A Potted History of Python Packaging

(Or how we got to Pipenv)

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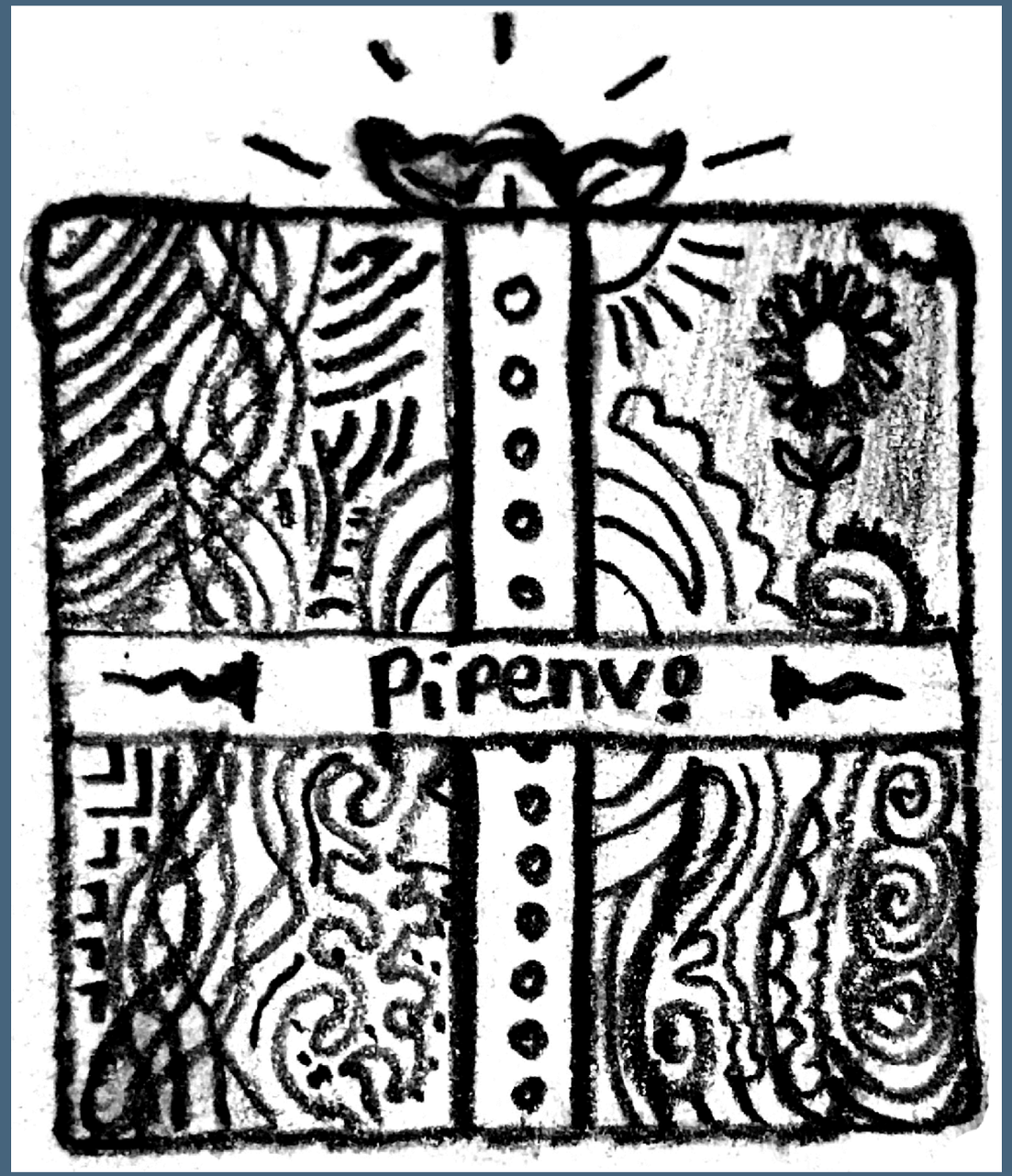


Star 14,671

Pipenv is a production-ready tool that aims to bring the best of all packaging worlds to the Python world. It harnesses Pipfile, pip, and virtualenv into one single command.

