Surviving Code Decay

Finding Shelter Amidst Erosion and Time

Goal

Discuss code decay and some tools which may help.

- Documentation
- Unused Code
- Environment Hazards

Why this matters

- 🧟 Eventually the things you create will decay.
- 🚀 Tools which help avoid decay may also increase your velocity.
- 🧠 Understanding the phenomenon is better than: "this code is bad and you should feel bad too."

Definition

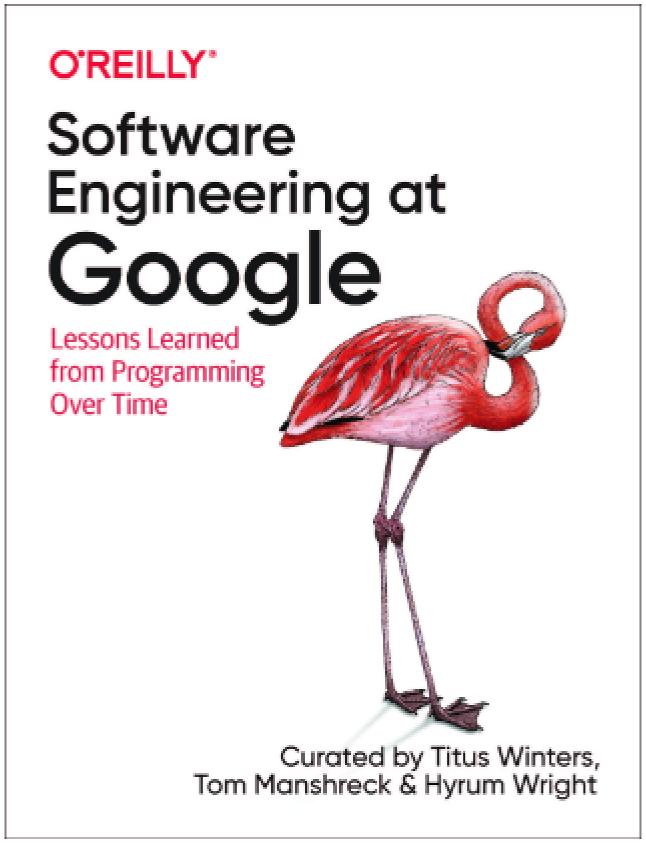
"Software rot ... is either a slow deterioration of software quality over time or its diminishing responsiveness that will eventually lead to software becoming faulty, unusable, or in need of upgrade. "

Wikipedia: Software Rot

Inspirations

Project: Memory of Mankind (MOM)

Inspirations


O'REILLY
Software Engineering at Google
Lessons Learned from Programming Over Time
Curated by Titus Winters, Tom Manshreck & Hyrum Wright

Book: Software Engineering at Google

Inspirations

"... it has been found that the results of many scientific studies are difficult or impossible to reproduce."

Metascience: Replication Crisis

Code Lifecycle

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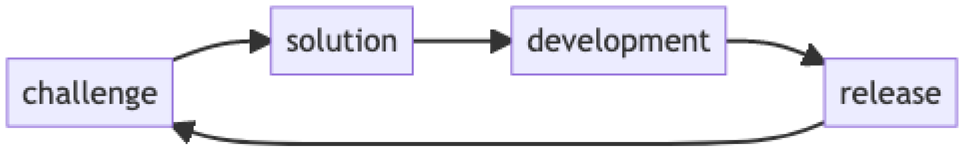
Code Lifecycle



Code Lifecycle

How long do you need your code to live?

- Hours
- Days
- Months
- Years

Code Lifecycle

How would someone else see the same results as you?

Documentation

Human understanding provides
a better chance your code will survive.

Documentation

Information decay; How much do we forget? 😵‍💫

Documentation

Type hints in code

```python
def example(var):
    return var[0]
```

```python
def example(var: list) -> str:
    return var[0]
```

No hints

Type hints

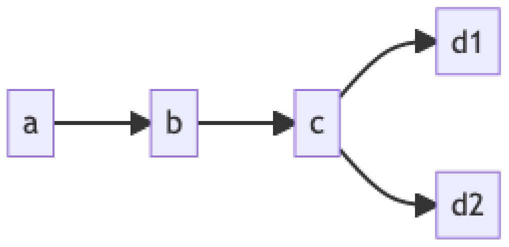
Documentation

Type hints can be linted using mypy.
This makes it easier to trace bugs over time.

Documentation

Diagramming in Markdown

~~~
```mermaid
flowchart LR
    a --> b
    b --> c
    c --> d1
    c --> d2
```
~~~



Mermaid Code Mermaid Render

Documentation

Mermaid can be rendered in Github using codeblocks. sphinxcontrib-mermaid can be used to render mermaid in Sphinx docs.

Documentation

Many other code-based diagramming tools.

- PlantUML (collection)
- https://kroki.io/ (collection of others)

Unused Code

It's easier to write code than it is
to make sure code is always used.

