python™

module,
script
or
program?

Python module

Convenient import with API

Python script

Convenient execution from command line

Python program

Perhaps composed of many modules

fred

```
def _int32_to_bytes(i):
    "Convert an integer to four bytes in little-endian format."
    return bytes( (i & 0xff,
                   i >> 8 & 0xff,
                   i >> 16 & 0xff,
                   i >> 24 & 0xff) )
```

```
def _bytes_to_int32(b):
    "Convert a bytes object containing four bytes into an integer."
    return b[0] | (b[1] << 8) | (b[2] << 16) | (b[3] << 24)
```

jim

```
def console_card_printer(passenger, seat, flight_number, aircraft):
    output = "| Name: {0}"     \
             "  Flight: {1}"   \
             "  Seat: {2}"     \
             "  Aircraft: {3}" \
             " |".format(passenger, flight_number, seat, aircraft)
    banner = '+' + '-' * (len(output) - 2) + '+'
    border = '|' + ' ' * (len(output) - 2) + '|'
    lines = [banner, border, output, border, banner]
    card = '\n'.join(lines)
    print(card)
    print()
```

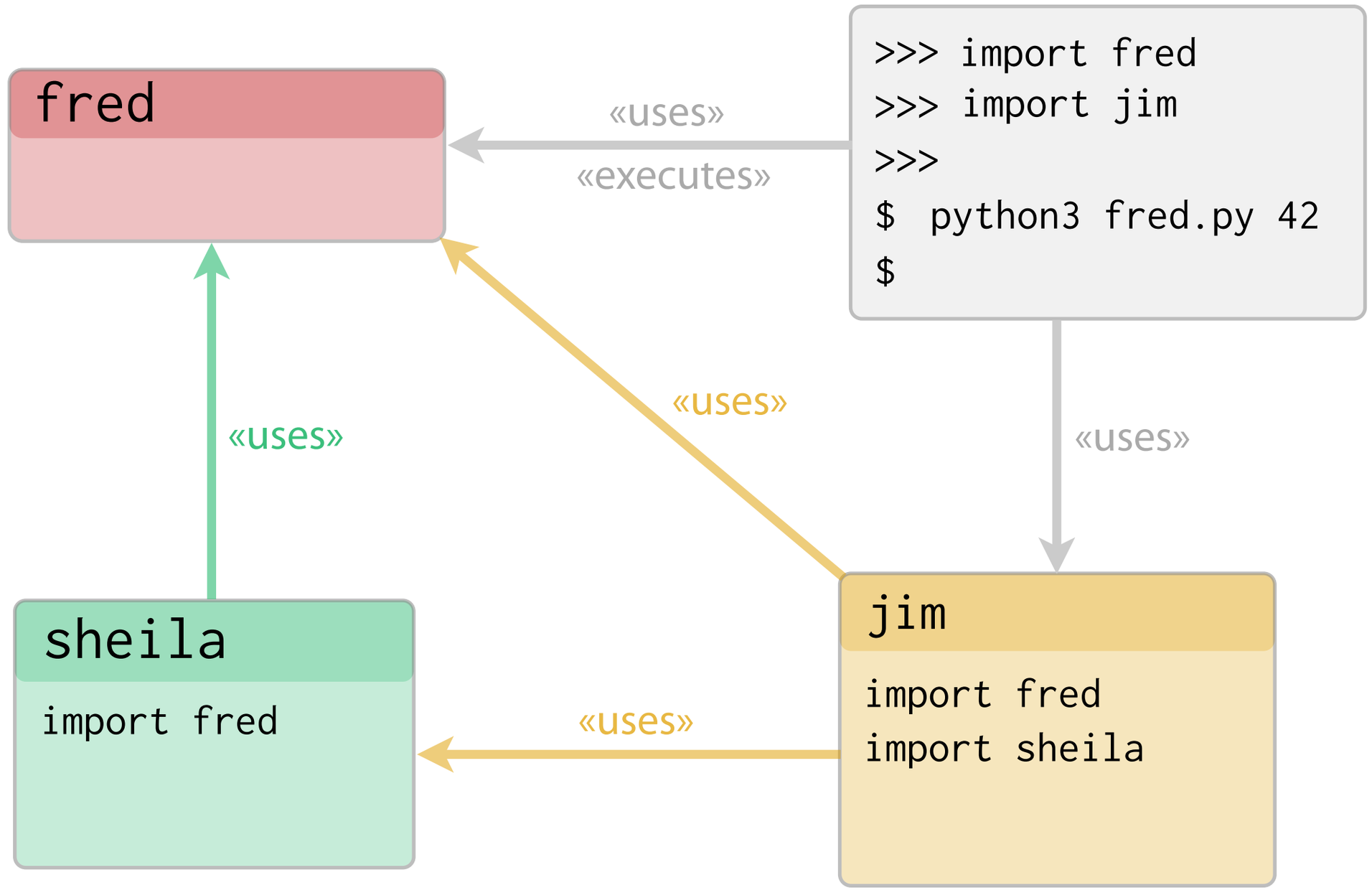
```
def make_flight():
    f = Flight("BA758", Aircraft("G-EUPT", "Airbus A319",
                num_rows=22, num_seats_per_row=6))
    f.allocate_seat('12A', 'Guido van Rossum')
    f.allocate_seat('15F', 'Bjarne Stroustrup')
    f.allocate_seat('15E', 'Anders Hejlsberg')
    f.allocate_seat('1C', 'John McCarthy')
    f.allocate_seat('1D', 'Richard Hickey')
    return f
```

sheila

```
def fetch_words():
    with urlopen('http://sixty-north.com/c/t.txt') as story:
        story_words = []
        for line in story:
            line_words = line.decode('utf8').split()
            for word in line_words:
                story_words.append(word)
    return story_words
```

```
def print_items(items):
    for item in items:
      print(item)
```

```
def main():
    url = sys.argv[1]
    words = fetch_words(url)
    print_items(words)
```


fred
«uses»
«executes»
>>> import fred
>>> import jim
>>>
$ python3 fred.py 42
$
«uses»
«uses»
«uses»
sheila
import fred
jim
import fred
import sheila