It features very pretty terminal colors.

Stay Informed

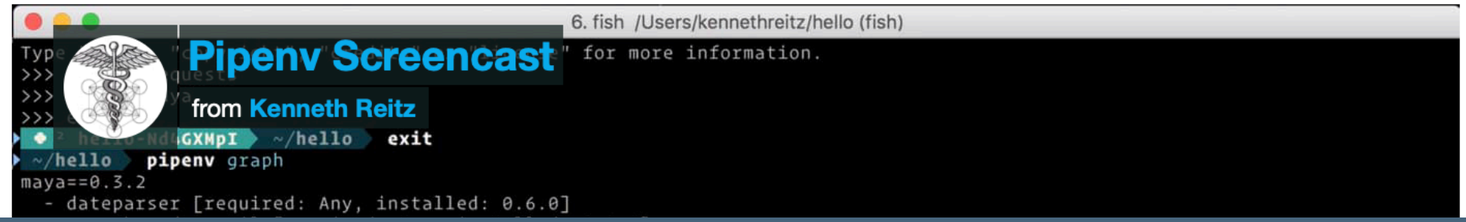
Pipenv: Python Dev Workflow for Humans

pypi v2018.11.14 | license MIT | python 2.7 | 3.4 | 3.5 | 3.6 | 3.7 | Say Thanks!

Pipenv is a tool that aims to bring the best of all packaging worlds (bundler, composer, npm, cargo, yarn, etc.) to the Python world. *Windows is a first-class citizen, in our world.*

It automatically creates and manages a virtualenv for your projects, as well as adds/removes packages from your `Pipfile` as you install/uninstall packages. It also generates the ever-important `Pipfile.lock`, which is used to produce deterministic builds.

Pipenv is primarily meant to provide users and developers of applications with an easy method to setup a working environment. For the distinction between libraries and applications and the usage of `setup.py` vs `Pipfile` to define dependencies, see ✟ Pipfile vs setup.py.



Timeline: Python Packaging

(In the wrong order and omitting bits to suit my narrative.)

(Mostly based on git or svn commit logs.)

Problems We Need to Solve in 1995

- We need to distribute python libraries
- We need to find and install libraries (we have newsgroups!)
- We need to specify dependencies for a project (we don't know we need to do this yet)
- We clobber packages in the system (we don't know this is a bad thing yet)
- We need to use the latest and greatest versions of dependencies (sensibly)
- We need to stay sane

1995: cp -r

```
cp somemodule.py myapp
cd myapp
python main.py
```

- Simple, works for most cases
- Pretty close to how I've built apps to ship to someone's desktop
- Advanced: cp -r
- Super advanced: python path .pth files

1998: distutils

In the beginning there was setup.py

(Well, there was Greg Ward in December 1998.)

— For packaging libraries, not so good for apps
— No dependency management
— Installs into python's `site-packages`

distutils example

```
from distutils.core import setup
setup(name="my_package", version="1.0", ...)

$ unzip my_package-1.0.zip
$ cd my_package-1.0
$ python setup.py install
```

2002: pypi

Python Package Index (also known as the cheeseshop). Started by Richard Jones.

- Provided official central index to find python packages.
- First sprint in 2003 held on table beside the pypy project, very confusing (pypi and pypy)
- Original code derived from Roundup (the bug tracking tool used by Python)
- Still had to download and install packages manually
- Partially inspired by sites like freshmeat.net (really)

Jikes 1.18

by cabbey - Friday, November 22nd 2002 01:16 EST

About: Jikes is a fast, simple, source code to byte code compiler that emphasizes strict adherence to the Java language definition. It is a high-quality tool that will help developers quickly create Java applications.

Changes: This release contains a handfull of bugfixes, including fixing some segfaults and regressions. It also introduces an entirely new error reporting scheme to allow new error messages to be added much faster, and is also more robust when syntax errors are encountered in the source.