Unused Code

Unused imports

```python
import os
import pathlib
import pandas as pd

df = pd.read_csv("example.csv")
df.head()
```

```python
import pandas as pd

df = pd.read_csv("example.csv")
df.head()
```

Unused imports

Only what we need

Unused Code

pylint can lint unused imports.
nbqa can lint notebooks (with pylint and more).

Unused Code

Unused blocks

```python
def foo():
    return 1

def bar():
    return 2

foo()
```

```python
def foo():
    return 1

foo()
```

Unused block

Used block only

Unused Code

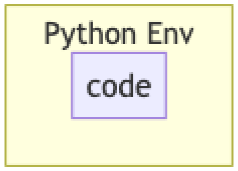
Vulture can search for unused code.

Maintaining tests can sometimes illuminate code usefulness (or lack thereof).

Environment Hazards

Where will your code run?

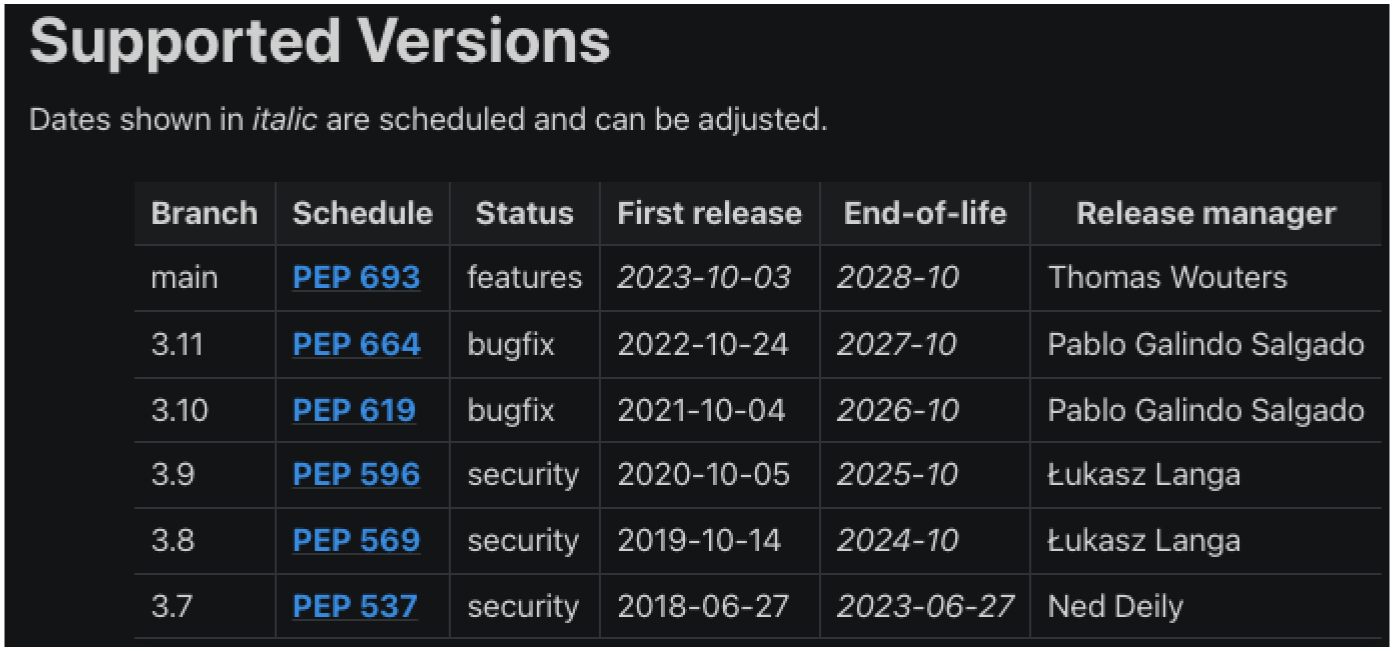
Environment Hazards



Python Environment

- Python version(s)
- External Python packages (and versions)

Environment Hazards



Supported Versions

Dates shown in *italic* are scheduled and can be adjusted.

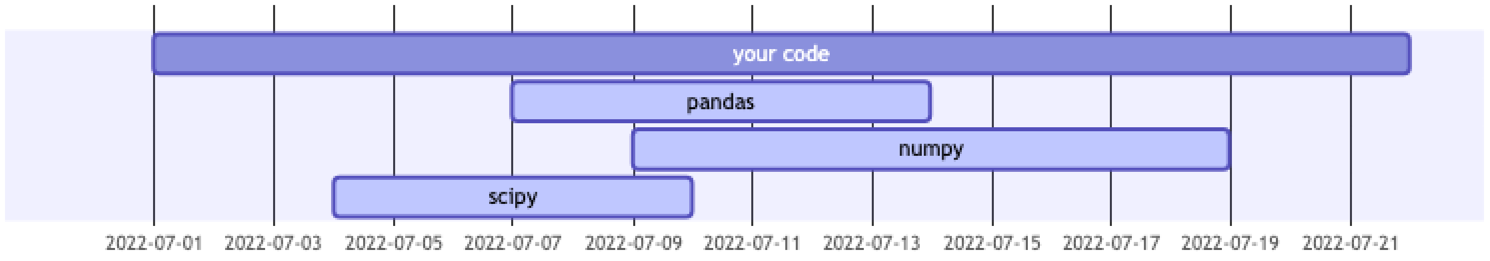
Branch	Schedule	Status	First release	End-of-life	Release manager
main	PEP 693	features	*2023-10-03*	*2028-10*	Thomas Wouters
3.11	PEP 664	bugfix	2022-10-24	*2027-10*	Pablo Galindo Salgado
3.10	PEP 619	bugfix	2021-10-04	*2026-10*	Pablo Galindo Salgado
3.9	PEP 596	security	2020-10-05	*2025-10*	Łukasz Langa
3.8	PEP 569	security	2019-10-14	*2024-10*	Łukasz Langa
3.7	PEP 537	security	2018-06-27	*2023-06-27*	Ned Deily

