation, thanks Vicky
10.2.22 Version 2.5.10, 2018-03-21

- Updated setuptools_scm to version 1.17.0

10.2.23 Version 2.5.9, 2018-03-20

- Updated setuptools_scm to version 1.16.1
- Fix error with setuptools version 39.0 and above, issue #148

10.2.24 Version 3.0.1, 2018-02-13

- Fix confusing error message when python setup.py docs and Sphinx is not installed, issue #142
- Fix ‘unknown’ version in case project name differs from the package name, issue #141
- Fix missing file: attribute in long-description of setup.cfg
- Fix sphinx-apidoc invocation problem with Sphinx 1.7

10.2.25 Version 3.0, 2018-01-07

- Improved Python API thanks to an extension system
- Dropped pbr in favor of setuptools >= 30.3.0
- Updated setuptools_scm to v1.15.6
- Changed my_project/my_package to recommended my_project/src/my_package structure
- Renamed CHANGES.rst to more standard CHANGELOG.rst
- Added platforms parameter in setup.cfg
- Call Sphinx api-doc from conf.py, issue #98
- Included six 1.11.0 as contrib sub-package
- Added CONTRIBUTING.rst
- Removed test-requirements.txt from template
- Added support for GitLab
- License change from New BSD to MIT
- FIX: Support of git submodules, issue #98
- Support of Cython extensions, issue #48
- Removed redundant --with- from most command line flags
- Prefix n was removed from the local_version string of dirty versions
- Added a --pretend flag for easier development of extensions
- Added a --verbose flag for more output what PyScaffold is doing
- Use pytest-runner 4.4 as contrib package
- Added a --no-skeleton flag to omit the creation of skeleton.py
- Save parameters used to create project scaffold in setup.cfg for later updating

10.2. Older versions
A special thanks goes to Anderson Bravalheri for his awesome support and inovex for sponsoring this release.

10.2.26 Version 2.5.8, 2017-09-10

• Use sphinx.ext.imgmath instead of sphinx.ext.mathjax
• Added --with-gitlab-ci flag for GitLab CI support
• Fix Travis install template dirties git repo, issue #107
• Updated setuptools_scm to version 1.15.6
• Updated pbr to version 3.1.1

10.2.27 Version 2.5.7, 2016-10-11

• Added encoding to __init__.py
• Few doc corrections in setup.cfg
• [tool:pytest] instead of [pytest] in setup.cfg
• Updated skeleton
• Switch to Google Sphinx style
• Updated setuptools_scm to version 1.13.1
• Updated pbr to version 1.10.0

10.2.28 Version 2.5.6, 2016-05-01

• Prefix error message with ERROR:
• Suffix of untagged commits changed from {version}-{hash} to {version}-n{hash}
• Check if package identifier is valid
• Added log level command line flags to the skeleton
• Updated pbr to version 1.9.1
• Updated setuptools_scm to version 1.11.0

10.2.29 Version 2.5.5, 2016-02-26

• Updated pbr to master at 2016-01-20
• Fix sdist installation bug when no git is installed, issue #90
10.2.30 Version 2.5.4, 2016-02-10

- Fix problem with fibonacci terminal example
- Update setuptools_scm to v1.10.1

10.2.31 Version 2.5.3, 2016-01-16

- Fix classifier metadata (classifiers to classifier in setup.cfg)

10.2.32 Version 2.5.2, 2016-01-02

- Fix is_git_installed

10.2.33 Version 2.5.1, 2016-01-01

- Fix: Do some sanity checks first before gathering default options
- Updated setuptools_scm to version 1.10.0

10.2.34 Version 2.5, 2015-12-09

- Usage of test-requirements.txt instead of tests_require in setup.py, issue #71
- Removed --with-numpydoc flag since this is now included by default with sphinx.ext.napoleon in Sphinx 1.3 and above
- Added small template for unittest
- Fix for the example skeleton file when using namespace packages
- Fix typo in devpi:upload section, issue #82
- Include pbr and setuptools_scm in PyScaffold to avoid dependency problems, issue #71 and issue #72
- Cool logo was designed by Eva Schmücker, issue #66

10.2.35 Version 2.4.4, 2015-10-29

- Fix problem with bad upload of version 2.4.3 to PyPI, issue #80

10.2.36 Version 2.4.3, 2015-10-27

- Fix problem with version numbering if setup.py is not in the root directory, issue #76

10.2. Older versions
10.2.37 Version 2.4.2, 2015-09-16

• Fix version conflicts due to too tight pinning, issue #69

10.2.38 Version 2.4.1, 2015-09-09

• Fix installation with additional requirements pyscaffold[ALL]
• Updated pbr version to 1.7

10.2.39 Version 2.4, 2015-09-02

• Allow different py.test options when invoking with py.test or python setup.py test
• Check if Sphinx is needed and add it to setup_requires
• Updated pre-commit plugins
• Replaced pytest-runner by an improved version
• Let pbr do sphinx-apidoc, removed from conf.py, issue #65

Note: Due to the switch to a modified pytest-runner version it is necessary to update setup.cfg. Please check the example.

10.2.40 Version 2.3, 2015-08-26

• Format of setup.cfg changed due to usage of pbr, issue #59
• Much cleaner setup.py due to usage of pbr, issue #59
• PyScaffold can be easily called from another script, issue #58
• Internally dictionaries instead of namespace objects are used for options, issue #57
• Added a section for devpi in setup.cfg, issue #62

Note: Due to the switch to pbr, it is necessary to update setup.cfg according to the new syntax.

10.2.41 Version 2.2.1, 2015-06-18

• FIX: Removed putup console script in setup.cfg template
10.2.42 Version 2.2, 2015-06-01

- Allow recursive inclusion of data files in setup.cfg, issue #49
- Replaced hand-written PyTest runner by pytest-runner, issue #47
- Improved default README.rst, issue #51
- Use tests/conftest.py instead of tests/__init__.py, issue #52
- Use setuptools_scm for versioning, issue #43
- Require setuptools>=9.0, issue #56
- Do not create skeleton.py during an update, issue #55

Note: Due to the switch to setuptools_scm the following changes apply:

- use python setup.py --version instead of python setup.py version
- git archive can no longer be used for packaging (and was never meant for it anyway)
- initial tag v0.0 is no longer necessary and thus not created in new projects
- tags do no longer need to start with v

10.2.43 Version 2.1, 2015-04-16

- Use alabaster as default Sphinx theme
- Parameter data_files is now a section in setup.cfg
- Allow definition of extras_require in setup.cfg
- Added a CHANGES.rst file for logging changes
- Added support for cookiecutter
- FIX: Handle an empty Git repository if necessary

10.2.44 Version 2.0.4, 2015-03-17

- Typo and wrong Sphinx usage in the RTD documentation

10.2.45 Version 2.0.3, 2015-03-17

- FIX: Removed misleading include_package_data option in setup.cfg
- Allow selection of a proprietary license
- Updated some documentations
- Added -U as short parameter for --update

10.2. Older versions
10.2.46 Version 2.0.2, 2015-03-04

- FIX: Version retrieval with setup.py install
- argparse example for version retrieval in skeleton.py
- FIX: import my_package should be quiet (verbose=False)

10.2.47 Version 2.0.1, 2015-02-27

- FIX: Installation bug under Windows 7

10.2.48 Version 2.0, 2015-02-25

- Split configuration and logic into setup.cfg and setup.py
- Removed .pre from version string (newer PEP 440)
- FIX: Sphinx now works if package name does not equal project name
- Allow namespace packages with --with-namespace
- Added a skeleton.py as a console_script template
- Set v0.0 as initial tag to support PEP440 version inference
- Integration of the Versioneer functionality into setup.py
- Usage of data_files configuration instead of MANIFEST.in
- Allow configuration of package_data in setup.cfg
- Link from Sphinx docs to AUTHORS.rst

10.2.49 Version 1.4, 2014-12-16

- Added numpydoc flag --with-numpydoc
- Fix: Add django to requirements if --with-django
- Fix: Don’t overwrite index.rst during update

10.2.50 Version 1.3.2, 2014-12-02

- Fix: path of Travis install script

10.2.51 Version 1.3.1, 2014-11-24

- Fix: --with-tox tuple bug, PR #28
10.2.52 Version 1.3, 2014-11-17

- Support for Tox (https://tox.wiki/en/stable/)
- flake8: exclude some files
- Usage of UTF8 as file encoding
- Fix: create non-existent files during update
- Fix: unit tests on MacOS
- Fix: unit tests on Windows
- Fix: Correct version when doing setup.py install

10.2.53 Version 1.2, 2014-10-13

- Support pre-commit hooks (https://pre-commit.com/)

10.2.54 Version 1.1, 2014-09-29

- Changed COPYING to LICENSE
- Support for all licenses from https://choosealicense.com/
- Fix: Allow update of license again
- Update to Versioneer 0.12

10.2.55 Version 1.0, 2014-09-05

- Fix when overwritten project has a git repository
- Documentation updates
- License section in Sphinx
- Django project support with –with-django flag
- Travis project support with –with-travis flag
- Replaced sh with own implementation
- Fix: new git describe version to PEP440 conversion
- conf.py improvements
- Added source code documentation
- Fix: Some Python 2/3 compatibility issues
- Support for Windows
- Dropped Python 2.6 support
- Some classifier updates
10.2.56 Version 0.9, 2014-07-27

• Documentation updates due to RTD
• Added a --force flag
• Some cleanups in setup.py

10.2.57 Version 0.8, 2014-07-25

• Update to Versioneer 0.10
• Moved sphinx-apidoc from setup.py to conf.py
• Better support for make html

10.2.58 Version 0.7, 2014-06-05

• Added Python 3.4 tests and support
• Flag --update updates only some files now
• Usage of setup_requires instead of six code

10.2.59 Version 0.6.1, 2014-05-15

• Fix: Removed six dependency in setup.py

10.2.60 Version 0.6, 2014-05-14

• Better usage of six
• Return non-zero exit status when doctests fail
• Updated README
• Fixes in Sphinx Makefile

10.2.61 Version 0.5, 2014-05-02

• Simplified some Travis tests
• Nicer output in case of errors
• Updated PyScaffold’s own setup.py
• Added --junit_xml and --coverage_xml/html option
• Updated .gitignore file
10.2.62 Version 0.4.1, 2014-04-27
• Problem fixed with pytest-cov installation

10.2.63 Version 0.4, 2014-04-23
• PEP8 and PyFlakes fixes
• Added –version flag
• Small fixes and cleanups

10.2.64 Version 0.3, 2014-04-18
• PEP8 fixes
• More documentation
• Added update feature
• Fixes in setup.py

10.2.65 Version 0.2, 2014-04-15
• Checks when creating the project
• Fixes in COPYRIGHT
• Usage of sh instead of GitPython
• PEP8 fixes
• Python 3 compatibility
• Coverage with Coverall.io
• Some more unit tests

10.2.66 Version 0.1.2, 2014-04-10
• Bugfix in Manifest.in
• Python 2.6 problems fixed

10.2.67 Version 0.1.1, 2014-04-10
• Unittesting with Travis
• Switch to string.Template
• Minor bug fixes
10.2.68 Version 0.1, 2014-04-03

- First release
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12.1 pyscaffold package

12.1.1 Subpackages

pyscaffold.extensions package

Submodules

pyscaffold.extensions.cirrus module

Extension that generates configuration for Cirrus CI.

class pyscaffold.extensions.cirrus.Cirrus(name=None)
    Bases: Extension
    Add configuration file for Cirrus CI (includes –pre-commit)
    activate(actions)
        Activate extension, see activate.
    augment_cli(parser)
        Augments the command-line interface parser. See augment_cli.

pyscaffold.extensions.cirrus.add_files(struct, opts)
    Add .cirrus.yml to the file structure

Parameters
    • struct – project representation as (possibly) nested dict.
    • opts – given options, see create_project for an extensive list.

