

Python is slow and does not scale

`stefan.nordhausen@solarisbank.de`

Python is slow and does not scale

- Global Interpreter Lock (GIL)
- Dynamic typing
- No JIT
- CPython is slow

Challenge I

- Create a web server that
 - Serves 10,000 bytes of static content
 - At 10,000 requests per second
 - On 10,000 concurrent connections
 - Has just 10 lines of Python code
 - Supports WSGI

Challenge II

- Additionally
 - No C code
 - No compiling
 - No kernel tweaking
 - Just plain CPython and “apt install ...”

Non-scalable implementation

```
from gevent.pywsgi import WSGIServer

DATA = b"X" * 10000

def application(env, start_response):
    start_response('200 OK', [('Content-Type', 'application/text')])
    return [DATA]

server = WSGIServer(('0.0.0.0', 5000), application)
server.serve_forever()
```

- You need to “`apt install python3-gevent`” on Ubuntu

Scalable Implementation

```
import multiprocessing

from gevent.pywsgi import WSGIServer
DATA = b"X" * 10000

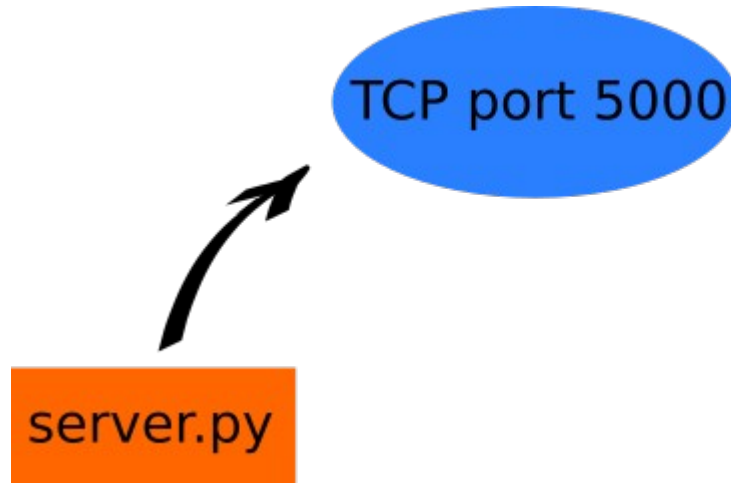
def application(env, start_response):
    start_response('200 OK', [('Content-Type', 'application/text')])
    return [DATA]

server = WSGIServer(('0.0.0.0', 5000), application)
server.init_socket()
for _ in range(multiprocessing.cpu_count()):
    multiprocessing.Process(target=server.serve_forever).start()
```

The important part is “`server.init_socket()`”

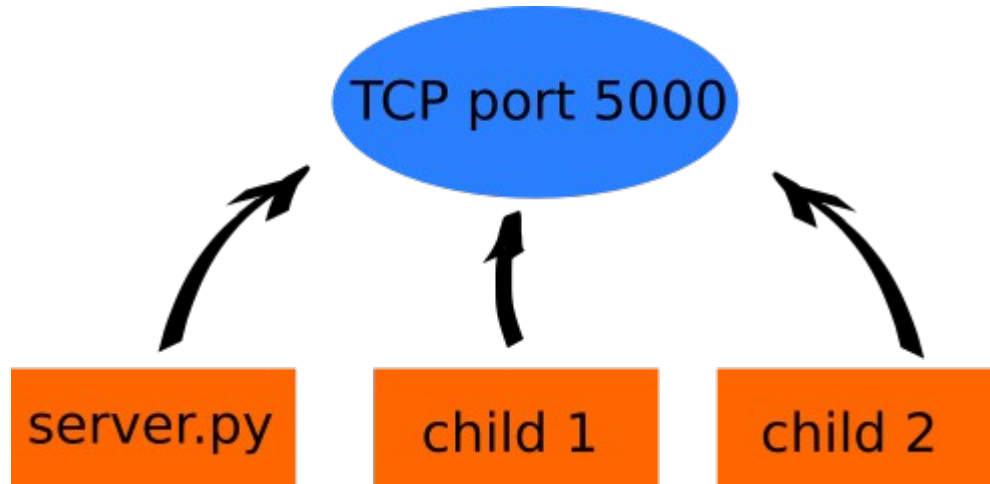
server.init_socket()

