xtream

The Hitchhiker's Guide to Asyncio

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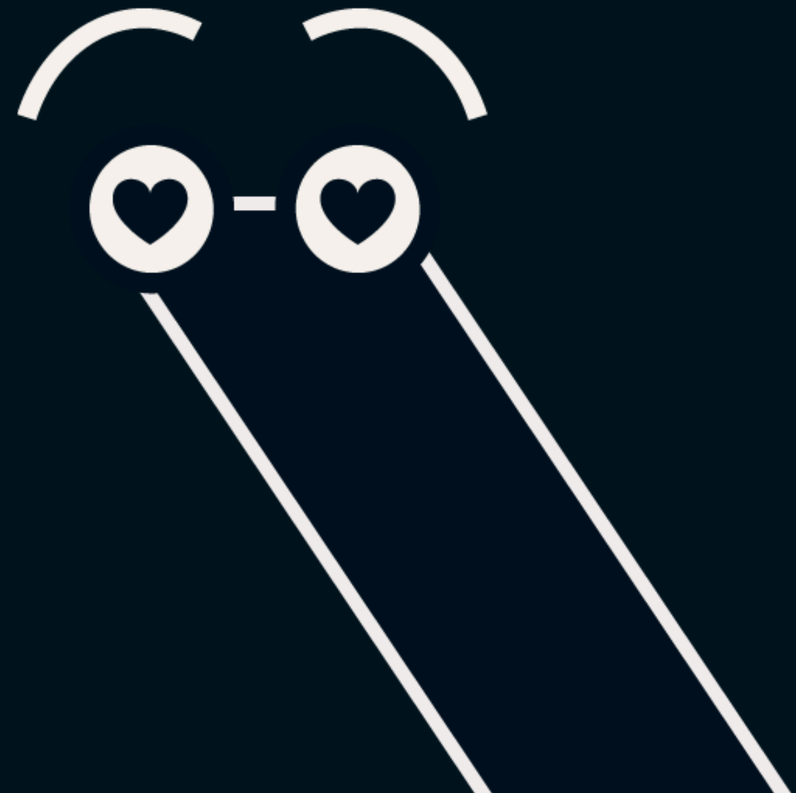
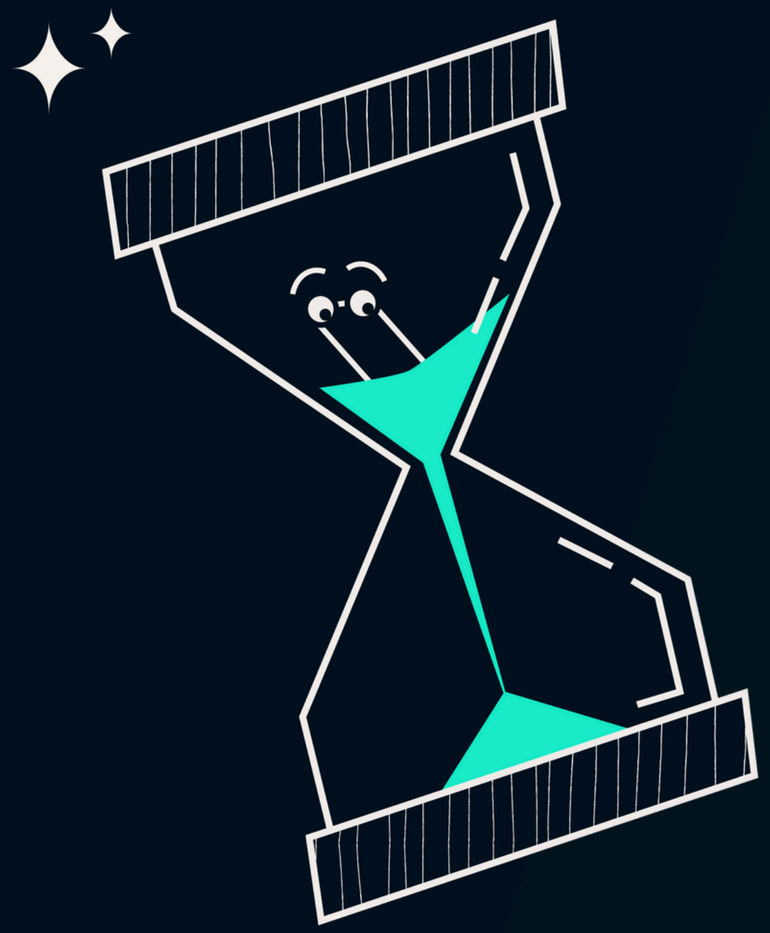
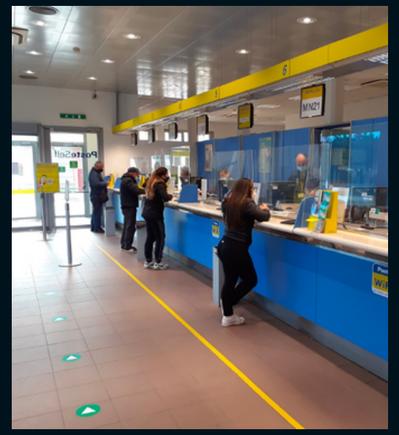




