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Jan 10, 2023

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Part I

Foreword

Loosely structured bits of knowledge

Selected chapters

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Part II

Python

CHAPTER

ONE

PYTHON PACKAGE DATA

Further down is a minimal example showing how to achieve both:

- packaging a data file `file.src` in `sdist` only;
- and packaging another data file `file.bin` in `bdist` only;
- additionally it shows how `file.all` is packaged in both distribution packages and `file.not` in none of them.

`file.bin` and built files

Files such as `file.bin` are not in the original source code of the project (i.e. not in the *git* source code repository for example) but should still be installed. Typically these files are created during a build step such as `./setup.py build` for example (think `gettext` `*.mo` messages catalogs).

The gist of it is:

- first and foremost, always thoroughly clean up the working directory between two packaging attempts while tweaking these packaging options (in particular empty the `src/Thing.egg-info` directory containing the `SOURCES.txt` file as well as the `build`, and `dist` directories) or the results will be inconsistent;
- set the `include_package_data` option to `True`;
- `file.all` and files that belong in both `sdist` and `bdist` are specified in `MANIFEST.in`;
- `file.bin` and files that belong in `bdist` only are specified in `package_data`;
- `file.src` and files that belong in `sdist` only are specified in both `MANIFEST.in` and `exclude_package_data`;
- `file.not` and files that do not belong in any distribution package are not specified anywhere.

The directory structure for our example:

```
.
├ MANIFEST.in
├ setup.py
└ src
    └ thing
        ├ __init__.py
        └ data
            ├ file.all
            ├ file.bin
            ├ file.not
            └ file.src
```

In `MANIFEST.in`:

```
recursive-include src/thing *.all
recursive-include src/thing *.src
```

In `setup.py`:

```
#!/usr/bin/env python3

import setuptools

setuptools.setup(
    exclude_package_data={'thing': ['data/*.src']},
    include_package_data=True,
    package_data={'thing': ['data/*.bin']},
    #
    name='Thing',
    version='1.0.0',
    #
    package_dir={'': 'src'},
    packages=setuptools.find_packages(where='src'),
)
```

This has been tested with:

- Python 3.6.7
- setuptools 39.0.1
- wheel 0.33.1

CHAPTER

TWO

PYTHON PACKAGING

2.1 Introduction

About proper packaging of Python projects…

2.2 Terminology

2.2.1 Module

Commonly a Python file (`mymodule.py`). Multiple Python modules are usually gathered in a Python package.

2.2.2 Package

Confusion #1: *Import package* vs. *distribution package*

One of the biggest confusion in the Python packaging terminology is around the meaning of the term *package*. Sometimes the terms *import package* and *distribution package* are used to clarify this.

It is sometimes named *import package*, as opposed to *distribution package* (see below).

A Python package is a directory containing one or more Python modules.

While it used to be mandatory, in more recent versions of Python a *package initializer* (the `__init__.py` module) is not strictly necessary to make an importable package out of a directory.

It is possible for a package to contain other sub-packages in a tree-like structure. The outermost package is then called the *top-level package*.

2.2.3 Project

A Python project is usually a collection of code (and sometimes also data) that is intended to be distributed as a single unit. Typically a Python project is a library, an application, a plugin, a framework, or a toolkit. In most cases this corresponds to a single source code repository (for example a *git*, *SVN*, or *CVS* repository).

Multiple *top-level* packages and modules

For example *setuptools* (version `46.1.2` as of this writing) has two *top-level packages* `setuptools` and `pkg_resources`. It additionally seems to have one *top-level module* `easy_install`.

It is not often the case, but a Python project can contain multiple top-level packages. So of course the name of a top-level package is not always the same as the name of the project itself. It would be otherwise impossible to have more than one top-level package per project.

Some Python projects are only made of one or more Python modules directly at the root without tree-like package structure.

2.2.4 Distribution

Confusion #2: Python distribution vs. Python project distribution

Project distributions are not to be confused with *Python distributions* such as *CPython*, *Anaconda*, *SciPy*, etc.