Categories	Focus	License	URLs
Software Development :: Compilers	Minor bugfixes	IBM Public License	

Tk LaTeX Editor 0.2.4

2004/2005: Setuptools, eggs and easy_install

- Created by Phillip J Eby
- setuptools attempted many new ideas, some big improvements on distutils (`find_packages()`!)
- easy_install used parsing of pypi HTML to find and install dependencies
- eggs created to act like java jars for python. Current iteration of this idea are wheels. (AFAIK it's snake eggs and cheese wheels)
- Introduced dependencies specified in setup.py (including the `Django >= 1.2` syntax)

2007: virtualenv

Exploited a neat trick: python looks for its libraries relative to the python binary. Could create symlinks from a copy of python back to system, creating an independent python install. Also created by Ian Bicking.

```
$ python -m venv /tmp/myenv
$ find /tmp/myenv
/tmp/myenv/bin/python3.7
/tmp/myenv/bin/activate
...
/tmp/myenv/lib/python3.7/site-packages/
$ . /tmp/myenv/bin/activate
$ which python
/tmp/myenv/bin/python
$ pip list
pip        10.0.1
setuptools 39.0.1
```

2008: pip

Built on setuptools work to give us way to download and install packages. Previously called pyinstall. Started by Ian Bicking

```
$ pip install 'django<2.0'
Collecting django<2.0
  Downloading https://files.pythonhosted.org/packages/44/e7/872bbf76aa16b7a061698d75325dac023285db33db4bda8ba8fe5d3bb356/Django-1.11.16-py2.py3-none-any.whl (7.0MB)
    100% |████████████████████████████████| 7.0MB 3.3MB/s
Collecting pytz (from django<2.0)
  Downloading https://files.pythonhosted.org/packages/f8/0e/2365ddc010afb3d79147f1dd544e5ee24bf4ece58ab99b16fbb465ce6dc0/pytz-2018.7-py2.py3-none-any.whl (506kB)
    100% |████████████████████████████████| 512kB 10.3MB/s
Installing collected packages: pytz, django
Successfully installed django-1.11.16 pytz-2018.7
```

pip bonus: uninstall

(easy_install did this too.)

```
$ pip uninstall django pytz
Uninstalling Django-1.11.16:
  Would remove:
    /usr/bin/django-admin
    /usr/bin/django-admin.py
    /usr/lib/python3.7/site-packages/Django-1.11.16.dist-info/*
    /usr/lib/python3.7/site-packages/django/*
Proceed (y/n)? y
  Successfully uninstalled Django-1.11.16
Uninstalling pytz-2018.7:
  Would remove:
    /usr/lib/python3.7/site-packages/pytz-2018.7.dist-info/*
    /usr/lib/python3.7/site-packages/pytz/*
Proceed (y/n)? y
  Successfully uninstalled pytz-2018.7
```

pip requirements.txt

Gave us way to specify dependencies in a project (woo!)

```
Django==1.11.16
pytz==2018.7
```

```
$ pip install -r requirements.txt
Collecting Django==1.11.16 (from -r /tmp/requirements.txt (line 1))
  Using cached https://files.pythonhosted.org/packages/44/e7/872bbf76aa16b7a061698d75325dac023285db33db4bda8ba8fe5d3bb356/Django-1.11.16-py2.py3-none-any.whl
Collecting pytz==2018.7 (from -r /tmp/requirements.txt (line 2))
  Using cached https://files.pythonhosted.org/packages/f8/0e/2365ddc010afb3d79147f1dd544e5ee24bf4ece58ab99b16fbb465ce6dc0/pytz-2018.7-py2.py3-none-any.whl
Installing collected packages: pytz, Django
Successfully installed Django-1.11.16 pytz-2018.7
```

So far

— We've solved distributing python libraries
— We've solved finding and installing libraries
— We've solved specifying dependencies for a project
— We've solved clobbering system python

Done?
Python development is perfect?