Python releases have a lifecycle of their own.

https://devguide.python.org/versions/

Environment Hazards

Development to Release



External Python packages have a lifecycle of their own.

Environment Hazards

Poetry is one of many tools which can help address external package dependency management in Python.

Environment Hazards

Poetry substitutes `requirements.txt` and/or `setup.py` for specialized configuration in `pyproject.toml` and optionally locked dependencies within a `poetry.lock` file.

Environment Hazards

Poetry's strength (in my opinion) is simplification of virtual environment tasks and compatibility with centralized PyPI packages by default.

Environment Hazards

Poetry initialization

```
% cd your-repo-dir
% poetry init

This command will guide you through creating your pyproject.toml cc

Package name [poetry-test]:
Version [0.1.0]:
Description []:  a quick demonstration
Author [someone <someone@somewhere.edu>, n to skip]:
License []:  Apache 2.0
Compatible Python versions [^3.9]:
...
```

Environment Hazards

Adding packages

```
% poetry add pandas pytest
Creating virtualenv poetry-test-zzzzzzz-py3.9 in /Users/someone/Lib
Using version ^1.5.1 for pandas

Updating dependencies
Resolving dependencies... (0.3s)

Writing lock file

Package operations: 5 installs, 0 updates, 0 removals

  • Installing six (1.16.0)
  • Installing numpy (1.23.4)
  • Installing python-dateutil (2.8.2)
  • Installing pytz (2022.5)
  • Installing pandas (1.5.1)
```

Environment Hazards

Updating your depenendencies

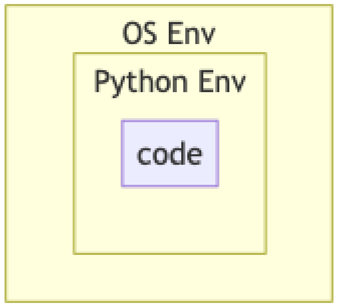
```
% poetry update
Updating dependencies
Resolving dependencies... (0.5s)

Writing lock file

Package operations: 0 installs, 1 update, 0 removals

  • Updating pandas (1.5.0 -> 1.5.1)
```

Environment Hazards

Running through a virtual environment
(without staying in it)

```
% echo "import pandas as pd\nprint(pd.__version__)" > test.py
% poetry run python test.py
1.5.1
```

Environment Hazards



OS or Container Environment

- System dependencies (shell, filesystem)
- Procedure dependencies (Python, Java, etc)

Environment Hazards

As an author, you are responsible for
ensuring others know how to run your code.

Environment Hazards

As an author, you are also responsible for ensuring other computers know how to run your code.

Environment Hazards

A related definition:

Infrastructure as Code (IaC): defining computing resources and their relationships within code.

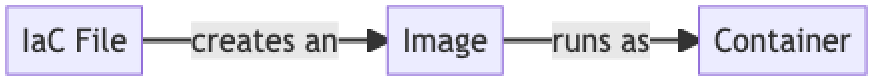
Implementing IaC tells a computer how and where to run your code.

Environment Hazards

How would you make sure someone can run a shell script in your code?

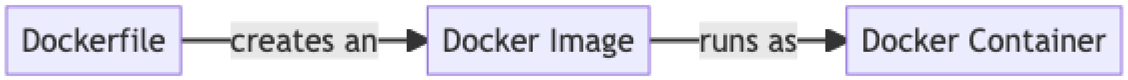
- `.sh` files may not run on Windows
- `.cmd` files may not run on unix-like systems
- `Makefiles` won't run everywhere
- Command differences: `ls` vs `dir`

Environment Hazards



IaC files, Images, and Containers

Environment Hazards



Docker's version

Environment Hazards

```dockerfile
# Example Pythonic Dockerfile
# Python 3.9 installed on Debian Linux
FROM python:3.9

# set our working directory (context for other cmds)
WORKDIR /usr/src/app

# copy over the app contents to image WORKDIR
COPY ./local-code /usr/src/app

# install poetry
RUN pip install poetry

# install poetry env for code
RUN poetry install

# run vulture from poetry env
CMD poetry run vulture /usr/src/app
```

Concluding Remarks

Hügelkultur: *what life will your code give others?*

Image Source

Thank you!

Questions / Comments?