It is sometimes named *distribution package*, as opposed to *import package* (see above).

A Python project distribution corresponds to a snapshot of a Python project that is distributed to other Python users. Each snapshot is labeled with a version string. Each snapshot (or project version) is made available in one or multiple formats. Users can then obtain their preferred format.

There are two common types of distribution formats: *source* and *binary*.

Source distribution

A source distribution, often abbreviated *sdist*, is a relatively raw type of distribution. It is not compiled, which is both an advantage and an inconvenient.

The inconvenient is that a source distribution is not always immediately usable. That is why source distributions typically contain the setup script. For example if the project contains a *C* extension, then this code must be compiled before running.

The advantage is that a source distribution is universal. It is not tied to a specific operating system, CPU architecture, etc. The source distribution is the *purest* form of distribution, it can be used to build all the binary distributions for all targets.

Source distributions can be found in multiple formats:

```
$ python setup.py sdist --help-formats
List of available source distribution formats:
  --formats=bztar  bzip2'ed tar-file
```

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```
--formats=gztar  gzip'ed tar-file
--formats=tar    uncompressed tar file
--formats=zip    ZIP file
--formats=ztar   compressed tar file
```

Attention: It is strongly recommended to always offer at least the *sdist* of a Python project (for example on PyPI). The reason is that it is always possible to use the *sdist* on any platform. On the other hand it is most likely impossible to use a *bdist* targetted for another platform.

So if no *bdist* of the project is available for the target platform, the *sdist* can still be used and eventually a target specific *bdist* can be built locally.

Binary distribution

A binary distribution, often abbreviated *bdist*, is a more advanced type of distribution.

There are multiple types of binary distributions, for example *egg* (`bdist_egg`) and *wheel* (`bdist_wheel`).

Wheel

wheel is the preferred format of distribution. It offers the best user experience, as it is the format that is the closest to the specifics of the target system.

2.2.5 Python package index

Confusion #3: About the PyPI name

The name Python *package* index is confusing since PyPI does not directly contains *packages*, but *distributions* of Python projects.

The *Python package index*, commonly called *PyPI* is the main repository of Python project distributions. It can be found at following URL:

- https://pypi.org/

2.3 References

David Beazley “Modules and Packages:Live and Let Die!”:

- http://www.dabeaz.com/modulepackage/ModulePackage.pdf

CHAPTER

THREE

PYTHON PROJECT VERSION SINGLE-SOURCING

3.1 Problem

It is not entirely straightforward where the version string should be written within a Python project.

A couple of things are sure:

- the version must be written in a `__version__` attribute as a string (see PEP 396[3])
- the version string must be available from the setup script
- the version string should be in the changelog

It is annoying to have to keep the version string up to date in these three locations. A solution for single-sourcing the project version would fix that.

3.2 Solution

This solution shows how to keep the Python project version string in just one place. The suggested location is in the change log:

Listing 1: CHANGELOG.rst

```
1.2.3
=====

* More bugs fixed

1.2.2
=====

* Bugs fixed
```

The current version string should always be on the same line and on its own so that the setup script can easily find it and extract it:

Listing 2: setup.py

```
import os
import setuptools

with open(os.path.join(HERE, 'CHANGELOG.rst')) as file_:
    changelog = file_.read()
```

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[3] https://www.python.org/dev/peps/pep-0396/

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```
setuptools.setup(
    name='Example',
    version=changelog.splitlines()[0],
    # ...
)
```

From the actual code of the project the version number should be accessed via `importlib.metadata`. Knowing the name of the project it is easy to get the version string:

Listing 3: src/example/__init__.py

```
import importlib.metadata

__version__ = importlib.metadata.version('Example')
```

The `importlib.metadata` package is part of the standard library starting with *Python 3.8*. For earlier versions use importlib-metadata[4] instead.

As a positive side effect, changing the version number forces the project maintainer to modify the change log and thus they always get at least one chance to keep it up to date.

