# Sans I/O Programming

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@alexwlchan
they/them

# Hi, I’m Alex! aka @alexwlchan

“very important celebrity” ~ Daniele, this morning

I’m a software developer building digital preservation systems at Wellcome


I’m trans, genderfluid, and I use “they/them” pronouns


Photo: **Wellcome Collection**


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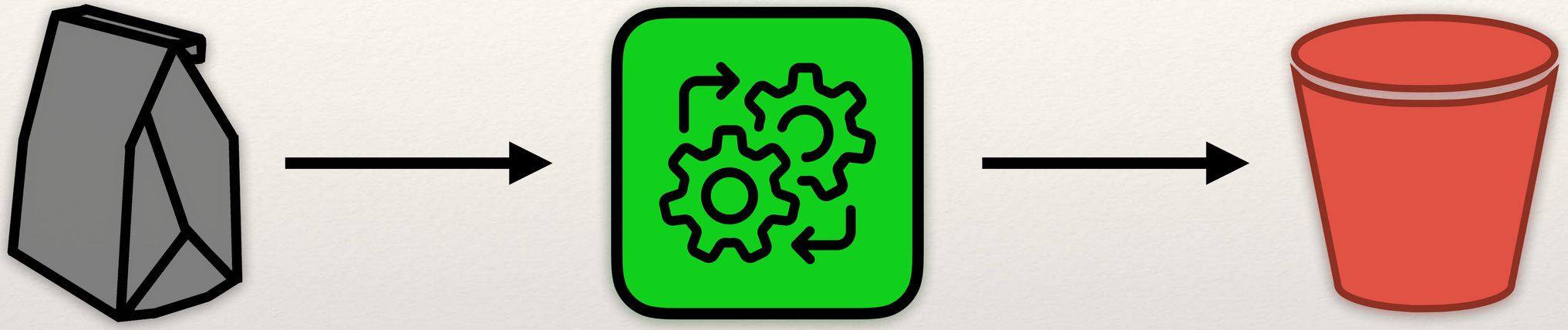
Icons: **Dorian Dawance, Alice Design (The Noun Project), AWS Simple Icons**



BagIt package

Storage service

Amazon S3

## LibraryOfCongress/bagit-python

Work with BagIt packages from Python.

Updated on 5 Jul

Python ★ 131

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## LibraryOfCongress/bagit-java

Java library to support the BagIt specification.