CPU Cycle	1s
L1 Cache	3s
RAM	4 mins
Network	7.6 years


McDonald's
McDonald's
DRIVETHRU


6
5
MN21



Preemptive multitasking

`threading`

Single Core *

Cooperative multitasking

`asyncio`

Single Core

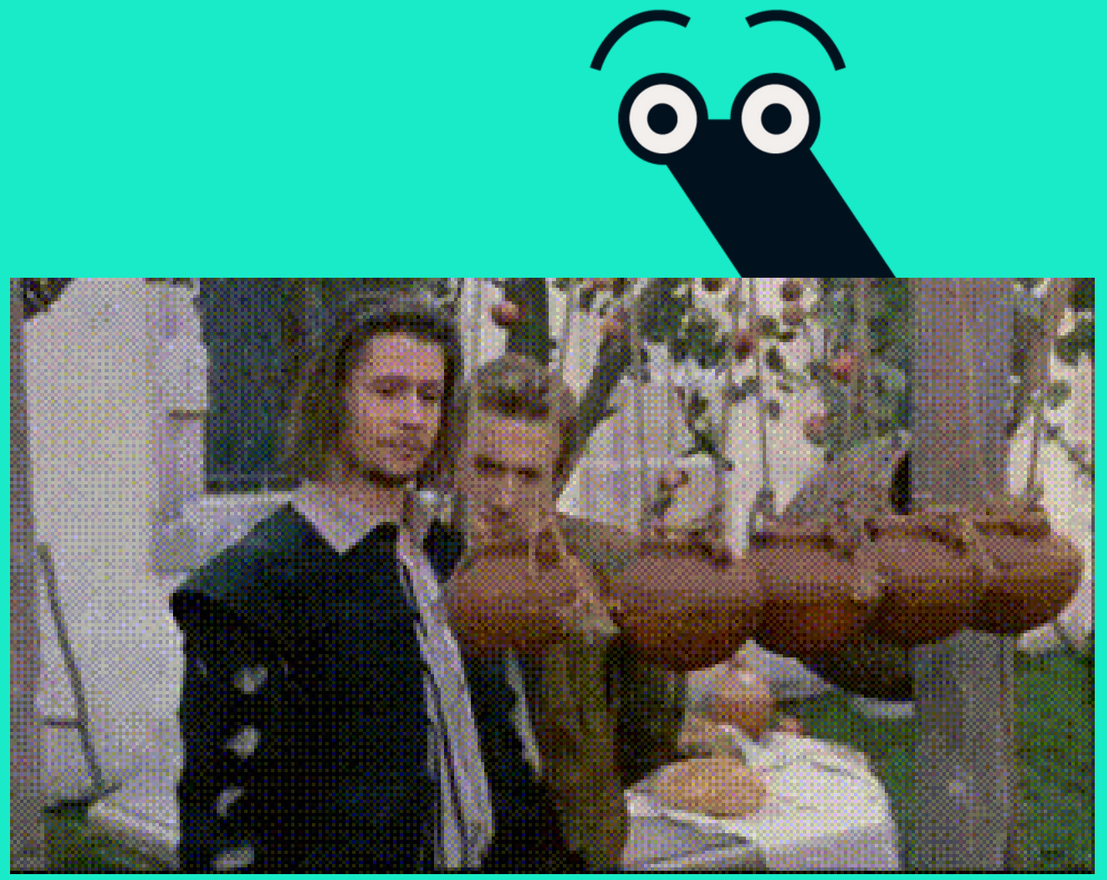
Multiprocessing

`multiprocessing`

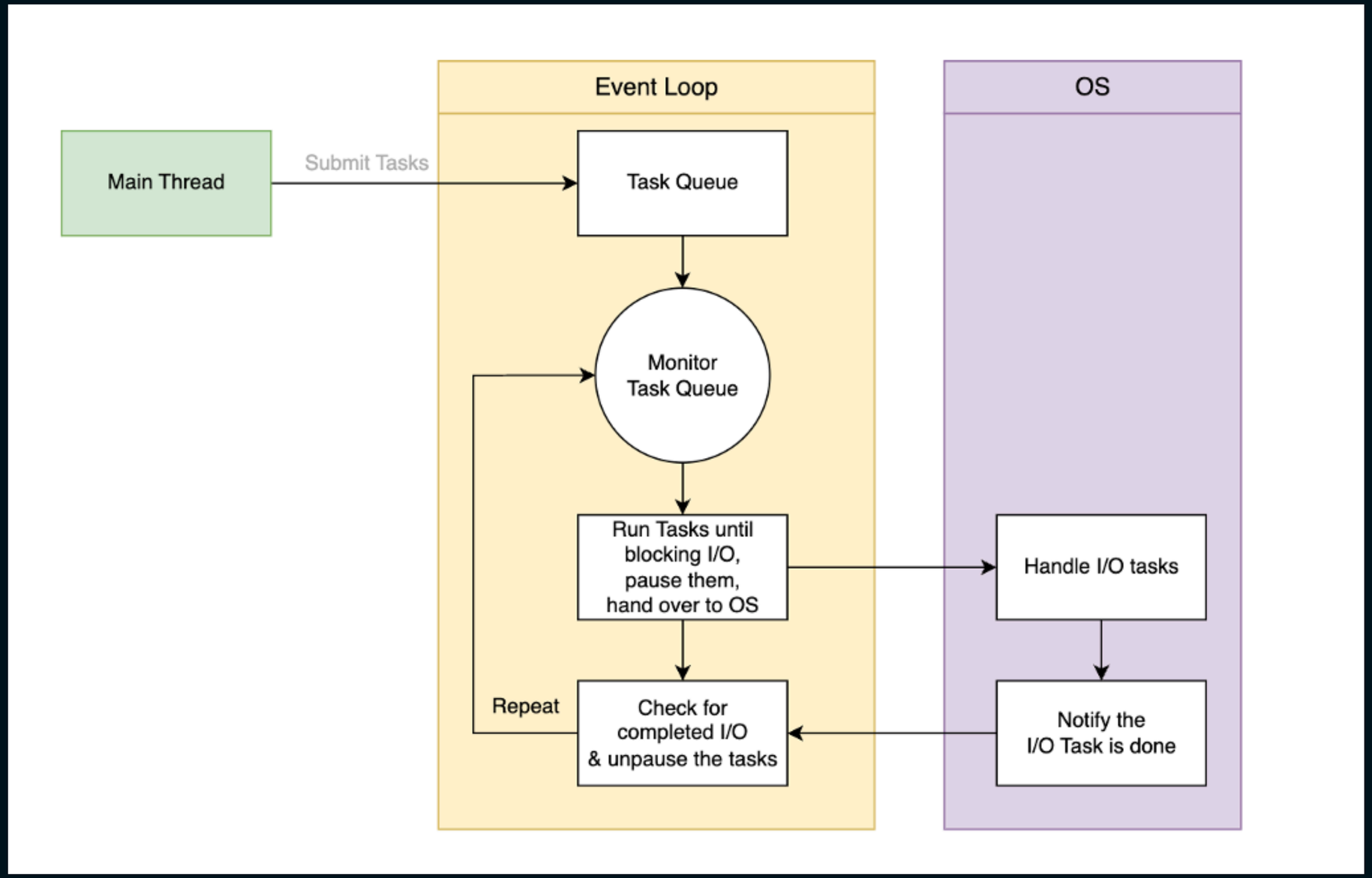
Many Cores

*Optional free threading was introduced in Python 3.13

Live Coding



How Does it Work ?


Event Loop
OS
Main Thread
Submit Tasks
Task Queue
Monitor
Task Queue
Run Tasks until
blocking I/O,
pause them,
hand over to OS
Handle I/O tasks
Repeat
Check for
completed I/O
& unpause the tasks
Notify the
I/O Task is done

- Python 2.2 -> Generators and yield
- Python 2.5 -> Generators support .send()
- Python 3.3 -> yield from
- Python 3.4 -> asyncio with @asyncio.coroutine
- Python 3.5 -> async / await

...

```python
from typing import Generator

def jumping_range(up_to: int) -> Generator[int, int, None]:
    index, jump = 0, 0
    while index < up_to:
        jump = yield index
        if jump is None:
            jump = 1
        index += jump

if __name__ == '__main__':
    iterator = jumping_range(5)
    print(next(iterator))    # 0
    print(iterator.send(2))  # 2
    print(next(iterator))    # 3
    print(iterator.send(-1)) # 2
```

```python
# Python 3.4
import asyncio

@asyncio.coroutine
def countdown(number, n):
    while n > 0:
