

# PyPy hands on

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# PyPy hands on

- What is PyPy (briefly)?
- How to use it?
- How does it work?
- How to analyse performance?

# What is PyPy

- A python interpreter
- Features speed
- Together with a fully transparent JIT compiler

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# How to run PyPy

- `pypy program.py`
- That's it!
  - ▶ (modulo details)

# Challenge

- `html_fibo.py`
- HTML list of fibonacci numbers
- (the most complicate ever)
- run it on CPython
- run it on PyPy
- fix it!

# Refcounting vs generational GC (1)

gc0.py

```
def foo():  
    f = file('/tmp/bar.txt', 'w')  
    f.write('hello world')  
  
foo()  
print file('/tmp/bar.txt').read()
```

gc1.py

```
def foo():  
    f = file('/tmp/bar.txt', 'w')  
    f.write('hello world')  
    f.close() # <-----
```

gc2.py

```
def foo():  
    with file('/tmp/bar.txt', 'w') as f:  
        f.write('hello world')
```

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# Refcounting vs generational GC (2)

- `__del__`
  - ▶ especially files or sockets
  - ▶ don't leak file descriptors!
- weakrefs
- `finally` inside generators

# How the python interpreter works

- compiles down to bytecode
- executes it one instruction at a time
- (PyPy, Psyco) compiles it further down to assembler

# Just-in-Time Compilation

- Tracing JIT, like TraceMonkey
- Complete by construction
- Supports Intel x86, amd64, and soon ARM

# Short introduction to JITting

- run code with the interpreter
- observe what it does
- generate optimized machine code for commonly executed paths
- using runtime knowledge (types, paths taken)

# Tracing JIT

- compiles one loop at a time
- generates linear code paths, recording what the interpreter did
- for each possible branch, generate a guard, that exits assembler on triggering
- if guard fails often enough, start tracing from the failure

- `PYPYLOG=categories:logfile pypy program.py`
- categories:
  - ▶ gc-minor, gc-major
  - ▶ jit-log-noopt, jit-log-opt
  - ▶ jit-backend
  - ▶ jit-backend-counts

# Inspecting the JIT log

count.py

```
def count_mult_of_5(N):  
    mult = 0  
    not_mult = 0  
    for i in range(N):  
        if i % 5 == 0:  
            mult += 1  
        else:  
            not_mult += 1  
    return mult, not_mult
```

- PYPYLOG=jit-log-opt:mylog pypy count.py 2000
- PYPYLOG=jit-log-opt:mylog pypy count.py 10000



# The jitviewer

- `PYPYLOG=jit-log-opt,jit-backend-counts:mylog pypy count.py 2000`
- `PYPYLOG=jit-log-opt,jit-backend-counts:mylog pypy count.py 10000`
- `jitviewer.py log.pypylog`
- Look at the (missing) bridge!