bagit java manifest validation checksum archive

Updated 26 days ago 2 issues need help

Java ★ 57

```
import bagit

bag = bagit.Bag("/path/to/bag")
```

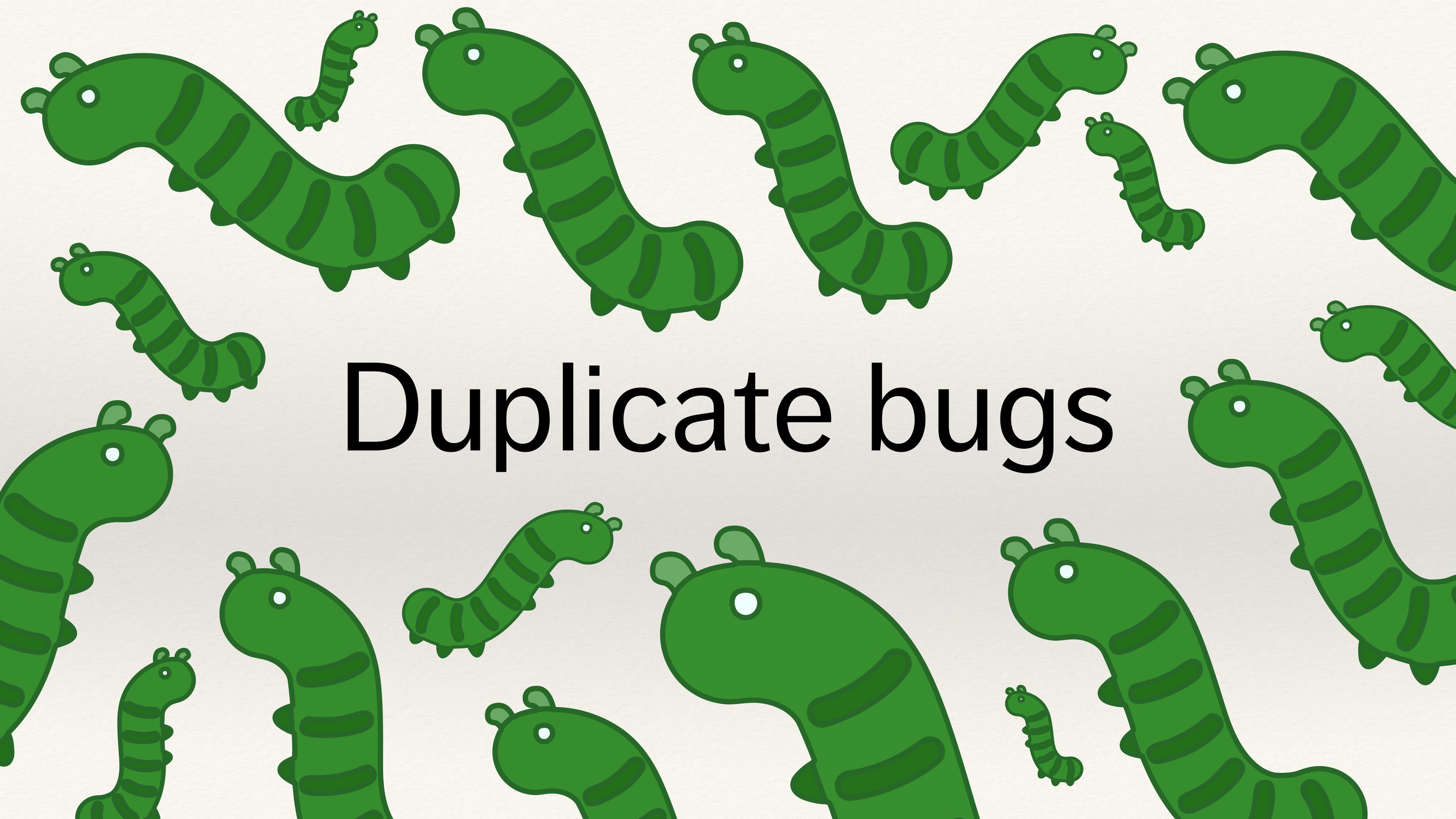
---

```
Path rootDir = Paths.get("/path/to/bag");
BagReader reader = new BagReader();
Bag bag = reader.read(rootDir);
```

We can’t use these libraries because they mix I/O and parsing logic


http://

# Wasted time and effort


Duplicate bugs

# Harder to experiment

# Harder to optimise your code

# Mixing I/O and business logic causes (some) problems:

- No code reuse
- Wasted time and effort
- Duplicate bugs
- Less room for experiments
- Harder to optimise your code

How do we fix
this problem?

**Never do I/O.**

How do we fix
this problem?

**Never mix I/O
and business logic.**

# Create an “I/O sandwich”

# Build a toolbox of I/O implementations

This isn’t everything,
but it’s a good start.

# What are the benefits?

# You get *much* simpler code

# Your code is easier to test...

# ...and test at 100% coverage

```
============= 1417 passed in 32.48 seconds =============

py37 run-test: commands[1] | coverage report
Name                    Stmts   Miss Branch BrPart  Cover   Missing
-------------------------------------------------------------------
h2/__init__.py              2      0      0      0   100%
h2/config.py               38      0      6      0   100%
h2/connection.py          600      0    162      0   100%
h2/errors.py               23      0      0      0   100%
h2/events.py              140      0      8      0   100%
h2/exceptions.py           45      0      0      0   100%
h2/frame_buffer.py         52      0     18      0   100%
h2/settings.py            119      0     38      0   100%
h2/stream.py              440      0     90      0   100%
h2/utilities.py           219      0    124      0   100%
h2/windows.py              36      0     12      0   100%
-------------------------------------------------------------------
TOTAL                    1714      0    458      0   100%
```