Returns
    updated project representation and options

Return type
    struct, opts

pyscaffold.extensions.cirrus.cirrus_descriptor(_opts)
    Returns the rendered template
pyscaffold.extensions.config module

CLI options for using/saving preferences as PyScaffold config files.

class pyscaffold.extensions.config.Config(name=None)
    Bases: Extension

    Add a few useful options for creating/using PyScaffold config files.

    activate(actions)
        Activates the extension by registering its functionality

        Parameters
            actions (List[Action]) – list of action to perform

        Returns
            updated list of actions

        Return type
            List[Action]

    augment_cli(parser)
        Augments the command-line interface parser.

        A command line argument --FLAG where FLAG=`self.name` is added which appends self.activate to the list of extensions. As help text the docstring of the extension class is used. In most cases this method does not need to be overwritten.

        Parameters
            parser – current parser object

        persist = False
            When True PyScaffold will store the extension in the PyScaffold’s section of setup.cfg. Useful for updates. Set to False if the extension should not be re-invoked on updates.

pyscaffold.extensions.config.save(struct, opts)

    Save the given opts as preferences in a PyScaffold’s config file.

pyscaffold.extensions.github_actions module

Extension that generates configuration for GitHub Actions.

class pyscaffold.extensions.github_actions.GithubActions(name=None)
    Bases: Extension

    Add configuration file for GitHub Actions (includes --pre-commit)

    activate(actions)
        Activate extension, see activate.

    augment_cli(parser)
        Augments the command-line interface parser. See augment_cli.

pyscaffold.extensions.github_actions.add_files(struct, opts)

    Add .github/workflows/ci.yml to the file structure

    Parameters
        • struct – project representation as (possibly) nested dict.
PyScaffold Documentation, Release 4.2.3

• **opts** – given options, see `create_project` for an extensive list.

  **Returns**
  updated project representation and options

  **Return type**
  struct, opts

### pyscaffold.extensions.gitlab_ci module

Extension that generates configuration and script files for GitLab CI.

**class** `pyscaffold.extensions.gitlab_ci.GitLab(name=None)`

**Bases:** `Extension`

Generate GitLab CI configuration files

**activate**(actions)

Activate extension, see `activate`.

**augment_cli**(parser)

Augments the command-line interface parser. See `augment_cli`.

**pyscaffold.extensions.gitlab_ci.add_files**(struct, opts)

Add `.gitlab-ci.yml` file to structure

  **Parameters**
  
  • **struct** – project representation as (possibly) nested `dict`.
  
  • **opts** – given options, see `create_project` for an extensive list.

  **Returns**
  updated project representation and options

  **Return type**
  struct, opts

### pyscaffold.extensions.interactive module

Similarly to `git rebase -i` this extension allows users to interactively choose which options apply to `putup`, by editing a file filled with examples.

See `CONFIG` for more details on how to tweak the text generated in the interactive mode.

New in version 4.0: “interactive mode” introduced as an `experimental` extension.

---

**Warning:** **NOTE FOR CONTRIBUTORS:** Due to the way `argparse` is written, it is not very easy to obtain information about which options and arguments a given parser is currently configured with. There are no public methods that allow inspection/reflection, and therefore in order to do so, one has to rely on a few non-public methods (according to Python’s convention, the ones starting with an `_` symbol). Since `argparse` implementation is very stable and mature, these non-public method are very unlikely to change and, therefore, it is relatively safe to use these methods, however developers and maintainers have to be aware and pay attention to eventual breaking changes. The non-public functions are encapsulated in the functions `get_actions` and `format_args` in this file, in order to centralise the usage of non-public API.
pyscaffold.extensions.interactive.CONFIG = {'comment': ['--verbose', '--very-verbose'], 'ignore': ['--help', '--version']}

Configuration for the options that are not associated with an extension class. This dict value consist of a set of metadata organised as follows:

- Each value must be a list of “long” argparse option strings (e.g. “--help” instead of “-h”).
- Each key implies on a different interpretation for the metadata:
  - "ignore": Options that should be simply ignored when creating examples
  - "comment": Options that should be commented when creating examples, even if they appear in the original sys.argv.

Extension classes (or instances) can also provide configurations by defining a interactive attribute assigned to a similar dict object.

class pyscaffold.extensions.interactive.Interactive(name=None)
    Bases: Extension

    Interactively choose and configure PyScaffold’s parameters

    augment_cli(parser)
        See augment_cli.

    command(opts)
        This method replace the regular call to cli.run_scaffold with an intermediate file to confirm the user’s choices in terms of arguments/options.

parser

pyscaffold.extensions.interactive.all_examples(parser, actions, opts)
    Generate a example of usage of the CLI options corresponding to the given actions including the help text.
    This function will skip options that are marked in the "ignore" configuration.
    See example_with_help.

pyscaffold.extensions.interactive.alternative_flags(action)
    Get the alternative flags (i.e. not the long one) of a argparse.Action

pyscaffold.extensions.interactive.comment(text, comment_mark='#{', indent_level=0)
    Comment each line of the given text (optionally indenting it)

pyscaffold.extensions.interactive.example(parser, action, opts)
    Generate a CLI example of option usage for the given argparse.Action. The opts argument corresponds to options already processed by PyScaffold, and interferes on the generated text (e.g., when the corresponding option is already processed, the example will be adjusted accordingly; when the corresponding option is not present, the example might be commented out; ...).
    This function will comment options that are marked in the "comment" configuration.

pyscaffold.extensions.interactive.example_no_value(parser, action, opts)
    Generate a CLI example of option usage for a argparse.Action that do not expect arguments (nargs = 0).
    See example.

pyscaffold.extensions.interactive.example_with_help(parser, action, opts)
    Generate a CLI example of option usage for the given argparse.Action that includes a comment text block explaining its meaning (basically the same text displayed when using --help).
    See example.
pyscaffold.extensions.interactive.example_with_value(parser, action, opts)

Generate a CLI example of option usage for a argparse.Action that expects one or more arguments (nargs is "?", "*", "+" or "N" > 0).

See example.

pyscaffold.extensions.interactive.expand_computed_opts(opts)

Pre-process the given PyScaffold options and add default/computed values (including the ones derived from setup.cfg in case of --update or PyScaffold’s own configuration file in the user’s home directory.

pyscaffold.extensions.interactive.format_args(parser, action)

Produce an example to be used together with the flag of the given action.

**Warning:** This function uses non-public API from Python’s stdlib argparse.

pyscaffold.extensions.interactive.get_actions(parser)

List actions related to options that were configured to the given ArgumentParser.

**Warning:** This function uses non-public API from Python’s stdlib argparse.

pyscaffold.extensions.interactive.get_config(kind)

Get configurations that will be used for generating examples (from both CONFIG and the interactive attribute of each extension).

The kind argument can assume the same values as the CONFIG keys.

This function is cached to improve performance. Call get_config.__wrapped__ to bypass the cache (or get_config.cache_clear, see functools.lru_cache).

pyscaffold.extensions.interactive.has_active_extension(action, opts)

Returns True if the given argparse.Action corresponds to an extension that was previously activated via CLI.

pyscaffold.extensions.interactive.join_block(*parts, sep='\n')

Join blocks of text using sep, but ignoring the empty ones

pyscaffold.extensions.interactive.long_option(action)

Get the long option corresponding to the given argparse.Action

pyscaffold.extensions.interactive.split_args(text)

Split the text from the interactive example into arguments that can be passed directly to argparse, as if they were invoked directly from the CLI (this includes removing comments).

pyscaffold.extensions.interactive.wrap(text, width=70, **kwars)

Wrap text to fit lines with a maximum number of characters
pyscaffold.extensions.namespace module

Extension that adjust project file tree to include a namespace package.

This extension adds a namespace option to create_project and provides correct values for the options root_pkg and namespace_pkg to the following functions in the action list.

class pyscaffold.extensions.namespace.Namespace(name=None)

Bases: Extension

Add a namespace (container package) to the generated package.

activate(actions)

Register an action responsible for adding namespace to the package.

Parameters
actions – list of actions to perform

Returns
updated list of actions

Return type
list

augment_cli(parser)

Add an option to parser that enables the namespace extension.

Parameters
parser (argparse.ArgumentParser) – CLI parser object

pyscaffold.extensions.namespace.add_namespace(struct, opts)

Prepend the namespace to a given file structure

Parameters
• struct – directory structure as dictionary of dictionaries
• opts – options of the project

Returns
Directory structure as dictionary of dictionaries and input options

pyscaffold.extensions.namespace.enforce_namespace_options(struct, opts)

Make sure options reflect the namespace usage.

pyscaffold.extensions.namespace.move_old_package(struct, opts)

Move old package that may be eventually created without namespace

Parameters
• struct (dict) – directory structure as dictionary of dictionaries
• opts (dict) – options of the project

Returns
directory structure as dictionary of dictionaries and input options

Return type
tuple(dict, dict)
pyscaffold.extensions.namespace\u2002\texttt{prepare_namespace}(\textit{namespace\_str})

Check the validity of \textit{namespace\_str} and split it up into a list

\begin{itemize}
  \item \textbf{Parameters}
    \begin{itemize}
    \item \texttt{namespace\_str} – namespace, e.g. “com.blue\_yonder”
    \end{itemize}
  \end{itemize}

\begin{itemize}
  \item \textbf{Returns}
    \begin{itemize}
    \item list of namespaces, e.g. [“com”, “com.blue\_yonder”]
    \end{itemize}
  \end{itemize}

\begin{itemize}
  \item \textbf{Raises}
    \begin{itemize}
    \item \texttt{InvalidIdentifier} – raised if namespace is not valid
    \end{itemize}
  \end{itemize}

\textbf{pyscaffold.extensions.no\_pyproject module}

Extension that omits the creation of file \textit{pyproject.toml}.