[4] https://pypi.org/project/importlib-metadata/

CHAPTER

FOUR

PYTHON PROJECT NAME

4.1 Problem

How to get the name of the project containing the current module (or package)?

- https://stackoverflow.com/a/60363617
- https://stackoverflow.com/a/60351412
- https://stackoverflow.com/a/60975978
- https://stackoverflow.com/a/63849982

4.2 Solution

```
#!/usr/bin/env python3

import importlib.util
import pathlib

import importlib_metadata

def get_distribution(file_name):
    result = None
    for distribution in importlib_metadata.distributions():
        try:
            relative = (
                pathlib.Path(file_name)
                .relative_to(distribution.locate_file(''))
            )
        except ValueError:
            pass
        else:
            if relative in distribution.files:
                result = distribution
    return result

def _alpha():
    file_name = importlib.util.find_spec('alpha').origin
    distribution = get_distribution(file_name)
    print("alpha", distribution.metadata['Name'])

def _bravo():
    import bravo
```

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```
    file_name = bravo.__file__
    distribution = get_distribution(file_name)
    print("bravo", distribution.metadata['Name'])

if __name__ == '__main__':
    _alpha()
    _bravo()
```

4.2.1 Update February 2021

Looks like this could be solved in a simpler way thanks to the newly added *packages_distributions()* function in *importlib_metadata*:

- https://importlib-metadata.readthedocs.io/en/stable/using.html#package-distributions
- https://github.com/python/importlib_metadata/pull/287/files

CHAPTER

FIVE

PYTHON IMPORTS

1. Identify clearly what you want your top level modules and packages to be.
2. Make all imports absolute.
3. Either:
   - make your project a real installable project, so that those top level modules and packages are installed in the environment's `site-packages` directory;
   - or make sure that the current working directory is the one containing the top level modules and packages.
4. Make sure to call your code via the *executable module* method instead of the *script* method:
   - DO
     - `path/to/pythonX.Y -m toplevelpackage.module`
     - `path/to/pythonX.Y -m toplevelmodule`
     - `path/to/pythonX.Y -m toplevelpackage.subpackage` (assuming there is a `toplevelpackage/subpackage/__main__.py` file)
   - DON'T
     - `path/to/pythonX.Y toplevelpackage/module.py`
     - `path/to/pythonX.Y toplevelmodule.py`
5. Later on, once it all works well and everything is under control, you might decide to change some or all imports to relative. (If things are done right, I believe it could be possible to make it so that it is possible to call the executable modules from any level within the directory structure as the current working directory.)

References:

- Old reference, possibly outdated, but assuming I interpreted it right, it says that running *scripts* that live in a package is an anti pattern, and one should use `python -m package.module` instead:
  - https://mail.python.org/pipermail/python-3000/2007-April/006793.html
  - https://www.python.org/dev/peps/pep-3122/

CHAPTER

SIX

PYTEST

6.1 Introduction

Python test runner

http://pytest.org/

6.2 pycodestyle and pylint

Use the plugins pytest-pep8[5] and pytest-pylint[6].

pep8 vs. pycodestyle

The Python project `pep8` has been renamed[7] to `pycodestyle`. But there is no `pytest-pycodestyle` project yet.

https://bitbucket.org/pytest-dev/pytest-pep8/issues/15

With these plugins the linting operations are completely integrated within the test workflow. The results of the tests and linting operations are rendered in a consistent format.

[5] https://pypi.python.org/pypi/pytest-pep8
[6] https://pypi.python.org/pypi/pytest-pylint
[7] https://github.com/PyCQA/pycodestyle/issues/466

6.2.1 pep8 only

Run only the `pep8` linting.

Listing 1: shell console

```
$ pytest --pep8 -m pep8
```

6.2.2 pylint only

Run only the `pylint` linting.

Listing 2: shell console

```
$ pytest --pylint -m pylint
```

6.2.3 Both pep8 and pylint

Run both linting tools but not the tests themselves.

Listing 3: shell console