        print('T-minus', n, '({})'.format(number))
        yield from asyncio.sleep(1)
        n -= 1

if __name__ == '__main__':
 loop = asyncio.get_event_loop()
 tasks = [
     asyncio.ensure_future(countdown("A", 2)),
     asyncio.ensure_future(countdown("B", 3))
 ]
 loop.run_until_complete(asyncio.wait(tasks))
 loop.close()
```

```python
@asyncio.coroutine
def py34_coro():
    yield from stuff()
```

```
>>> dis.dis(py34_coro)
  2           0 LOAD_GLOBAL
              3 CALL_FUNCTION
              6 GET_YIELD_FROM_ITER
              7 LOAD_CONST
             10 YIELD_FROM
             11 POP_TOP
             12 LOAD_CONST
             15 RETURN_VALUE
```

```python
async def py35_coro():
    await stuff()
```

```
>>> dis.dis(py35_coro)
  1           0 LOAD_GLOBAL
              3 CALL_FUNCTION
              6 GET_AWAITABLE
              7 LOAD_CONST
             10 YIELD_FROM
             11 POP_TOP
             12 LOAD_CONST
             15 RETURN_VALUE
```

https://docs.python.org/3/library/concurrency.html

https://docs.python.org/3/library/asyncio.html

https://realpython.com/python-concurrency

https://realpython.com/python-gil

https://realpython.com/async-io-python

https://snarky.ca/how-the-heck-does-async-await-work-in-python-3-5

https://github.com/donlelef/the-hitchhikers-guide-to-asyncio

The End

Ego Slide

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