Since the isolated builds with PEP517/PEP518 are not completely backward compatible, this extension provides an escape hatch for people that want to maintain the legacy behaviour.

\begin{itemize}
  \item \textbf{Warning:} This extension is \texttt{transitional} and will be removed in future versions of PyScaffold. Once support for isolated builds stabilises, the Python community will likely move towards using them more exclusively.
\end{itemize}

\begin{verbatim}
class pyscaffold.extensions.no_pyproject.NoPyProject(name=None)
    Bases: Extension
    Do not include a pyproject.toml file in the project root, and thus avoid isolated builds as defined in PEP517/518 [not recommended]
    activate(actions)
        Activates the extension by registering its functionality
        Parameters
            actions (List[Action]) – list of action to perform
        Returns
            updated list of actions
        Return type
            List[Action]

    name = 'no_pyproject'
\end{verbatim}

pyscaffold.extensions.no_pyproject\u2002\texttt{ensure\_option}(\textit{struct, opts})

Make option available in non-CLI calls (used by other parts of PyScaffold)

pyscaffold.extensions.no\_pyproject\u2002\texttt{remove\_files}(\textit{struct, opts})
**pyscaffold.extensions.no_skeleton module**

Extension that omits the creation of file `skeleton.py`

```python
class pyscaffold.extensions.no_skeleton.NoSkeleton(name=None):
    Bases: Extension
    Omit creation of skeleton.py and test_skeleton.py

    activate(actions)
    Activate extension, see activate.

pyscaffold.extensions.no_skeleton.remove_files(struct, opts)
Remove all skeleton files from structure

Parameters

- **struct** – project representation as (possibly) nested `dict`.
- **opts** – given options, see `create_project` for an extensive list.

Returns

Updated project representation and options
```

**pyscaffold.extensions.no_tox module**

Extension that removes configuration files for the Tox test automation tool.

```python
class pyscaffold.extensions.no_tox.NoTox(name=None):
    Bases: Extension
    Prevent a tox configuration file from being created

    activate(actions)
    Activate extension, see activate.

pyscaffold.extensions.no_tox.remove_files(struct, opts)
Remove .tox.ini file to structure
```

**pyscaffold.extensions.pre_commit module**

Extension that generates configuration files for Yelp pre-commit.

```python
class pyscaffold.extensions.pre_commit.PreCommit(name=None):
    Bases: Extension
    Generate pre-commit configuration file

    activate(actions)
    Activate extension

    Parameters

    - **actions** (`list`) – list of actions to perform

    Returns

    updated list of actions

    Return type

    list
```
pyScaffold Documentation, Release 4.2.3

pyscaffold.extensions.pre_commit.add_files(struct, opts)
Add .pre-commit-config.yaml file to structure
Since the default template uses isort, this function also provides an initial version of .isort.cfg that can be extended by the user (it contains some useful skips, e.g. tox and venv)

pyscaffold.extensions.pre_commit.add_instructions(opts, content, file_op)
Add pre-commit instructions to README

pyscaffold.extensions.pre_commit.find_executable(struct, opts)
Find the pre-commit executable that should run later in the next action... Or take advantage of the venv to install it...

pyscaffold.extensions.pre_commit.install(struct, opts)
Attempts to install pre-commit in the project

pyscaffold.extensions.venv module

Create a virtual environment for the project
pyscaffold.extensions.venv.DEFAULT = '.venv'
Default directory name for collocated virtual environment that will be created

exception pyscaffold.extensions.venv.NotInstalled(msg=None)
Bases: ImportError
Neither virtualenv or venv are installed in the computer. Please check the following alternatives:
  • virtualenv can be installed via pip
  • venv is supposed to be installed by default with Python3, however some OS or distributions (such as Ubuntu) break the standard library in a series of packages that need to be manually installed via OS package manager. You can try to search for a python-venv, python3-venv or similar in the official repositories.

class pyscaffold.extensions.venv.Venv(name=None)
Bases: Extension
Create a virtual environment for the project (using virtualenv or stddlib’s venv). Default location: “{DEFAULT}”. If virtualenv is available, it will be used, since it has some advantages over stddlib’s venv (such as being faster, see https://virtualenv.pypa.io/en/stable/).
Notice that even if part of Python’s stddlib, venv is not guaranteed to be installed, some OS/distributions (such as Ubuntu) require an explicit installation. If you have problems, try installing virtualenv with pip and run the command again.

activate(actions)
Activate extension, see activate.

augment_cli(parser)
Augments the command-line interface parser. See augment_cli.

persist = False
When True PyScaffold will store the extension in the PyScaffold’s section of setup.cfg. Useful for updates. Set to False if the extension should not be re-invoked on updates.

pyscaffold.extensions.venv.create(path, pretend=False)
Create the virtual environment with the first technique available. (virtualenv is preferred because it is faster).
pyscaffold.extensions.venv.create_with_stdlib(path, pretend=False)

pyscaffold.extensions.venv.create_with_virtualenv(path, pretend=False)

pyscaffold.extensions.venv.get_path(opts, default='.venv')
    Get the path to the venv that will be created.

pyscaffold.extensions.venv.install_packages(struct, opts)
    Install the specified packages inside the created venv.

pyscaffold.extensions.venv.instruct_user(struct, opts)
    Simply display a message reminding the user to activate the venv.

pyscaffold.extensions.venv.run(struct, opts)
    Action that will create a virtualenv for the project

### Module contents

Built-in extensions for PyScaffold.

class pyscaffold.extensions.Extension(name=None)
    Bases: object
    Base class for PyScaffold’s extensions

    Parameters
    name (str) – How the extension should be named. Default: name of class By default, this value
    is used to create the activation flag in PyScaffold cli.

    See our docs on how to create extensions in: https://pyscaffold.org/en/latest/extensions.html
    Also check actions, Structure and ScaffoldOpts for more details.

---

**Note:** Please name your class using a CamelCase version of the name you use in the setuptools entrypoint
(alternatively you will need to overwrite the name property to match the entrypoint name).

activate(actions)
    Activates the extension by registering its functionality

    Parameters
    actions (List[Action]) – list of action to perform

    Returns
    updated list of actions

    Return type
    List[Action]

augment_cli(parser)
    Augments the command-line interface parser.

    A command line argument --FLAG where FLAG=`self.name` is added which appends selfactivate
to the list of extensions. As help text the docstring of the extension class is used. In most cases this method
does not need to be overwritten.

    Parameters
    parser – current parser object
property flag

property help_text

property name

persist = True

When True PyScaffold will store the extension in the PyScaffold’s section of setup.cfg. Useful for updates. Set to False if the extension should not be re-invoked on updates.

static register(actions, action, before=None, after=None)

Shortcut for pyscaffold.actions.register

static unregister(actions, reference)

Shortcut for pyscaffold.actions.unregister

pyscaffold.extensions.NO_LONGER_NEEDED = {'pyproject', 'tox'}

Extensions that are no longer needed and are now part of PyScaffold itself

pyscaffold.extensions.include(*extensions)

Create a custom argparse.Action that saves multiple extensions for activation.

Parameters

*extensions – extension objects to be saved

pyscaffold.extensions.iterate_entry_points(group=’pyscaffold.cli’)

Produces a generator yielding an EntryPoint object for each extension registered via setuptools entry point mechanism.

This method can be used in conjunction with load_from_entry_point to filter the extensions before actually loading them.

pyscaffold.extensions.list_from_entry_points(group=’pyscaffold.cli’, filtering=<function <lambda>>)

Produces a list of extension objects for each extension registered via setuptools entry point mechanism.

Parameters

• group – name of the setuptools’ entry_point group where extensions is being registered
• filtering – function returning a boolean deciding if the entry point should be loaded and included (or not) in the final list. A True return means the extension should be included.

pyscaffold.extensions.load_from_entry_point(entry_point)

Carefully load the extension, raising a meaningful message in case of errors

pyscaffold.extensions.store_with(*extensions)

Create a custom argparse.Action that stores the value of the given option in addition to saving the extension for activation.

Parameters

*extensions – extension objects to be saved for activation
**pyscaffold.templates package**

**Module contents**

Templates for all files of a project’s scaffold

All template files (*.template) within this subpackage are licensed under the BSD 0-Clause license.

**pyscaffold.templates.add_pyscaffold(config, opts)**

Add PyScaffold section to a setup.cfg-like file + PyScaffold’s version + extensions and their associated options.

**pyscaffold.templates.get_template(name, relative_to=pyscaffold.templates)**

Retrieve the template by name

**Parameters**

- **name** – name of template (the .template extension will be automatically added to this name)
- **relative_to** – module/package object or name to which the resource file is relative (in the standard module format, e.g. foo.bar.baz). Notice that relative_to should not represent directly a shared namespace package, since this kind of package is spread in different folders in the file system.

Default value: pyscaffold.templates (please assign accordingly when using in custom extensions).

**Examples**

Consider the following package organization:

```
.
|-- src
|   |-- my_package
|   |   |-- __init__.py
|   |   |   |-- templates
|   |   |   |   |-- __init__.py
|   |   |   |   |   |-- file1.template
|   |   |   |   |   |   |-- file2.template
|   |   |   |   ...
|   |-- tests
```

Inside the file src/my_package/__init__.py, one can easily obtain the contents of file1.template by doing:

```
from pyscaffold.templates import get_template
from . import templates as my_templates

tpl1 = get_template("file1", relative_to=my_templates)
# OR
# tpl1 = get_template('file1', relative_to=my_templates.__name__)
```

Please notice you can also use relative_to=__name__ or a combination of from .. import __name__ as parent and relative_to=parent to deal with relative imports.