```
$ pytest --pep8 --pylint -m 'pep8 or pylint'
```

Run all the tests including the linting tools.

Listing 4: shell console

```
$ pytest
```

CHAPTER

SEVEN

TOX

7.1 Introduction

The `tox` tool allows to easily create multiple Python virtual environments while specifying a list of Python dependencies to install in each environment as well as a list of commands to run in each environment.

The original purpose of the tool is to test the source distribution (`sdist`) of a Python project against multiple combinations of Python interpreters and Python dependencies.

- https://tox.readthedocs.io/

7.2 Defaults

Listing 1: tox.ini

```
[tox]
envlist =
    py37
    py38
isolated_build = True
# ...

[testenv]
commands =
    python3 -m pytest
extras =
    dev_test
# ...
```

7.3 Development environment

It is a good idea to setup an environment for interactive use. The purpose of this environment is to be actually activated from the interactive shell in order to do the actual development.

The `commands` configuration setting should be relatively neutral. It can also be left empty. There is no need to trigger any test suite or linting, since those should be triggered manually once the environment is active.

The environment should contain the dependencies for all use cases: test, build, distribute, and then eventually some more to develop.

Listing 2: tox.ini

```
# ...
[testenv:develop]
commands =
deps =
    dev_doc
    dev_lint
    dev_package
    dev_test
usedevelop = True
# ...
```

7.4 Notes

7.4.1 GitLab CI

Automatically set the `TOXENV` environment variable based on the job name:

Listing 3: .gitlab-ci.yml

```
'.review':
  script:
    - 'export TOXENV="${CI_JOB_NAME##review}"'
    - 'python3 -m pip install tox'
    - 'python3 -m tox'

'review py37':
  extends: '.review'
  image: 'python:3.7'

'review py38':
  extends: '.review'
  image: 'python:3.8'
```

CHAPTER

EIGHT

PEX

8.1 Introduction

In a couple of words: `pex` helps create *self-contained executable Python virtual environments*.

https://pex.readthedocs.io/

https://www.youtube.com/watch?v=NmpnGhRwsu0

8.2 Bootstrap

Bootstrap `pex` with these steps:

- create a short lived Python virtual environment;
- install `pex` in this environment;
- use the newly installed `pex` to create a `pex` file:
  - containing the `pex` project as well as the dependencies; *and*
  - having the `pex` console script as its entry point.

With Python 3 and the `~/bin` directory on the `PATH` this could look like this:

Listing 1: shell console

```
$ python3 -m venv pexenv
$ . pexenv/bin/activate
(pexenv) $ pip install pex
(pexenv) $ pex \
> 'pex[requests,cachecontrol]' \
> --console-script=pex \
> --output-file=~/bin/pex
(pexenv) $ deactivate
```

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```
$ rm --force --recursive pexenv
$ which pex
$ pex --version
```

The `pexenv` Python virtual environment can be deleted immediately afterwards. `pex` can be used directly since it is self contained in its own Python virtual environment within the `~/bin/pex` file.

8.3 Overview

Per default pex starts the Python interpreter in a dynamically created empty virtual environment.

Listing 2: shell console

```
$ pex
Python 2.7.12 (default, Nov 19 2016, 06:48:10)
[GCC 5.4.0 20160609] on linux2
Type "help", "copyright", "credits" or "license" for more information.
(InteractiveConsole)
>>> exit()
```

It is possible to select which Python interpreter should be used.

Listing 3: shell console

```
$ pex --python=python3
Python 3.5.2 (default, Nov 17 2016, 17:05:23)
[GCC 5.4.0 20160609] on linux
Type "help", "copyright", "credits" or "license" for more information.
(InteractiveConsole)
>>> exit()
```

`pex` allows to specify which Python projects should be installed in the virtual environment.

Listing 4: shell console

```
$ pex 'requests<2.0.0' 'setuptools==30'
Python 3.5.2 (default, Nov 17 2016, 17:05:23)
[GCC 5.4.0 20160609] on linux
Type "help", "copyright", "credits" or "license" for more information.
(InteractiveConsole)
>>> import requests
>>> requests.__version__
'1.2.3'
>>> import setuptools
>>> setuptools.__version__
'30.0.0'
>>> exit()
```

The dependencies can be specified via a `pip requirements.txt` file.