# You have less bugs

# Your code is easier to reuse

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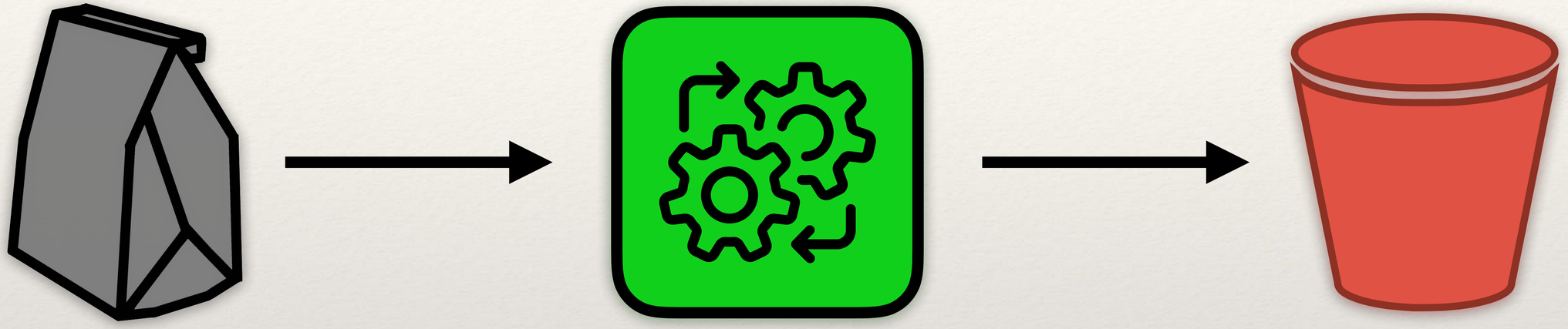

BagIt package

Storage service

Amazon S3

https://thenounproject.com/term/paper-bag/28579

https://thenounproject.com/term/process/2473979

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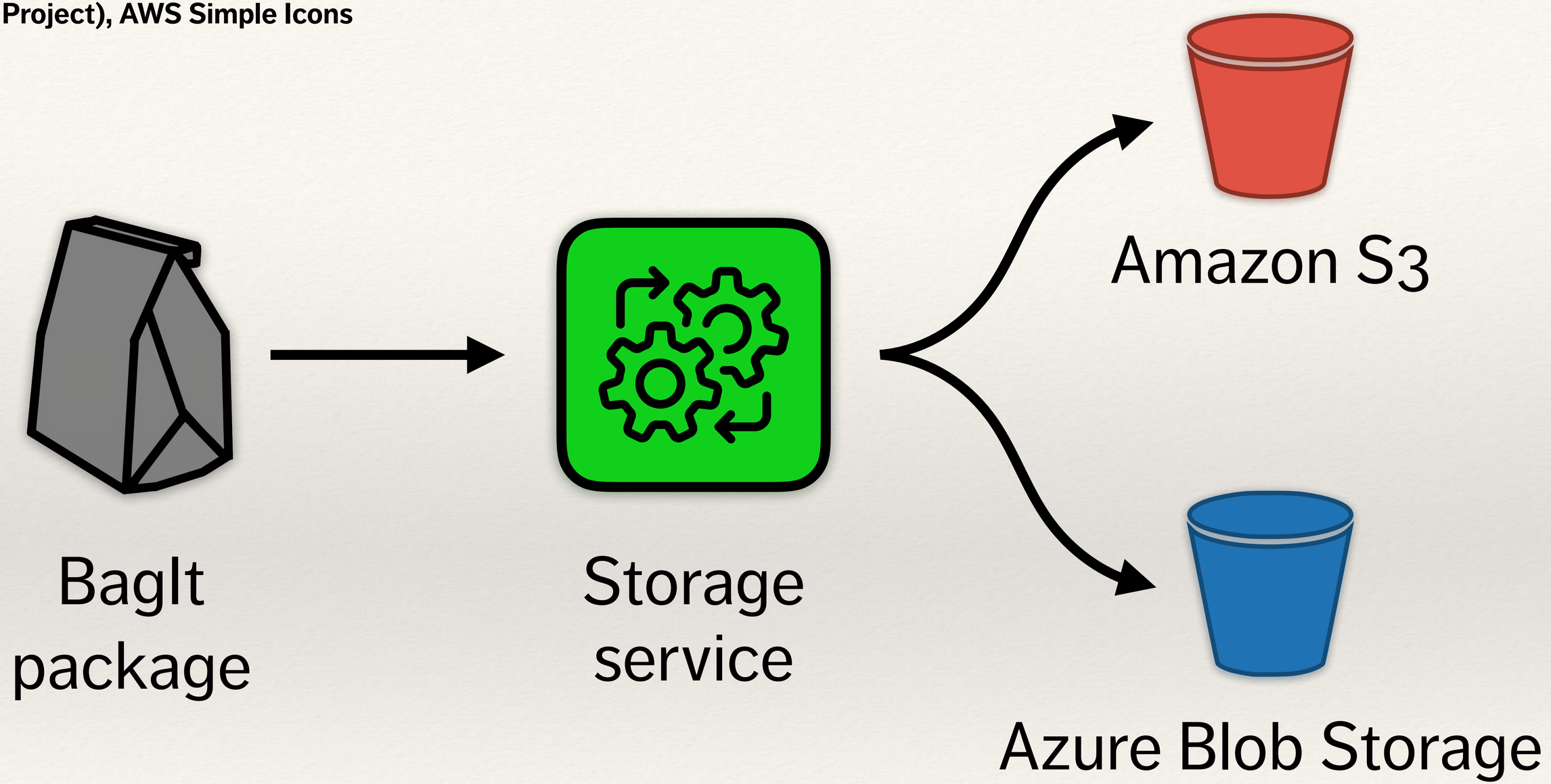