**Returns**

- template
Return type

```
string.Template
```

Changed in version 3.3: New parameter `relative_to`

**pyscaffold.templates.init**(*opts*)

Template of `__init__.py`

**Parameters**

- `opts` – mapping parameters as dictionary

**Returns**

file content as string

**Return type**

```
str
```

**pyscaffold.templates.license**(*opts*)

Template of `LICENSE.txt`

**Parameters**

- `opts` – mapping parameters as dictionary

**Returns**

file content as string

**Return type**

```
str
```

**pyscaffold.templates.licenses** = {
    '0BSD': 'license_bsd0',
    'AGPL-3.0-only': 'license_gpl_3.0',
    'AGPL-3.0-or-later': 'license_gpl_3.0',
    'Apache-2.0': 'license_apache',
    'Artistic-2.0': 'license_artistic_2.0',
    'BSD-2-Clause': 'license_simplified_bsd',
    'BSD-3-Clause': 'license_new_bsd',
    'CC0-1.0': 'license_cc0_1.0',
    'EPL-1.0': 'license_eclipse_1.0',
    'GPL-2.0-only': 'license_gpl_2.0',
    'GPL-2.0-or-later': 'license_gpl_2.0',
    'GPL-3.0-only': 'license_gpl_3.0',
    'GPL-3.0-or-later': 'license_gpl_3.0',
    'ISC': 'license_isc',
    'LGPL-2.0-only': 'license_lgpl_2.1',
    'LGPL-2.0-or-later': 'license_lgpl_2.1',
    'LGPL-3.0-only': 'license_lgpl_3.0',
    'LGPL-3.0-or-later': 'license_lgpl_3.0',
    'MIT': 'license_mit',
    'MPL-2.0': 'license_mozilla',
    'Proprietary': 'license_none',
    'Unlicense': 'license_public_domain'}

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**pyscaffold.templates.parse_extensions**(*extensions*)

Given a string value for the field `pyscaffold.extensions` in a `setup.cfg`-like file, return a set of extension names.

**pyscaffold.templates.pyproject_toml**(*opts*)

**pyscaffold.templates.setup_cfg**(*opts*)

Template of `setup.cfg`

**Parameters**

- `opts` – mapping parameters as dictionary

**Returns**

file content as string

**Return type**

```
str
```

12.1. `pyscaffold` package
12.1.2 Submodules

12.1.3 pyscaffold.actions module

Default PyScaffold’s actions and functions to manipulate them.

When generating a project, PyScaffold uses a pipeline of functions (each function will receive as arguments the values returned by the previous function). These functions have a specific purpose and are called actions. Please follow the Action signature when developing your own action.

Note: Some actions are more complex and are placed in dedicated modules together with other auxiliary functions, see pyscaffold.structure, pyscaffold.update.

pyscaffold.actions.Action

Signature of a PyScaffold action, both arguments should be treated as immutable, but a copy of the arguments, modified by the extension might be returned:

```
Callable[[Structure, ScaffoldOpts], Tuple[Structure, ScaffoldOpts]]
```

alias of Callable[[Dict[str, Union[str, None, Callable[[Dict[str, Any]], Optional[str]], Template, Tuple[Union[str, None, Callable[[Dict[str, Any]], Optional[str]], Template], Callable[[Path, Optional[str]], Dict[str, Any]], Optional[Path]], dict]], Dict[str, Any]], Tuple[Dict[str, Union[str, None, Callable[[Dict[str, Any]], Optional[str]], Template, Tuple[Union[str, None, Callable[[Dict[str, Any]], Optional[str]], Template], Callable[[Path, Optional[str]], Dict[str, Any]], Optional[Path]], dict]], Dict[str, Any]]]

pyscaffold.actions.ActionParams

Both argument and return type of an action (struct, opts), so a sequence of actions work in pipeline:

```
Tuple[Structure, ScaffoldOpts]
```

When actions run, they can return an updated copy of Structure and ScaffoldOpts.

alias of Tuple[Dict[str, Union[str, None, Callable[[Dict[str, Any]], Optional[str]], Template, Tuple[Union[str, None, Callable[[Dict[str, Any]], Optional[str]], Template], Callable[[Path, Optional[str]], Dict[str, Any]], Optional[Path]], dict]], Dict[str, Any]]

pyscaffold.actions.DEFAULT = [\<function get_default_options>, \<function verify_options_consistency>, \<function define_structure>, \<function verify_project_dir>, \<function version_migration>, \<function create_structure>, \<function init_git>, \<function report_done>]

Default list of actions forming the main pipeline executed by PyScaffold

pyscaffold.actions.ScaffoldOpts

Dictionary with PyScaffold’s options, see pyscaffold.api.create_project.

alias of Dict[str, Any]

pyscaffold.actions.discover(extensions)

Retrieve the action list.

This is done by concatenating the default list with the one generated after activating the extensions.

Parameters

extensions – list of functions responsible for activating the extensions.
pyscaffold.actions.get_default_options(struct, opts)

Compute all the options that can be automatically derived.
This function uses all the available information to generate sensible defaults. Several options that can be derived are computed when possible.

Parameters

• struct – project representation as (possibly) nested dict.
• opts – given options, see create_project for an extensive list.

Returns

project representation and options with default values set

Return type

ActionParams

Raises

• DirectoryDoesNotExist – when PyScaffold is told to update an nonexistent directory
• GitNotInstalled – when git command is not available
• GitNotConfigured – when git does not know user information

Note: This function uses git to determine some options, such as author name and email.

pyscaffold.actions.init_git(struct, opts)

Add revision control to the generated files.

Parameters

• struct – project representation as (possibly) nested dict.
• opts – given options, see create_project for an extensive list.

Returns

Updated project representation and options

pyscaffold.actions.invoke(struct_and_opts, action)

Invoke action with proper logging.

Parameters

• struct_and_opts – PyScaffold’s arguments for actions
• action – to be invoked

Returns

updated project representation and options

Return type

ActionParams

pyscaffold.actions.register(actions, action, before=None, after=None)

Register a new action to be performed during scaffold.

Parameters

• actions (List[Action]) – previous action list.
• **action** (*Action*) – function with two arguments: the first one is a (nested) dict representing
the file structure of the project and the second is a dict with scaffold options. This function
**MUST** return a tuple with two elements similar to its arguments. Example:

```python
def do_nothing(struct, opts):
    return (struct, opts)
```

• **kwargs** (*dict*) – keyword arguments make it possible to choose a specific order when
executing actions: when before or after keywords are provided, the argument value is
used as a reference position for the new action. Example:

```python
register(actions, do_nothing,
    after='create_structure')
# Look for the first action with a name
# `create_structure` and inserts `do_nothing` after it.
# If more than one registered action is named
# `create_structure`, the first one is selected.
```

When no keyword argument is provided, the default execution order specifies that the action
will be performed after the project structure is defined, but before it is written to the disk.
Example:

```python
register(actions, do_nothing)
# The action will take place after
# `pyscaffold.structure:define_structure`
```

Returns
modified action list.

Return type
List[Action]

*pyscaffold.actions.report_done* (*struct*, *opts*)
Just inform the user PyScaffold is done

*pyscaffold.actions.unregister* (*actions*, *reference*)
Prevent a specific action to be executed during scaffold.

Parameters

• **actions** (*List[Action]*) – previous action list.

• **reference** (*str*) – action identifier. Similarly to the keyword arguments of *register* it
can assume two formats:
  – the name of the function alone,
  – the name of the module followed by : and the name of the function

Returns
modified action list.
Return type
List[Action]
pyscaffold.actions.verify_options_consistency(struct, opts)
Perform some sanity checks about the given options.

Parameters
• struct – project representation as (possibly) nested dict.
• opts – given options, see create_project for an extensive list.

Returns
Updated project representation and options

pyscaffold.actions.verify_project_dir(struct, opts)
Check if PyScaffold can materialize the project dir structure.

Parameters
• struct – project representation as (possibly) nested dict.
• opts – given options, see create_project for an extensive list.

Returns
Updated project representation and options

12.1.4 pyscaffold.api module

External API for accessing PyScaffold programmatically via Python.
pyscaffold.api.DEFAULT_OPTIONS = {
'config_files': [],
'description': 'Add a short description here!',
'extensions': [],
'force': False,
'license': 'MIT',
'update': False,
'url': 'https://github.com/pyscaffold/pyscaffold/',
'verison': '4.2.3'}
Default values for PyScaffold’s options.

Options that can be derived from the values of other options (e.g. package can be derived from project_path when not explicitly passed) are computed in pyscaffold.actions.get_default_options.

When config_files is empty, a default value is computed dynamically by pyscaffold.info.config_file before the start of PyScaffold’s action pipeline.

Warning: Default values might be dynamically overwritten by config_files or, during updates, existing setup.cfg.

pyscaffold.api.NO_CONFIG = ConfigFiles.NO_CONFIG
This constant is used to tell PyScaffold to not load any extra configuration file, not even the default ones
Usage:
create_project(opts, config_files=NO_CONFIG)

Please notice that the setup.cfg file inside an project being updated will still be considered.
pyscaffold.api.bootstrap_options(opts=opts, **kwargs)
Internal API: augment the given options with minimal defaults and existing configurations saved in files (e.g. setup.cfg)
See list of arguments in create_project. Returns a dictionary of options.
Warning: This function is not part of the public Python API of PyScaffold, and therefore might change even in minor/patch releases (not bounded to semantic versioning).

Note: This function does not replace the `pyscaffold.actions.get_default_options` action. Instead it is needed to ensure that action works correctly.

```python
pyscaffold.api.create_project(opts=None, **kwargs)
```

Create the project’s directory structure

**Parameters**
- `opts` (dict) – options of the project
- `**kwargs` – extra options, passed as keyword arguments

**Returns**
- a tuple of `struct` and `opts` dictionary

**Return type**
tuple

Valid options include:

**Project Information**
- `project_path` (os.PathLike or str)

**Naming**
- `name` (str): as in `pip install` or in PyPI
- `package` (str): Python identifier as in `import` (without namespace)

**Package Information**
- `author` (str)
- `email` (str)
- `release_date` (str)
- `year` (str)
- `title` (str)
- `description` (str)
- `url` (str)
- `classifiers` (str)
- `requirements` (list)

**PyScaffold Control**
- `update` (bool)
- `force` (bool)
- `pretend` (bool)
- `extensions` (list)
- `config_files` (list or NO_CONFIG)
Some of these options are equivalent to the command line options, others are used for creating the basic python package meta information, but the ones in the “PyScaffold Control” group affects how the “scaffolding” behaves.