Listing 5: shell console

```
$ pex --requirement=requirements.txt
```

`pex` also allows to specify an entry point that should be executed from within the virtual environment.

Listing 6: shell console

```
$ pex 'httpie==0.9.6' --console-script=http -- --version
0.9.6
$ pex --python=python3 --entry-point=http.server
Serving HTTP on 0.0.0.0 port 8000 ...
```

Finally `pex` allows to write this self-contained executable virtual environment into a single file.

Listing 7: shell console

```
$ pex --python=python3 --entry-point=http.server --output-file=server.pex
$ ./server.pex
Serving HTTP on 0.0.0.0 port 8000 ...
```

8.4 Inspect

Since `pex` files are `ZIP` archives, inspecting their content is very straighforward.

Listing 8: shell console

```
$ python -m zipfile -l example.pex
$ unzip -l example.pex
```

It is a good idea to check that only the required and necessary dependencies are included. Nothing more and nothing less should be found in the `.deps` directory.

8.5 setuptools

To easily build a `pex` executable with `setuptools` use the `bdist_pex` command. `bdist_pex` will use the `console_scripts` entry point bearing the exact name of the Python project itself.

Listing 9: setup.py

```
import setuptools

NAME = 'Example'

setuptools.setup(
    name=NAME,
    entry_points={
        'console_scripts': [
            '{}=example.app:run'.format(NAME),
        ],
    },
    # ...
)
```

8.5.1 Requirements

For a stricter control over the dependencies added to the `pex` file, a `requirements.txt` file can be specified via the `--pex-args` option.

Listing 10: shell console

```
$ python setup.py bdist_pex --pex-args='--requirement=requirements.txt'
```