Kinda

- `requirements.txt` a little fiddly to manage
  - `django==2.0.1` is better than `django>1.0` or even `django`
  - How do we update? e.g. `pip-tools` partially solves
- Each project has to figure out how to manage virtualenvs
  - Some impose patterns which are hard for some people to work with
- Security is opt in
- Lots of rough edges which required working around in large projects

2011: distribute

— Phillip Eby had largely discontinued development of setuptools and easy_install at this point

— Python packaging efforts had somewhat stalled

— NPM, Gems and friends were doing cools stuff

— Tarek Ziadé forked setuptools to reinvigorate project

2011: pypa

— Python Packaging Authority formed to take over maintenance of python packaging

— Works hard to update python packaging infrastructure (including pypi itself) from 2011 through to today

— Made the critical mistake of not picking "Ministry of Installation" as their name

2017: pipenv

- Computer science solution: Add another layer of abstraction
- Handles pip and virtualenv for you
- Handles both high level dependencies (`Pipfile`) and specific versions (`Pipfile.lock`)
- More secure by default
- Nice little snake emoji
- And more!
- Started by Kenneth Reitz

```
$ pipenv install Flask
Creating a Pipfile for this project…
Installing Flask…
Adding Flask to Pipfile's [packages]…
✓ Installation Succeeded
Pipfile.lock not found, creating…
Locking [dev-packages] dependencies…
Locking [packages] dependencies…
✓ Success!
Updated Pipfile.lock (662286)!
Installing dependencies from Pipfile.lock (662286)…
  🐍   ████████████████████████████████████████ 6/6 — 00:00:01
```

Pipfile

```
[[source]]
name = "pypi"
url = "https://pypi.org/simple"
verify_ssl = true

[dev-packages]

[packages]
flask = "*"

[requires]
python_version = "3.7"
```

Pipfile.lock


```
{
    "_meta": {
        "hash": {
            "sha256": "a82b674d67d29678775ff6b773de1686a9593749ec14483b0d8e05131b662286"
        },
        "pipfile-spec": 6,
        "requires": {
            "python_version": "3.7"
        },
        "sources": [
            {
                "name": "pypi",
                "url": "https://pypi.org/simple",
                "verify_ssl": true
            }
        ]
    },
    "default": {
        "click": {
            "hashes": [
                "sha256:2335065e6395b9e67ca716de5f7526736bfa6ceead690adf616d925bdc622b13",
            ],
            "version": "==7.0"
        },
        "flask": { ... },
        ...
    },
    "develop": {}
}
```

Bonus: Security Checks

```
$ pipenv check
Checking PEP 508 requirements…
Passed!
Checking installed package safety…
All good!
```

Bonus: .env

```
$ cat .env
DB_SECRET_PASSWORD=sekret

$ pipenv shell --fancy
Loading .env environment variables…
Creating a virtualenv for this project…
Pipfile: /Users/michael/Dropbox/2018/Presentations/2018-11_PyLadies_Dublin_pipenv/demos/flask/Pipfile
Using /usr/local/bin/python3 (3.7.1) to create virtualenv…
✓ Complete
Using base prefix '/usr/local/Cellar/python/3.7.1/Frameworks/Python.framework/Versions/3.7'
New python executable in /Users/michael/.local/share/virtualenvs/flask-xL7FF9jX/bin/python3.7
Also creating executable in /Users/michael/.local/share/virtualenvs/flask-xL7FF9jX/bin/python
Installing setuptools, pip, wheel...
done.
Running virtualenv with interpreter /usr/local/bin/python3
Virtualenv location: /Users/michael/.local/share/virtualenvs/flask-xL7FF9jX
Launching subshell in virtual environment…

$ env | grep SECRET
DB_SECRET_PASSWORD=sekret
```

Bonus: pyenv

Free yourself from the tyranny of system python installs! (Not pipenv related but works well with pipenv.)