When the force flag is True, existing files will be overwritten. When the update flag is True, PyScaffold will consider that some files can be updated (usually the packaging boilerplate), but will keep others intact. When the pretend flag is True, the project will not be created/updated, but the expected outcome will be logged.

The extensions list may contain any object that follows the extension API. Note that some PyScaffold features, such as cirrus, tox and pre-commit support, are implemented as built-in extensions. In order to use these features it is necessary to include the respective objects in the extension list. All built-in extensions are accessible via pyscaffold.extensions submodule.

Finally, when setup.cfg-like files are added to the config_files list, PyScaffold will read its options from there in addition to the ones already passed. If the list is empty, the default configuration file is used. To avoid reading any existing configuration, please pass config_file=NO_CONFIG. See usage for more details.

Note that extensions may define extra options. For example, the cookiecutter extension define a cookiecutter option that should be the address to the git repository used as template and the namespace extension define a namespace option with the name of a PEP 420 compatible (and possibly nested) namespace.

### 12.1.5 pyscaffold.cli module

Command-Line-Interface of PyScaffold

**pyscaffold.cli.add_default_args(parser)**

Add the default options and arguments to the CLI parser.

**pyscaffold.cli.add_extension_args(parser)**

Add options and arguments defined by extensions to the CLI parser.

**pyscaffold.cli.add_log_related_args(parser)**

Add options that control verbosity/logger level

**pyscaffold.cli.get_log_level(args=None)**

Get the configured log level directly by parsing CLI options from args or obj:sys.argv.

Useful when the CLI crashes before applying the changes to the logger.

**pyscaffold.cli.list_actions(opts)**

Do not create a project, just list actions considering extensions

**Parameters**

- **opts (dict)** – command line options as dictionary

**pyscaffold.cli.main(args)**

Main entry point for external applications

**Parameters**

- **args** – command line arguments

**pyscaffold.cli.parse_args(args)**

Parse command line parameters respecting extensions

**Parameters**

- **args** – command line parameters as list of strings

**Returns**

command line parameters
Return type
dict

pyscaffold.cli.run(args=None)
Entry point for console script

pyscaffold.cli.run_scaffold(opts)
Actually scaffold the project, calling the python API

Parameters
opts (dict) – command line options as dictionary

12.1.6 pyscaffold.dependencies module

Internal library for manipulating package dependencies and requirements.

pyscaffold.dependencies.BUILD = ('setuptools_scm>=5', 'wheel')
Dependencies that will be required to build the created project

pyscaffold.dependencies.ISOLATED = ('setuptools>=46.1.0', 'setuptools_scm[toml]>=5', 'wheel')
Dependencies for isolated builds (PEP517/518). - setuptools min version might be slightly higher then the version required at runtime. - setuptools_scm requires an optional dependency to work with pyproject.toml

pyscaffold.dependencies.REQ_SPLITTER = re.compile(';(?!!\s*(python|platform|implementation|os|sys)_)', re.MULTILINE)
Regex to split requirements that considers both setup.cfg specs and PEP 508 (in a good enough simplified fashion).

pyscaffold.dependencies.RUNTIME = ('importlib-metadata; python_version<"3.8"',)
Dependencies that will be required at runtime by the created project

pyscaffold.dependencies.add(requirements, to_add=('setuptools_scm>=5', 'wheel'))
Given a sequence of individual requirement strings, add to_add to it. By default adds BUILD if to_add is not given.

pyscaffold.dependencies.attempt_pkg_name(requirement)
In the case the given string is a dependency specification (PEP 508/440), it returns the “package name” part of dependency (without versions). Otherwise, it returns the same string (removed the comment marks).

pyscaffold.dependencies.deduplicate(requirements)
Given a sequence of individual requirement strings, e.g. ["platformdirs>=1.4.4", "packaging>=20.0"], remove the duplicated packages. If a package is duplicated, the last occurrence stays.

pyscaffold.dependencies.remove(requirements, to_remove)
Given a list of individual requirement strings, e.g. ["platformdirs>=1.4.4", "packaging>=20.0"], remove the requirements in to_remove.

pyscaffold.dependencies.split(requirements)
Split a combined requirement string (such as the values for setup_requires and install_requires in setup.cfg) into a list of individual requirement strings, that can be used in is_included, get_requirements_str, remove, etc...
12.1.7 pyscaffold.exceptions module

Functions for exception manipulation + custom exceptions used by PyScaffold to identify common deviations from the expected behavior.

**exception** pyscaffold.exceptions.ActionNotFound(name, *args, **kwargs)

Bases: KeyError

Impossible to find the required action.

**exception** pyscaffold.exceptions.DirectErrorForUser(message=None, *args, **kwargs)

Bases: RuntimeError

Parent class for exceptions that can be shown directly as error messages to the final users.

**exception** pyscaffold.exceptions.DirectoryAlreadyExists(message=None, *args, **kwargs)

Bases: DirectErrorForUser

The project directory already exists, but no update or force option was used.

**exception** pyscaffold.exceptions.DirectoryDoesNotExist(message=None, *args, **kwargs)

Bases: DirectErrorForUser

No directory was found to be updated.

**exception** pyscaffold.exceptions.ErrorLoadingExtension(extension=, entry_point=None)

Bases: DirectErrorForUser

There was an error loading '{extension}'. Please make sure you have installed a version of the extension that is compatible with PyScaffold {version}. You can also try uninstalling it.

**exception** pyscaffold.exceptions.ExtensionNotFound(extensions)

Bases: DirectErrorForUser

The following extensions were not found: {extensions}. Please make sure you have the required versions installed. You can look for official extensions at https://github.com/pyscaffold.

**exception** pyscaffold.exceptions.GitDirtyWorkspace(message="Your working tree is dirty. Commit your changes first or use '--force'.", *args, **kwargs)

Bases: DirectErrorForUser

Workspace of git is empty.

DEFAULT_MESSAGE = "Your working tree is dirty. Commit your changes first or use '--force'."

**exception** pyscaffold.exceptions.GitNotConfigured(message='Make sure git is configured. Run:

c git config --global user.email "you@example.com"
c git config --global user.name "Your Name"
nto set your account's default identity.
rc k

c

Bases: DirectErrorForUser

PyScaffold tries to read user.name and user.email from git config.

DEFAULT_MESSAGE = 'Make sure git is configured. Run:
c git config --global user.email "you@example.com"
c git config --global user.name "Your Name"
nto set your account's default identity.'
exception pyscaffold.exceptions.GitNotInstalled

Bases: DirectErrorForUser

PyScaffold requires git to run.

DEFAULT_MESSAGE = 'Make sure git is installed and working. Use flag --very-verbose for more information.'

exception pyscaffold.exceptions.ImpossibleToFindConfigDir

Bases: DirectErrorForUser

An expected error occurred when trying to find the config dir.

This might be related to not being able to read the $HOME env var in Unix systems, or %USERPROFILE% in Windows, or even the username.

exception pyscaffold.exceptions.InvalidIdentifier

Bases: RuntimeError

Python requires a specific format for its identifiers.

https://docs.python.org/3.6/reference/lexical_analysis.html#identifiers

exception pyscaffold.exceptions.NestedRepository(directory)

Bases: DirectErrorForUser

The directory '{directory}' is already part of a git repository.

PyScaffold avoids creating nested projects to prevent errors with setuptools-scm.

If you know what you are doing you can try running putup again with the `--force` flag, but please be aware that you will have to manually customise the configuration for setuptools-scm. For more information, have a look on:

- https://github.com/pypa/setuptools_scm
- https://github.com/pyscaffold/pyscaffold/issues/423

exception pyscaffold.exceptions.NoPyScaffoldProject

Bases: DirectErrorForUser

PyScaffold cannot update a project that it hasn’t generated

DEFAULT_MESSAGE = 'Could not update project. Was it generated with PyScaffold?'

exception pyscaffold.exceptions.PyScaffoldTooOld

Bases: DirectErrorForUser

PyScaffold cannot update a pre 3.0 version

DEFAULT_MESSAGE = 'setup.cfg has no section [pyscaffold]! Are you trying to update a pre 3.0 version?'

exception pyscaffold.exceptions.ShellCommandException

Bases: RuntimeError

Outputs proper logging when a ShellCommand fails
pyscaffold.exceptions.exceptions2exit(exception_list)
Decorator to convert given exceptions to exit messages
This avoids displaying nasty stack traces to end-users
Parameters
[Exception](exception_list) – list of exceptions to convert

12.1.8 pyscaffold.file_system module

Internal library that encapsulate file system manipulation. Examples include: creating/removing files and directories, changing permissions, etc.

Functions in this library usually extend the behaviour of Python’s standard lib by providing proper error handling or adequate logging/control flow in the context of PyScaffold (an example of adequate control flow logic is dealing with the pretend flag).

pyscaffold.file_system.ERROR_INVALID_NAME = 123
Windows-specific error code indicating an invalid pathname.

pyscaffold.file_system.chdir(path, **kwargs)
Contextmanager to change into a directory
Parameters
path – path to change current working directory to

Keyword Arguments
pretend (bool) – skip execution (but log) when pretending. Default False.

pyscaffold.file_system.chmod(path, mode, pretend=False)
Change the permissions of file in the given path.
This function reports the operation in the logs.
Parameters
• path – path in the file system whose permissions will be changed
• mode – new permissions, should be a combination of :obj:`stat.S_* <stat.S_IEXEC>` (see os.chmod).
• pretend (bool) – false by default. File is not changed when pretending, but operation is logged.

pyscaffold.file_system.create_directory(path, update=False, pretend=False)
Create a directory in the given path.
This function reports the operation in the logs.
Parameters
• path – path in the file system where contents will be written.
• update (bool) – false by default. A OSError can be raised when update is false and the directory already exists.
• pretend (bool) – false by default. Directory is not created when pretending, but operation is logged.
pyscaffold.file_system.create_file(path, content, pretend=False, encoding='utf-8')

Create a file in the given path.

This function reports the operation in the logs.

Parameters

- **path** – path in the file system where contents will be written.
- **content** – what will be written.
- **pretend** (bool) – false by default. File is not written when pretending, but operation is logged.