- Creates the TCP socket



multiprocessing.Process

- All child processes inherit the open TCP port



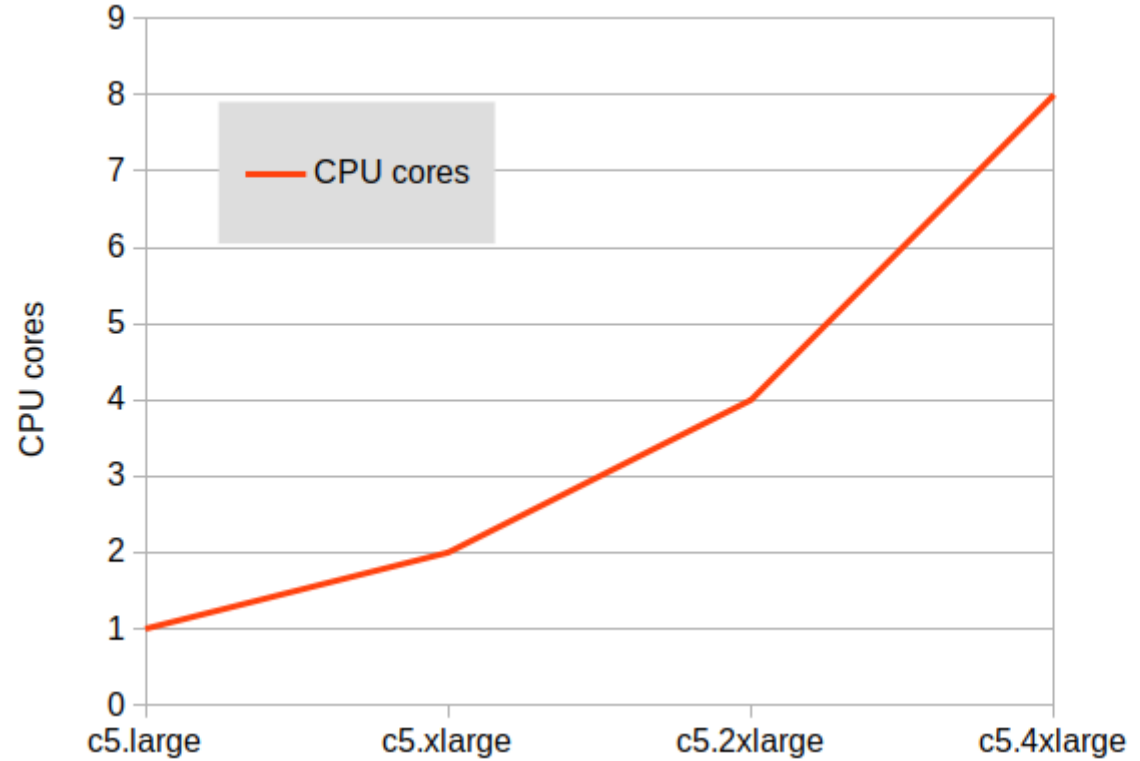
- Child processes launch web app
- Linux kernel does TCP load balancing
- Each child has its own GIL

Benchmarking

- AWS with “c5” instance type
- Amazon Linux 2
- In AWS, “2 vCPUs” mean “1 real CPU core + Hyper Threading”

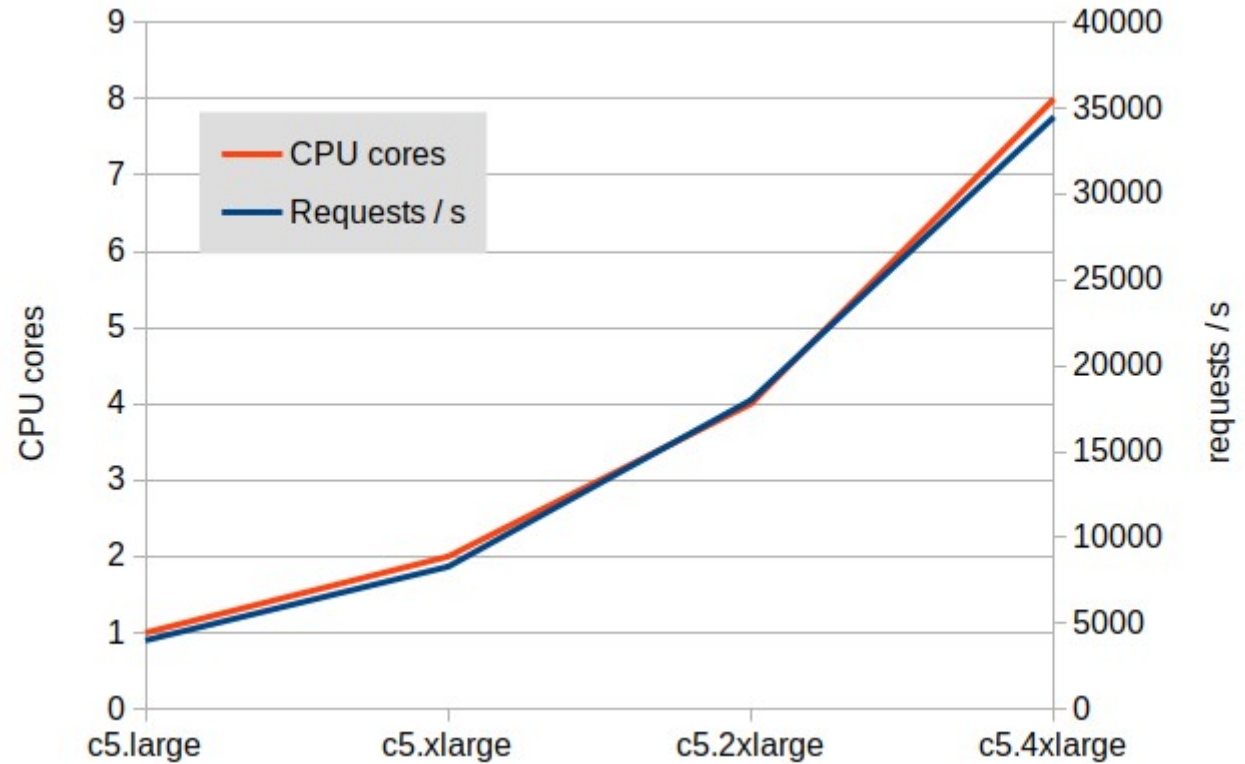
Benchmarking

- Tested with 1-8 real CPU cores



Results

- On 8 cores:
 - 34,500 requests / s
 - 10,000 connections
- Scales linearly with CPU cores
- Not bad for a language that is slow and does not scale



Purists will say

- All the heavy lifting is done by C code!
 - gevent
 - libev (used by gevent)
 - Linux kernel

Pragmatic Says

- I wrote Python code
- It worked

Thanks

- <https://github.com/snordhausen/pythonisslowanddoesnotscale>
- <https://github.com/gevent/gevent>
- stefan.nordhausen@solarisbank.de