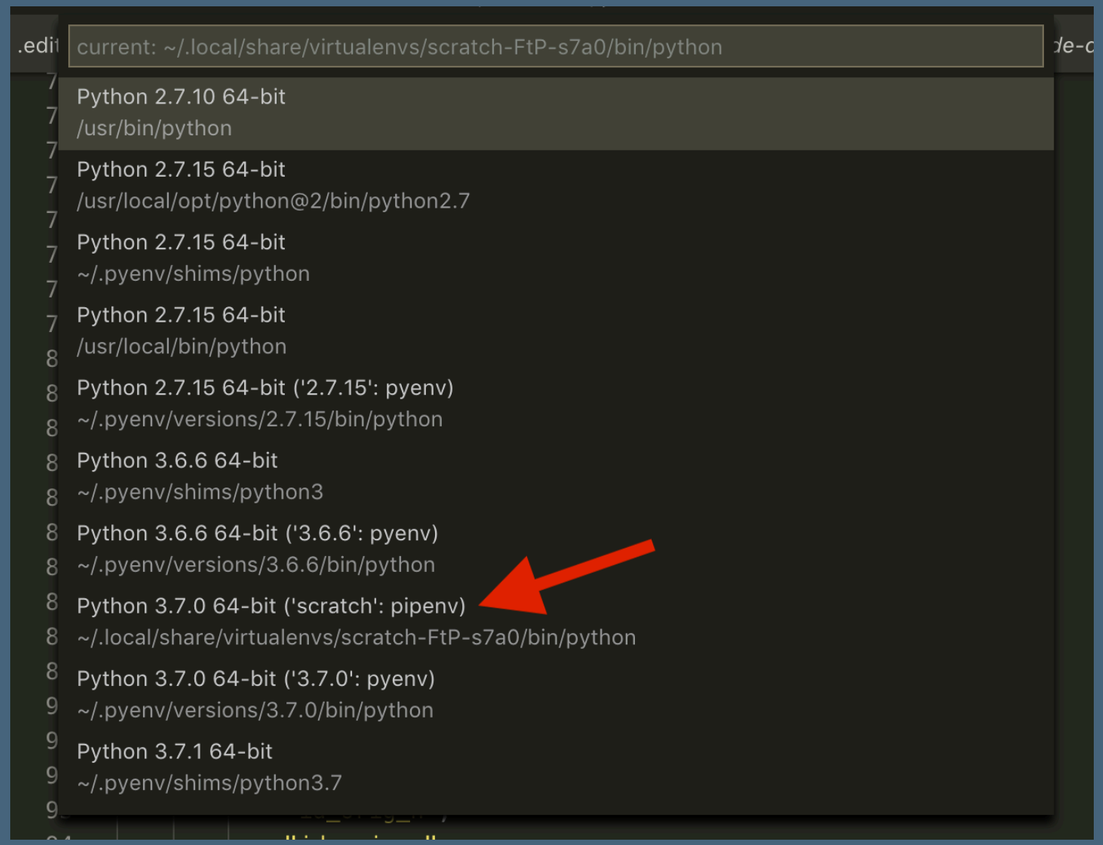
```
$ echo $PYENV_ROOT
/Users/michael/.pyenv

$ ls $PYENV_ROOT/versions/
2.7.15         3.6.6          3.7.0          3.7.1

$ pipenv install --python 3.6 flask
Creating a virtualenv for this project…
Pipfile: /private/tmp/old/Pipfile
Using /Users/michael/.pyenv/versions/3.6.6/bin/python3 (3.6.6) to create virtualenv…
✓ Complete
...
Updated Pipfile.lock (8a3288)!
Installing dependencies from Pipfile.lock (8a3288)…
  🐍   ▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉▉ 6/6 — 00:00:01
To activate this project's virtualenv, run pipenv shell.
Alternatively, run a command inside the virtualenv with pipenv run.
```

Bonus: Native Visual Studio Code Support

Autodetects Pipfile and loads correct virtualenv



Bonus: Stores Virtualenvs Outside of Source

— Keeps your source directory small

— Keep your source in Dropbox but don't pay for your libs :)

```
$ ls -a
.env                Pipfile             Pipfile.lock     flask_example.py

$ du -shc .
 16K    .
 16K    total

$ du -shc (pipenv --venv)
 11M    /Users/michael/.local/share/virtualenvs/flask-xL7FF9jX
 11M    total
```

Links

— This Talk - https://github.com/micktwomey/2019-03_PyCon_Limerick_pipenv

— pipenv - https://pipenv.readthedocs.io/en/latest/

— python packaging guide - https://packaging.python.org/

— pyenv - https://github.com/pyenv/pyenv

— Hitchiker's Guide to Python - https://docs.python-guide.org/