Special attributes in Python are delimited by **double underscores**

__name__

Evaluates to “`__main__`” or the actual module name depending on how the enclosing module is being used.

The Python Execution Model

When are functions defined?

What happens when a module is imported?

Python module
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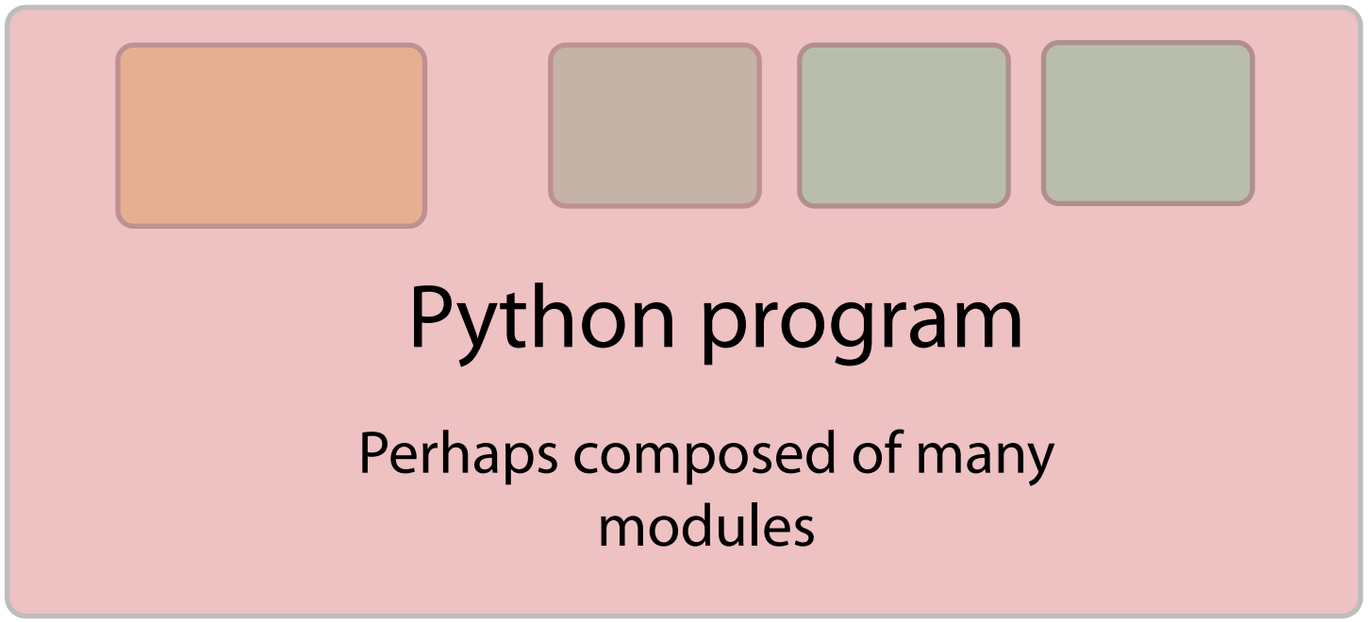
Python program
Perhaps composed of many modules

It doesn't have to be called this!

Setting up a `main()` function with a command line argument

Advanced command line argument parsing:

- Python Standard Library: `argparse`
- Many third-party options such as `docopt`

"""Documenting your code.

Using docstrings.

"""

Docstring conventions

- PEP 257 – not widely adopted
- reStructuredText / Sphinx
- Google Python Style Guide

Google it!

Comments

PyLauncher

- **executable is** `py.exe` **and is on the** PATH
- **associated with** `*.py` **files**
- **parses Unix-style shebangs to locate the correct Python interpreter version**
- `#!/usr/bin/env python3` **works on Windows**

Modularity – Summary

- **Python code is placed in** `*.py` **files called "modules"**
- **Modules can be executed directly with**

```
python module_name.py
```

- **Brought into the REPL or other modules with**

```
import module_name
```

- **Named functions defined with the** `def` **keyword**

```
def function_name(arg1, argn):
```

- **Return from functions using** `return` **keyword with optional parameter**
- **Omitted** `return` **parameter or implicit return at end returns** `None`
- **Use** `__name__` **to determine how the module is being used**
- **If** `__name__ == "__main__"` **the module is being executed**
- **Module code is executed exactly once, on first import**
- `def` **is a *statement* which binds a function definition to a name**

Modularity – Summary

- **Command line arguments are accessible through** `sys.argv`
- **The script filename is in** `sys.argv[0]`
- **Docstrings are a standalone literal string as the first statement of a function or module**
- **Docstrings are delimited by triple quotes**
- **Docstrings provide** `help()`
- **Comments begin with # and run to the end of the line**
- **A special comment on the first line beginning #! controls module execution by the program loader**