Returns

given path

Return type

Path

pyscaffold.file_system.is_pathname_valid(pathname)

Check if a pathname is valid

Code by Cecil Curry from StackOverflow

Parameters

- **pathname** (str) – string to validate

Returns

True if the passed pathname is a valid pathname for the current OS; False otherwise.

pyscaffold.file_system.localize_path(path_string)

Localize path for Windows, Unix, i.e. / or

Parameters

- **path_string** (str) – path using /

Returns

path depending on OS

Return type

str

pyscaffold.file_system.move(*src, target, **kwargs)

Move files or directories to (into) a new location

Parameters

- **src** (PathLike) – one or more files/directories to be moved

Keyword Arguments

- **target** (PathLike) – if target is a directory, src will be moved inside it. Otherwise, it will be the new path (note that it may be overwritten)
- **pretend** (bool) – skip execution (but log) when pretending. Default False.

pyscaffold.file_system.on_ro_error(func, path, exc_info)

Error handler for shutil.rmtree.

If the error is due to an access error (read only file) it attempts to add write permission and then retries.

If the error is for another reason it re-raises the error.

Usage: shutil.rmtree(path, onerror=onerror)
Parameters

- **func** (*callable*) – function which raised the exception
- **path** (*str*) – path passed to *func*
- **exc_info** (*tuple of str*) – exception info returned by *sys.exc_info()*

```python
pyscaffold.file_system.rm_rf(path, pretend=False)
```

Remove path by all means like `rm -rf` in Linux

```python
pyscaffold.file_system.tmpfile(**kwargs)
```

Context manager that yields a temporary Path

### 12.1.9 *pyscaffold.identification* module

Internal library for manipulating, creating and dealing with names, or more generally identifiers.

```python
pyscaffold.identification.dasherize(word)
```

Replace underscores with dashes in the string.

Example:

```python
>>> dasherize("foo_bar")
"foo-bar"
```

Parameters

- **word** (*str*) – input word

Returns

input word with underscores replaced by dashes

```python
pyscaffold.identification.deterministic_name(obj)
```

Private API that returns a string that can be used to deterministically deduplicate and sort sequences of objects.

```python
pyscaffold.identification.deterministic_sort(sequence)
```

Private API that order a sequence of objects lexicographically (by *deterministic_name*), removing duplicates, which is needed for determinism.

The main purpose of this function is to deterministically sort a sequence of PyScaffold extensions (it will also sort internal extensions before external: "pyscaffold.*" < "pyscaffoldext.*").

```python
pyscaffold.identification.get_id(function)
```

Given a function, calculate its identifier.

A identifier is a string in the format `<module name>:<function name>`, similarly to the convention used for `setuptools` entry points.

**Note:** This function does not return a Python 3 __qualname__ equivalent. If the function is nested inside another function or class, the parent name is ignored.

Parameters

- **function** (*callable*) – function object
pyscaffold.identification.is_valid_identifier(string)

Check if string is a valid package name

Parameters

string – package name

Returns

True if string is valid package name else False

pyscaffold.identification.levenshtein(s1, s2)

Calculate the Levenshtein distance between two strings

Parameters

• s1 – first string
• s2 – second string

Returns

Distance between s1 and s2

pyscaffold.identification.make_valid_identifier(string)

Try to make a valid package name identifier from a string

Parameters

string – invalid package name

Returns

Valid package name as string or RuntimeError

Raises

InvalidIdentifier – raised if identifier can not be converted

pyscaffold.identification.underscore(word)

Convert CamelCasedStrings or dasherized-strings into underscore_strings.

Example:

```python
>>> underscore("FooBar-foo")
"foo_bar_foo"
```

12.1.10 pyscaffold.info module

Provide general information about the system, user and the package itself.

pyscaffold.info.CONFIG_FILE = 'default.cfg'

PyScaffold's own config file name

class pyscaffold.info.GitEnv(value)

Bases: Enum

An enumeration.

author_date = 'GIT_AUTHOR_DATE'

author_email = 'GIT_AUTHOR_EMAIL'

author_name = 'GIT_AUTHOR_NAME'

committer_date = 'GIT_COMMITTER_DATE'
committer_email = 'GIT_COMMITTER_EMAIL'
committer_name = 'GIT_COMMITTER_NAME'
pyscaffold.info.RAISE_EXCEPTION = default.RAISE_EXCEPTION
   When no default value is passed, an exception should be raised
pyscaffold.info.best_fit_license(txt)
   Finds proper license name for the license defined in txt
pyscaffold.info.check_git()
   Checks for git and raises appropriate exception if not
   Raises
      • GitNotInstalled – when git command is not available
      • GitNotConfigured – when git does not know user information
pyscaffold.info.config_dir(prog=pyscaffold, org=None, default=default.RAISE_EXCEPTION)
   Finds the correct place where to read/write configurations for the given app.
   Parameters
      • prog – program name (defaults to pyscaffold)
      • org – organisation/author name (defaults to the same as prog)
      • default – default value to return if an exception was raise while trying to find the config dir. If no default value is passed, an ImpossibleToFindConfigDir execution is raised.
   Please notice even if the directory doesn’t exist, if its path is possible to calculate, this function will return a Path object (that can be used to create the directory)
   Returns
      Location somewhere in the user’s home directory where to put the configs.
pyscaffold.info.config_file(name='default.cfg', prog=pyscaffold, org=None, default=default.RAISE_EXCEPTION)
   Finds a file inside config_dir.
   Parameters
      name – file you are looking for
   The other args are the same as in config_dir and have the same meaning.
   Returns
      Location of the config file or default if an error happened.
pyscaffold.info.email()
   Retrieve the user's email
pyscaffold.info.get_curr_version(project_path)
   Retrieves the PyScaffold version that put up the scaffold
   Parameters
      project_path – path to project
   Returns
      version specifier
   Return type
      Version
pyscaffold.info.is_git_configured()  
Check first git environment variables, then config settings. This will also return false if git is not available at all.

    Returns  
    True if it is set globally, False otherwise

pyscaffold.info.is_git_installed()  
Check if git is installed

pyscaffold.info.is_git_workspace_clean(path)  
Checks if git workspace is clean

    Parameters  
    path – path to git repository

    Raises:  
    GitNotInstalled: when git command is not available  
    GitNotConfigured: when git does not know user information

pyscaffold.info.project(opts, config_path=None, config_file=None)  
Update user options with the options of an existing config file

    Parameters  
    • opts – options of the project  
    • config_path – path where config file can be found (default: opts["project_path"])  
    • config_file – if config_path is a directory, name of the config file, relative to it (default: setup.cfg)

    Returns  
    Options with updated values

    Raises  
    • PyScaffoldTooOld – when PyScaffold is to old to update from  
    • NoPyScaffoldProject – when project was not generated with PyScaffold

pyscaffold.info.read_pyproject(path, filename="pyproject.toml")  
Reads-in a configuration file that follows a pyproject.toml format.

    Parameters  
    • path – path where to find the config file  
    • filename – if path is a directory, name will be considered a file relative to path to read (default: setup.cfg)

    Returns  
    Object that can be used to read/edit configuration parameters.

pyscaffold.info.read_setupcfg(path, filename="setup.cfg")  
Reads-in a configuration file that follows a setup.cfg format. Useful for retrieving stored information (e.g. during updates)

    Parameters  
    • path – path where to find the config file  
    • filename – if path is a directory, name will be considered a file relative to path to read (default: setup.cfg)
Returns
Object that can be used to read/edit configuration parameters.

```
pyscaffold.info.username()
```
Retrieve the user’s name

### 12.1.11 pyscaffold.log module

Custom logging infrastructure to provide execution information for the user.

```
class pyscaffold.log.ColoredReportFormatter(fmt=None, datefmt=None, style='\x1b[38m\x1b[1m\x1b[0m', validate=True):
    ACTIVITY_MAXLEN = 12
    CONTEXT_PREFIX = '\x1b[35m\x1b[1mfrom\x1b[0m'
    LOG_STYLES = {'.critical': ('red', 'bold'), '.debug': ('green',), '.error': ('red',), '.info': ('blue',), '.warning': ('yellow',)}
    SUBJECT_STYLES = {'.invoke': ('blue',)}
    TARGET_MAXLEN = 12
    TARGET_PREFIX = '\x1b[35m\x1b[1mtoto\x1b[0m'

    def format(self, record):
        return ' '.join((self.format_activity(activity) for activity in record['activities']) + self.format_default(record))

    def format_activity(activity):
        return activity

    def format_default(record):
        return record

    def format_subject(subject, activity=None):
        return subject

    def create_padding(self, activity):
        return SPACING

    def create_activity(self, activity):
        return activity

    def create_subject(self, subject, activity=None):
        return subject

    def create_logger_name(self, activity):
        return self.DEFAULT_LOGGER

    def create_target(self, activity):
        return target
```

Bases: `ReportFormatter`

Format logs with ANSI colors.

```
ACTIVITY_STYLES = {'create': ('green', 'bold'), 'delete': ('red', 'bold'),
                   'invoke': ('green', 'bold'), 'move': ('green', 'bold'),
                   'remove': ('red', 'bold'), 'run':
                   ('magenta', 'bold'), 'skip': ('yellow', 'bold')}
```

```
CONTEXT_PREFIX = '\x1b[35m\x1b[1mfrom\x1b[0m'
```

```
LOG_STYLES = {'.critical': ('red', 'bold'), '.debug': ('green',), '.error':
              ('red',), '.info': ('blue',), '.warning': ('yellow',)}
```

```
SUBJECT_STYLES = {'.invoke': ('blue',)}
```

```
TARGET_PREFIX = '\x1b[35m\x1b[1mtoto\x1b[0m'
```

```
format_activity(activity)
```
Format the activity keyword.

```
format_default(record)
```
Format default log messages.

```
format_subject(subject, activity=None)
```
Format the subject of the activity.

```
pyscaffold.log.DEFAULTLOGGER = 'pyscaffold.log'
```
Name of PyScaffold’s default logger (it can be used with `logging.getLogger`

```
class pyscaffold.log.ReportFormatter(fmt=None, datefmt=None, style='\x1b[38m\x1b[1m\x1b[0m',
```

Bases: `Formatter`

Formatter that understands custom fields in the log record.

```
ACTIVITY_MAXLEN = 12
CONTEXT_PREFIX = 'from'
SPACING = '
TARGET_MAXLEN = 12
TARGET_PREFIX = 'to'
create_padding(activity)
    Create the appropriate padding in order to align activities.
format(record)
    Compose message when a record with report information is given.
```

12.1. pyscaffold package
format_activity(activity)
Format the activity keyword.

format_context(context, _activity=None)
Format extra information about the activity context.

format_default(record)
Format default log messages.

format_path(path)
Simplify paths to avoid wasting space in terminal.

format_report(record)
Compose message when a custom record is given.

format_subject(subject, _activity=None)
Format the subject of the activity.

format_target(target, _activity=None)
Format extra information about the activity target.

class pyscaffold.log.ReportLogger(logger=None, handler=None, formatter=None, extra=None, propagate=False)
Bases: LoggerAdapter

Suitable wrapper for PyScaffold CLI interactive execution reports.