# The benefits of separating I/O and business logic:

- Much simpler code
- Your code is easier to test (at 100% coverage!)
- You have less bugs
- Easier to reuse code

# Create an “I/O sandwich”

# Examples!

Example:

# Creating an HTTP/2 server with hyper-h2

```
import h2.connection

conn = h2.connection.H2Connection(
    client_side=False
)

conn.initiate_connection()
out_bytes = conn.data_to_send()
```

Example:

# Calling the Slack API with slack-sansio

```
import slack.methods

query = (
    slack.methods.CHAT_POST_MESSAGE,
    {"channel": "CM579FC82", "text": "Hello, PyCon UK!"}
)
```

```
import slack.methods

query = (
    slack.methods.CHAT_POST_MESSAGE,
    {"channel": "CM579FC82", "text": "Hello, PyCon UK!"}
)
```

```
import slack.io.abc

class SlackAPIWrapper(abc.SlackAPI):
    async def _request(self, method, url, headers, body):
        # implementation goes here
```

```
import slack.methods

query = (
    slack.methods.CHAT_POST_MESSAGE,
    {"channel": "CM579FC82", "text": "Hello, PyCon UK!"}
)

import requests
from slack.io.requests import SlackAPI

session = requests.Session()
client = SlackAPI(token="…", session=session)

client.query(*query)
```

```
import slack.methods

query = (
    slack.methods.CHAT_POST_MESSAGE,
    {"channel": "CM579FC82", "text": "Hello, PyCon UK!"}
)

import asks
import curio
from slack.io.curio import SlackAPI

session = asks.Session()
client = SlackAPI(token="…", session=session)

curio.run(client.query(*query))
```

```
import slack.methods

query = (
    slack.methods.CHAT_POST_MESSAGE,
    {"channel": "CM579FC82", "text": "Hello, PyCon UK!"}
)

import aiohttp, asyncio
from slack.io.aiohttp import SlackAPI

loop = asyncio.get_event_loop()
session = aiohttp.ClientSession(loop=loop)
client = SlackAPI(token="…", session=session)

loop.run_until_complete(client.query(*query))
```

Example:

# Refactoring a function in bagit-python

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Python ★ 131

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Java ★ 57

```
def load_tag_file(tag_file_name):
    with open_text_file(tag_file_name) as tag_file:
        tags = {}
        for name, value in _parse_tags(tag_file):
            # … code omitted
            # … store (name, value) in tags

        return tags
```

```
def load_tag_file(tag_file_name):
    with open_text_file(tag_file_name) as tag_file:
        return load_tag_file_from_lines(tag_file)


def load_tag_file_from_lines(lines):
    tags = {}
    for name, value in _parse_tags(lines):
        # … code omitted
        # … store (name, value) in tags

    return tags
```

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