CHAPTER

NINE

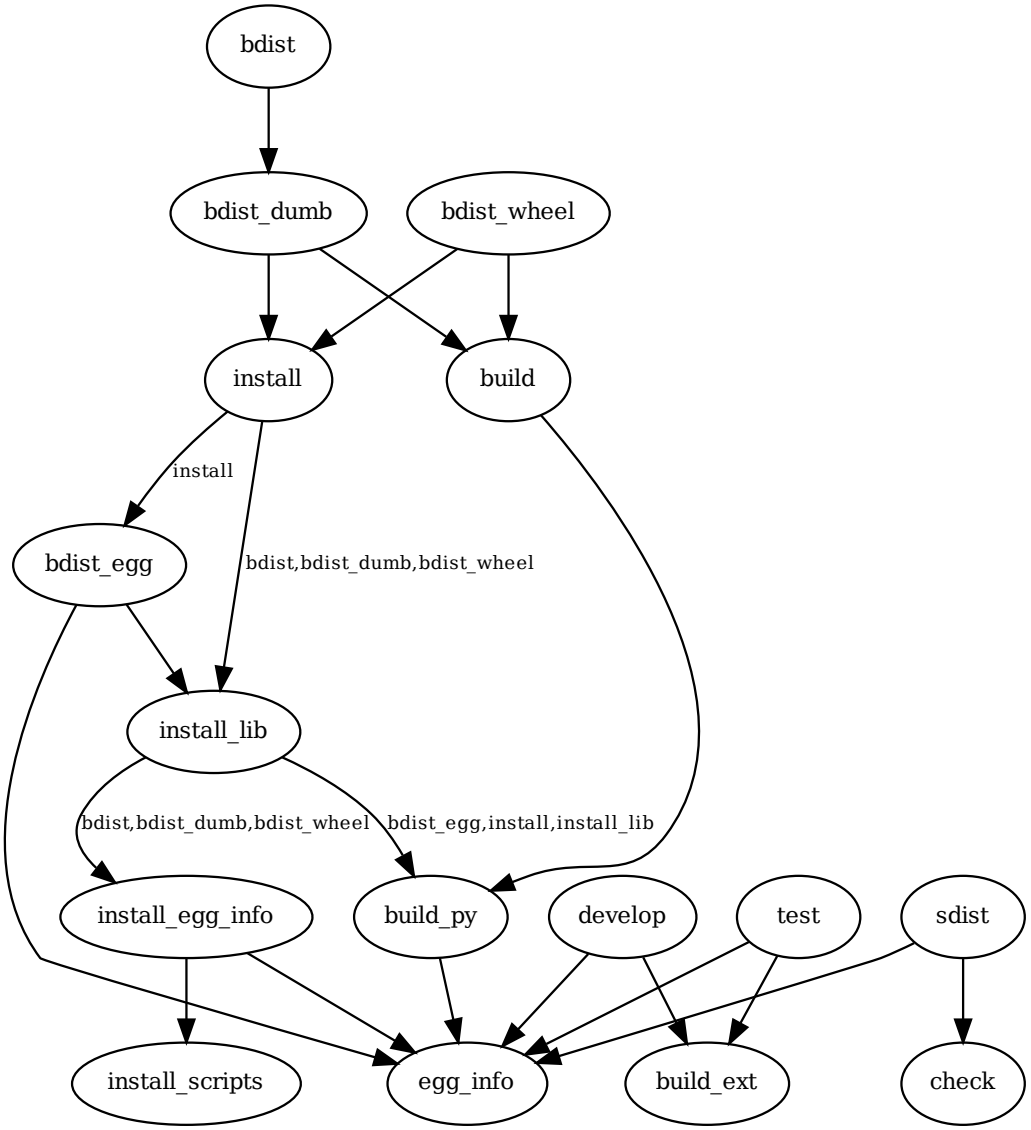
SETUPTOOLS

9.1 Tests

Place the tests in the `test` directory. Per default `setuptools` adds the `test` directory to the source distribution `sdist`. This can be disabled in the `MANIFEST.in`.

9.2 Commands dependencies

Graph showing the dependencies between the common `setuptools` commands:



9.3 Extend install command

Warning: This is a work in progress that needs to be improved on.

This shows how to add a subcommand to the `install` command. This also shows how the subcommand can add to the list of files to be installed (packaged in a `bdist`).

```
class install_something(setuptools.Command):
    user_options = [
        ('install-dir=', 'd', "directory to install to"),
    ]
    def initialize_options(self):
```

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```
        self.install_dir = None
    def finalize_options(self):
        self.outputs = []
        self.set_undefined_options(
            'install',
            ('install_lib', 'install_dir'),
        )
    def run(self):
        self.outputs.append('package/something.bin')
        self.mkpath(self.install_dir + 'package')
        self.copy_file(
            'src/package/something.bin',
            self.install_dir + 'package/something.bin',
        )
    def get_outputs(self):
        return self.outputs


class install(distutils.command.install.install):
    _sub_command = (
        'install_something',
        None,
    )
    _sub_commands = distutils.command.install.install.sub_commands
    sub_commands = [_sub_command] + _sub_commands
```

CHAPTER

TEN

CHAMELEON

10.1 Introduction

- https://pypi.org/project/Chameleon/
- https://chameleon.readthedocs.io/

10.2 Macros

10.2.1 Omit tag

Tags from the namespace `tal` and `metal` are omitted. But no specific tag name is required. So use something like this

```
<metal: metal:something="whatever">...</metal:>
<tal: tal:something="whatever">...</tal:>
```

10.2.2 Same file

Use macro from the same template (same file).

The macros are available under `template.macros` or directly under `macros`.

```
<metal: metal:define-macro="ping">pong</metal:>

<metal: metal:use-macro="template.macros['ping']"></metal:>
<metal: metal:use-macro="macros['ping']"></metal:>
```

10.3 I18N

10.3.1 Babel

According to its documentation `chameleon` should provide a message extractor for `Babel`, but it is not actually the case.

https://github.com/malthe/chameleon/issues/12

Use `lingua` instead. It has a message extractor for `chameleon`.

10.3.2 lingua

Even though `lingua` claims in its documentation to always extract messages that do not have a domain, it is not the case for the `chameleon` extractor.

Make sure to always specify a `domain` in the `.pt` file. Otherwise the messages won't be extracted by `pot-create`.