Parameters

- **logger** ([logging.Logger](https://docs.python.org/3/library/logging.html#logging.Logger)) – custom logger to be used. Optional: the default logger will be used.
- **formatter** ([logging.Formatter](https://docs.python.org/3/library/logging.html#logging.Formatter)) – custom formatter to be used. Optional: by default a [ReportFormatter](https://docs.python.org/3/library/logging.html#logging.Formatter) is created and used.
- **extra** ([dict](https://docs.python.org/3/library/types.html#dict)) – extra attributes to be merged into the log record. Options, empty by default.
- **propagate** ([bool](https://docs.python.org/3/library/types.html#bool)) – whether or not to propagate messages in the logging hierarchy, False by default. See [logging.Logger.propagate](https://docs.python.org/3/library/logging.html#logging.Logger.propagate).

**nesting**

current nesting level of the report.

**copy()**

Produce a copy of the wrapped logger.

Sometimes, it is better to make a copy of the report logger to keep indentation consistent.

**property formatter**

Formatter configured in the default handler

**property handler**

Stream handler configured for providing user feedback in PyScaffold CLI

**indent(count=1)**

Temporarily adjust padding while executing a context.
Example

```python
from pyscaffold.log import logger

logger.report("invoke", "custom_action")
with logger.indent():
    logger.report("create", "some/file/path")

# Expected logs:
# --------------------------------------
# invoke custom_action
# create some/file/path
# --------------------------------------
# Note how the spacing between activity and subject in the
# second entry is greater than the equivalent in the first one.
```

Note: This method is not thread-safe and should be used with care.

**property level**

Effective level of the logger

**process**(msg, kwargs)

Method overridden to augment LogRecord with the *nesting* attribute

**property propagate**

Whether or not to propagate messages in the logging hierarchy, See *logging.Logger.propagate*.

**reconfigure**(opts=None, **kwargs)

Reconfigure some aspects of the logger object.

Parameters

- **opts**(dict) – dict with the same elements as the keyword arguments below

Keyword Arguments

- **log_level** – One of the log levels specified in the *logging* module.

- **use_colors** – automatically set a colored formatter to the logger if ANSI codes support is detected. (Defaults to *True*).

Additional keyword arguments will be ignored.

**report**(activity, subject, context=None, target=None, nesting=None, level=20)

Log that an activity has occurred during scaffold.

Parameters

- **activity**(str) – usually a verb or command, e.g. create, invoke, run, chdir...

- **subject**(str or *os.PathLike*) – usually a path in the file system or an action identifier.

- **context**(str or *os.PathLike*) – path where the activity take place.

- **target**(str or *os.PathLike*) – path affected by the activity

- **nesting**(int) – optional nesting level. By default it is calculated from the activity name.

- **level**(int) – log level. Defaults to *logging.INFO*. See *logging* for more information.
**Notes**

This method creates a custom log record, with additional fields: `activity`, `subject`, `context`, `target` and `nesting`, but an empty `msg` field. The `ReportFormatter` creates the log message from the other fields.

Often `target` and `context` complement the logs when `subject` does not hold all the necessary information. For example:

```python
logger.report('copy', 'my/file', target='my/awesome/path')
logger.report('run', 'command', context='current/working/dir')
```

**property wrapped**

Underlying logger object

```python
pyscaffold.log.logger = <ReportLogger pyscaffold.log (WARNING)>
```

Default logger configured for PyScaffold.

### 12.1.12 pyscaffold.operations module

Collection of functions responsible for the “reification” of the file representation in the project structure into a file written to the disk.

A function that “reifies” a file (manifests the programmatic representation of the file in the project structure dictionary to the disk) is called here a **file operation** or simply a **file op**. Actually file ops don’t even need to be functions strictly speaking, they can be any **callable** object. The only restriction is that file ops **MUST** respect the `FileOp` signature. The `create` function is a good example of how to write a new file op.

A function (or callable) that modifies the behaviour of an existing file op, by wrapping it with another function/callable is called here **modifier**. Modifiers work similarly to Python **decorators** and allow extending/refining the existing file ops. A modifier should receive a file op as argument and return another file op. `no_overwrite` and `skip_on_update` are good examples on how to write new file op modifiers.

While modifiers don’t have a specific signature (the number of parameters might vary, but they always return a single file op value), the following conventions **SHOULD** be observed when creating new modifiers:

- Modifiers should accept at least one argument: the **file op** they modify (you don’t have to be very creative, go ahead and name this parameter `file_op`, it is a good convention). This parameter should be made **optional** (the default value of `create` usually works, unless there is a better default value for the main use case of the modifier).
- Modifiers can accept arguments other then the file op they modify. These arguments should **precede** the file op in the list of arguments (the file op should be the last argument, which interoperates well with `partial`).
- When writing a modifier that happens to be a function (instead of a callable class), please name the inner function with the same name of the modifier but preceded by an `_` (underscore) char. This allows better inspection/debugging.

Changed in version 4.0: Previously, file operations where simply indicated as a numeric flag (the members of `pyscaffold.structure.FileOp`) in the project structure. Starting from PyScaffold 4, file operation are functions with signature given by `FileOp`.

**pyscaffold.operations.FileContents**

When the file content is `None`, the file should not be written to disk (empty files are represented by an empty string `""` as content).

alias of `Optional[str]`
pyscaffold.operations.FileOp

Signature of functions considered file operations:

Callable[[Path, FileContents, ScaffoldOpts], Union[Path, None]]

Parameters

- **path** (*pathlib.Path*) – file path potentially to be written to/changed in the disk.
- **contents** (*FileContents*) – usually a string that represents a text content of the file. *None* indicates the file should not be written.
- **opts** (*ScaffoldOpts*) – a dict with PyScaffold’s options.

Returns

If the file is written (or more generally changed, such as new access permissions), by convention they should return the file path. If no file was touched, *None* should be returned. Please notice a FileOp might return *None* if a pre-existing file in the disk is not modified.

**Note:** A FileOp usually has side effects (e.g. write a file to the disk), see *FileContents* and *ScaffoldOpts* for other conventions.

alias of Callable[[Path, Optional[str], Dict[str, Any]], Optional[Path]]

pyscaffold.operations.ScaffoldOpts

Dictionary with PyScaffold’s options, see *pyscaffold.api.create_project*. Should be treated as immutable (if required, copy before changing).

Please notice some behaviours given by the options SHOULD be observed. For example, files should be overwritten when the *force* option is True. Similarly when *pretend* is True, no operation should be really performed, but any action should be logged as if realized.

alias of Dict[str, Any]

pyscaffold.operations.add_permissions(*permissions, file_op=<function create>*)

File op modifier. Returns a FileOp that will add access permissions to the file (on top of the ones given by default by the OS).

Parameters

- **permissions** (*int*) – permissions to be added to file:

  updated file mode = old mode | permissions (bitwise OR)

  Preferably the values should be a combination of *stat.S_* values (see *os.chmod*).
- **file_op** – a FileOp that will be “decorated”. If the file exists in disk after file_op is called (either created or pre-existing), permissions will be added to it. Default: *create*.

**Warning:** This is an experimental file op and might be subject to incompatible changes (or complete removal) even in minor/patch releases.

**Note:** File access permissions work in a completely different way depending on the operating system. This file op is straightforward on POSIX systems, but a bit tricky on Windows. It should be safe for desirable but
not required effects (e.g. making a file with a shebang executable, but that can also run via python FILE), or ensuring files are readable/writable.

pyscaffold.operations.create(path, contents, opts)
Default FileOp: always create/write the file even during (forced) updates.

pyscaffold.operations.no_overwrite(file_op=<function create>)
File op modifier. Returns a FileOp that does not overwrite an existing file during update (still created if not exists).

Parameters
• file_op – a FileOp that will be “decorated”, i.e. will be called if the no_overwrite conditions are met. Default: create.

pyscaffold.operations.remove(path, _content, opts)
Remove the file if it exists in the disk

pyscaffold.operations.skip_on_update(file_op=<function create>)
File op modifier. Returns a FileOp that will skip the file during a project update (the file will just be created for brand new projects).

Parameters
• file_op – a FileOp that will be “decorated”, i.e. will be called if the skip_on_update conditions are met. Default: create.

12.1.13 pyscaffold.repo module

Functionality for working with a git repository

pyscaffold.repo.add_tag(project, tag_name, message=None, **kwargs)
Add an (annotated) tag to the git repository.

Parameters
• project – path to the project
• tag_name – name of the tag
• message – optional tag message

Additional keyword arguments are passed to the git callable object.

pyscaffold.repo.get_git_root(default=None)
Return the path to the top-level of the git repository or default.

Parameters
• default – if no git root is found, default is returned

Returns
top-level path or default

Return type
str

pyscaffold.repo.git_tree_add(struct, prefix=None, **kwargs)
Adds recursively a directory structure to git

Parameters
• struct – directory structure as dictionary of dictionaries
• **prefix** – prefix for the given directory structure

Additional keyword arguments are passed to the *git* callable object.

**pyscaffold.repo.init_commit_repo**(*project, struct, **kwargs*)

Initialize a git repository

**Parameters**

• **project** – path to the project

• **struct** – directory structure as dictionary of dictionaries

Additional keyword arguments are passed to the *git* callable object.

**pyscaffold.repo.is_git_repo**(*path*)

Check if path is a git repository

### 12.1.14 *pyscaffold.shell* module

Shell commands like git, django-admin etc.

**pyscaffold.shell.EDITORS** = {'atom': ['--wait'], 'code': ['--wait'], 'mate': ['-w'], 'nano': [], 'notepad': [], 'nvim': [], 'sensible-editor': [], 'subl': ['-w'], 'vi': [], 'vim': []}

Programs to be tried (in sequence) when calling *edit* and *get_editor* in the case the environment variables EDITOR and VISUAL are not set.

**class** *pyscaffold.shell.ShellCommand**(command, shell=True, cwd=None)**

Bases: *object*

Shell command that can be called with flags like git('add', 'file')

**Parameters**

• **command** – command to handle

• **shell** – run the command in the shell (True by default).