```
<tal: i18n:domain="MyDomain">
    <!-- ... -->
    <span i18n:translate="">message</span>
    <!-- ... -->
</tal:>
```

CHAPTER

ELEVEN

WORKING WITH PYTHON

11.1 No *pip*

Do not install a global system-wide version of *pip* at all.

There is almost never a good reason to install global system-wide packages via *pip* to begin with. Especially on Linux where the default version of Python is part of the system and used by the system. So mixing this with Python projects that the user install install themselves via *pip* is very likely to cause conflicts sooner rather than later.

11.2 Use isolation

If Python tools are needed to be always available from the command line, then isolate them with *zapp*, *shiv*, or *pex*.

- *zapp* https://pypi.org/project/zapp/
- *shiv* https://pypi.org/project/shiv/
- *pex* https://pypi.org/project/pex/

Those are all *zipapp* single-file Python executables.

- https://www.python.org/dev/peps/pep-0441/
- https://docs.python.org/3/library/zipapp.html

shiv and *pex* applications are self extractable. *zapp* does not need to be extracted. The code is executed directly from within the zip-compressed archive.

pex applications are executed from their own virtual environment. *zapp* applications are not executed in a virtual environment. Not sure about *shiv*.

shiv applications show up somehow in the current environment. Whereas *zapp* applications do not, so they are perfect for tools such as *deptree*, and *pipdeptree*.

11.3 Use *toolmaker*

To automate the creation of single file Python applications with *zapp*, *shiv*, or *pex*, one can use *toolmaker*.

- https://pypi.org/project/toolmaker/

11.4 Use *venv*

Python 3 has the module *venv* in its standard library since version 3.3.

- https://docs.python.org/3/library/venv.html

So the need for the third party library *virtualenv* is much less pressing.

```
$ python3 -m venv .venv
$ . .venv/bin/activate
```

11.5 Do not activate virtual environments

The scripts that are installed in a virtual environment (with *setuptools* at least) get a shebang with the full path to the Python interpeter from the virtual environment. So there is no need to activate the virtual environment to call such scripts.

```
$ .venv/bin/myscript
$ .venv/bin/python3 -m mymodule
```

11.6 Interactive debug

- https://docs.python.org/3/library/functions.html#breakpoint

```
breakpoint()
```

- https://docs.python.org/3/using/cmdline.html#cmdoption-i

```
python -i main.py

python -i -m something
```

- https://stackoverflow.com/a/1396386/11138259

```
import pdb; pdb.set_trace()
```

Then:

- https://docs.python.org/3/library/pdb.html#pdbcommand-interact

```
(Pdb) interact
*interactive*
>>>
```

Or:

- https://docs.python.org/3/library/code.html#code.interact

```
import code; code.interact(local=locals())
```

CHAPTER

TWELVE

FIZZ BUZZ

Toy implementation of the *Fizz buzz* game.

```
#!/usr/bin/env python3

class Injector:

    def __init__(self, multiple, word):
        self._multiple = multiple
        self._output = '{}!'.format(word)

    def __call__(self, value):
        result = None
        if value % self._multiple == 0:
            result = self._output
        return result

def fizz_buzz(start, end):
    injectors = [
        Injector(3, 'Fizz'),
        Injector(5, 'Buzz'),
    ]
    #
    for i in range(start, end + 1):
        items = []
        output = None
        #
        for injector in injectors:
            item = injector(i)
            if item:
                items.append(item)
        #
        if items:
            output = ' '.join(items)
        else:
            output = str(i)
        #
        print(output)

def main():
    fizz_buzz(1, 50)

if __name__ == '__main__':
    main()