• **cwd** – current working dir to run the command

The produced command can be called with the following keyword arguments:

• **pretend** (*bool*): skip execution (but log) when pretending. False by default.

The positional arguments are passed to the underlying shell command. In the case the path to the executable contains spaces of any other special shell character, *command* needs to be properly quoted.

**run**(*args, **kwargs*)

Execute command with the given arguments via *subprocess.run*.

**pyscaffold.shell.command_exists**(*cmd*)

Check if command exists

**Parameters**

• **cmd** – executable name

**pyscaffold.shell.edit**(*file, *args, **kwargs*)

Open a text editor and returns back a *Path* to file, after user editing.
pyscaffold.shell.get_command(name, prefix=’/home/docs/checkouts/readthedocs.org/user_builds/pyscaffold/envs/stable’, include_path=True, shell=True, **kwargs)

Similar to get_executable but return an instance of ShellCommand if it is there to be found. Additional kwargs will be passed to the ShellCommand constructor.

pyscaffold.shell.get_editor(**kwargs)

Get an available text editor program.

pyscaffold.shell.get_executable(name, prefix=’/home/docs/checkouts/readthedocs.org/user_builds/pyscaffold/envs/stable’, include_path=True)

Find an executable in the system, if available.

**Parameters**

- **name** – name of the executable
- **prefix** – look on this directory, exclusively or in addition to $PATH depending on the value of include_path. Defaults to sys.prefix.
- **include_path** – when True the functions tries to look in the entire $PATH.

**Note:** The return value might contain whitespaces. If this value is used in a shell environment, it needs to be quote properly to avoid the underlying shell interpreter splitting the executable path.

pyscaffold.shell.get_git_cmd(**args)

Retrieve the git shell command depending on the current platform.

**Parameters**

- **args** – additional keyword arguments to ShellCommand

pyscaffold.shell.git(*args, **kwargs)

Command for git.

pyscaffold.shell.join(parts)

Join different parts of a shell command into a string, quoting whitespaces.

pyscaffold.shell.python = <pyscaffold.shell.ShellCommand object>

Command for python.

pyscaffold.shell.shell_command_error2exit_decorator(func)

Decorator to convert given ShellCommandException to an exit message.

This avoids displaying nasty stack traces to end-users.

### 12.1.15 pyscaffold.structure module

Functionality to generate and work with the directory structure of a project.

Changed in version 4.0: Callable[[dict], str] and string.Template objects can also be used as file contents. They will be called with PyScaffold’s opts (string.Template via safe_substitute).

pyscaffold.structure.AbstractContent

*Recipe* for obtaining file contents.
pyscaffold.structure

- **pyscaffold.package**

12.1. pyscaffold package
The top level keys in the dict are file/dir names relative to the project root, while keys in nested dicts are relative to the parent's key/location.

For example:

```python
from pyscaffold.operations import no_overwrite
struct: Structure = {
    'namespace': {
        'module.py': ('print("Hello World!"), no_overwrite())
    }
}
```

represents a namespace/module.py file inside the project folder with content `print("Hello World!")`, that will be created only if not present.

Note: None file contents are ignored and not created in disk.

### pyscaffold.structure.create_structure(struct, opts, prefix=None)

Manifistics/reifies a directory structure in the filesystem

**Parameters**

- `struct` – directory structure as dictionary of dictionaries
- `opts` – options of the project
- `prefix` – prefix path for the structure

**Returns**

Directory structure as dictionary of dictionaries (similar to input, but only containing the files that actually changed) and input options

**Raises**

- `TypeError` – raised if content type in struct is unknown

**Changed in version 4.0:** Also accepts `string.Template` and `callable` objects as file contents.

### pyscaffold.structure.define_structure(struct, opts)

Creates the project structure as dictionary of dictionaries

**Parameters**

- `struct` – previous directory structure (usually and empty dict)
- `opts` – options of the project

**Returns**

Project structure and PyScaffold’s options

**Changed in version 4.0:** `string.Template` and functions added directly to the file structure.

### pyscaffold.structure.ensure(struct, path, content=None, file_op=<function create>)

Ensures a file exists in the representation of the project tree with the provided content. All the parent directories are automatically created.

**Parameters**
• **struct** – project representation as (possibly) nested.
• **path** – path-like string or object relative to the structure root. See **modify**.

Changed in version 4.0: The function no longer accepts a list of strings of path parts.

• **content** – file text contents, **None** by default. The old content is preserved if **None**.
• **file_op** – see **pyscaffold.operations, create** by default.

Changed in version 4.0: Instead of a **update_rule** flag, the function now accepts a **file_op**.

**Returns**
Updated project tree representation

---

**Note:** Use an empty string as content to ensure a file is created empty.

**pyscaffold.structure.merge**(old, new)

Merge two dict representations for the directory structure.

Basically a deep dictionary merge, except from the leaf update method.

**Parameters**

• **old** – directory descriptor that takes low precedence during the merge.
• **new** – directory descriptor that takes high precedence during the merge.

Changed in version 4.0: Project structure now considers everything **under** the top level project folder.

**Returns**
Resulting merged directory representation

---

**Note:** Use an empty string as content to ensure a file is created empty. (**None** contents will not be created).

**pyscaffold.structure.modify**(struct, path, modifier)

Modify the contents of a file in the representation of the project tree.

If the given path does not exist, the parent directories are automatically created.

**Parameters**

• **struct** – project representation as (possibly) nested dict. See **merge**.

• **path** – path-like string or object relative to the structure root. The following examples are equivalent:

```python
from pathlib import Path
'docs/api/index.html'
Path('docs', 'api', 'index.html')
```

Changed in version 4.0: The function no longer accepts a list of strings of path parts.

• **modifier** – function (or callable object) that receives the old content and the old file operation as arguments and returns a tuple with the new content and new file operation. Note that, if the file does not exist in **struct**, **None** will be passed as argument. Example:

```python
modifier = lambda old, op: ((old or '') + 'APPENDED CONTENT!', op)
modifier = lambda old, op: ('PREPENDED CONTENT!' + (old or ''), op)
```
Changed in version 4.0: modifier requires 2 arguments and now is a mandatory argument.

Changed in version 4.0: update_rule is no longer an argument. Instead the arity modifier was changed to accept 2 arguments instead of only 1. This is more suitable to handling the new `pyscaffold.operations` API.

**Returns**

Updated project tree representation

**Note:** Use an empty string as content to ensure a file is created empty (None contents will not be created).

```python
pyscaffold.structure.reify_content(content, opts)
```

Make sure content is string (calling `__call__()` or `safe_substitute()` with opts if necessary)

```python
pyscaffold.structure.reify_leaf(contents, opts)
```

Similar to `resolve_leaf` but applies `reify_content` to the first element of the returned tuple.

```python
pyscaffold.structure.reject(struct, path)
```

Remove a file from the project tree representation if existent.

**Parameters**

- `struct` – project representation as (possibly) nested.
- `path` – path-like string or object relative to the structure root. See `modify`.

Changed in version 4.0: The function no longer accepts a list of strings of path parts.

**Returns**

Modified project tree representation

```python
pyscaffold.structure.resolve_leaf(contents)
```

Normalize project structure leaf to be a Tuple[AbstractContent, FileOp]

### 12.1.16 pyscaffold.termui module

Basic support for ANSI code formatting.

```python
```

Possible styles for `decorate`

```python
pyscaffold.termui.SYSTEM_SUPPORTS_COLOR = True
```

Handy indicator of the system capabilities (relies on colorama if available)

```python
pyscaffold.termui.curses_available()
```

Check if the curses package from stdlib is available.

Usually not available for windows, but its presence indicates that the terminal is capable of displaying some UI.

**Returns**

result of check

**Return type**

`bool`
pyscaffold.termui.decorate(msg, *styles)

Use ANSI codes to format the message.

Parameters
- **msg** (str) – string to be formatted
- ***styles** (list) – the remaining arguments should be strings that represent the 8 basic ANSI colors. clear and bold are also supported. For background colors use on_<color>.

Returns
styled and formatted message

Return type
str

pyscaffold.termui.init_colorama()

Initialize colorama if it is available.

Returns
result of check

Return type
bool

pyscaffold.termui.isatty(stream=None)

Detect if the given stream/stdout is part of an interactive terminal.

Parameters
- **stream** – optionally the stream to check

Returns
result of check

Return type
bool

pyscaffold.termui.supports_color(stream=None)

Check if the stream is supposed to handle coloring.

Returns
result of check

Return type
bool

12.1.17 pyscaffold.toml module

Thin wrapper around the dependency so we can maintain some stability while being able to swap implementations (e.g. replace tomlkit with toml).

Despite being used in pep517, toml offers limited support for comments, so we prefer tomlkit.

pyscaffold.toml.TOMLMapping

Abstraction on the value returned by loads.

This kind of object ideally should present a dict-like interface and be able to preserve the formatting and comments of the original TOML file.

alias of MutableMapping
pyscaffold.toml.dumps(obj)
    Serialize a dict-like object into a TOML str. If the object was generated via loads, then the style will be preserved.

pyscaffold.toml.loads(text)
    Parse a string containing TOML into a dict-like object, preserving style somehow.

pyscaffold.toml.setdefault(obj, key, value)
    tomlkit seems to be tricky to use together with setdefault, this function is a workaround for that.
    When key is string containing '.', it will perform a nested setdefault.

**12.1.18 pyscaffold.update module**

Functionality to update one PyScaffold version to another

pyscaffold.update.ALWAYS = VersionUpdate.ALWAYS
    Perform the update action regardless of the version

pyscaffold.update.add_dependencies(setupcfg, opts)
    Add dependencies

pyscaffold.update.add_entrypoints(setupcfg, opts)
    Add [options.entry_points] to setup.cfg

pyscaffold.update.handover_setup_requires(setupcfg, opts)
    When paired with update_pyproject_toml, this will transfer setup.cfg :: options.setup_requires
to pyproject.toml :: build-system.requires

pyscaffold.update.replace_find_with_find_namespace(setupcfg, opts)

pyscaffold.update.update_pyproject_toml(struct, opts)
    Update old pyproject.toml generated by pyscaffoldext-pyproject and import setup_requires from update_setup_cfg into build-system.requires.

pyscaffold.update.update_setup_cfg(setupcfg, opts)
    Update pyscaffold in setupcfg and ensure some values are there as expected

pyscaffold.update.version_migration(struct, opts)
    Update projects that were generated with old versions of PyScaffold

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