# EOF
```

Part III

Docker

CHAPTER

THIRTEEN

PRESENTATION

First public presentation of Docker, *The future of Linux Containers*: https://www.youtube.com/watch?v=wW9CAH9nSLs

Official website: https://www.docker.com/

CHAPTER

FOURTEEN

TIPS

14.1 Playground

Play with Docker in the web browser: https://labs.play-with-docker.com/

Part IV

Miscellaneous

CHAPTER

FIFTEEN

HTML5

15.1 Sectioning

```
<!DOCTYPE html>
<html>
 <head>
  <title>Title</title>
 </head>
 <body>
  <main>
   <h1>Title</h1>
   <article>
    <h2>Section</h2>
    <section>
     <h3>Subsection</h3>
     <p>Content</p>
    </section>
   </article>
  </main>
 </body>
</html>
```

Use following link to validate: https://validator.w3.org/nu/?showoutline=yes

15.2 Minimal document

Shortest valid HTML5 document:

```
<!DOCTYPE html><title>x</title>
```

CHAPTER

SIXTEEN

MAKEFILE

16.1 Links

- https://www.gnu.org/software/make/manual/make.html
- http://clarkgrubb.com/makefile-style-guide
- http://gromnitsky.users.sourceforge.net/articles/notes-for-new-make-users/

16.2 Example

```
input_dir := input
output_dir := output

input_files := $(wildcard $(input_dir)/*.in)
output_files := $(patsubst $(input_dir)/%.in,$(output_dir)/%.out,$(input_files))

vpath %.in $(input_dir)

.DEFAULT_GOAL := all

.PHONY: all
all: $(output_files)

$(output_dir)/%.out: %.in | $(output_dir)
    cp $< $@

$(output_dir):
    mkdir --parent $@

.PHONY: clean
clean:
    $(RM) $(output_files)

# Disable default rules and suffixes
# (improve speed and avoid unexpected behaviour)
MAKEFLAGS := --no-builtin-rules
.SUFFIXES:
```

CHAPTER

SEVENTEEN

NPM

17.1 Packages in home directory

This will let `npm` use a custom directory for globally installed package.

Listing 1: ~/.profile

```
# ...
export NPM_PACKAGES="${HOME}/.npm_packages"
PATH="${NPM_PACKAGES}/bin:${PATH}"
NODE_PATH="${NPM_PACKAGES}/lib/node_modules:${PATH}"
# ...
```

Listing 2: ~/.npmrc

```
# ...
prefix = "${NPM_PACKAGES}"
# ...
```

Listing 3: shell interactive console

```
$ . ~/.profile
$ npm install --global npm
```

CHAPTER

EIGHTEEN

SHELL

Create a temporary directory and change to it:

```
$ cd ($mktemp --directory)
$ cd ($mktemp -d)
```

List directories by disk usage:

```
$ du --human-readable | sort --human-numeric-sort --reverse | less
$ du -h | sort -hr | less
```

```
$ sudo du --all --human-readable --max-depth=1 / 2>/dev/null | sort --human-numeric-
↪sort --reverse
$ sudo du -a -d 1 -h / 2>/dev/null | sort -hr
```

Part V

Appendix

CHAPTER

NINETEEN

ABOUT

19.1 Introduction

Written in reStructuredText[8] and built with Sphinx[9].

19.1.1 Mirrors

- https://sinoroc.gitlab.io/kb/
- https://sinoroc.github.io/kb/

19.2 Hacking

19.2.1 Repositories

- https://gitlab.com/sinoroc/kb
- https://github.com/sinoroc/kb

19.2.2 Style guide

Use the following for section headings:

- # with overline, for parts
- * with overline, for chapters
- =, for sections
- -, for subsections
- ^, for subsubsections
- ", for paragraphs

Suggestion taken from Python Developer's Guide[10].

[8] http://docutils.sourceforge.net/rst.html
[9] http://www.sphinx-doc.org/en/stable/index.html
[10] https://devguide.python.org/documentation/markup/#sections

CHAPTER

TWENTY

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