Python 3
10 years later

EuroPython 2018, Edinburgh

Victor Stinner

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Victor Stinner

- CPython core developer since 2010
- Maintain Python for Red Hat
- Very happy user of Fedora and vim!

Autumn

Birth of Python 3000

2006: PEP 3000 “Python 3000”

Fix "Python warts":

- long vs int; new class vs old class
- int vs float division
- Unicode mess
- Comparisons
- Relative imports

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Risk management

- Don't break everything, only acknowledged warts
- Have an open community process for deciding what to change
- Don't reimplement the interpreter from scratch
- Plan end of life for Python 2

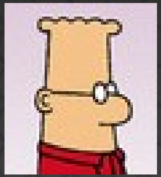
2008: Python 3.0 released

First migration plan

- Run 2to3 to port your whole code base at once: you're done! ...
- Drop Python 2 is a no-go, modules authors care of Python 2 users!
- All dependencies must be Python 3 compatible
- Python 2.7 was heavily used in production

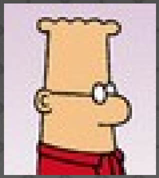
Technical debt

– Why should I let you work on Python 3 support?



– For all these new cool Python 3 features!

– Can we use these features?



– Well.... since we still have to support Python 2... no

Two branches in Git?

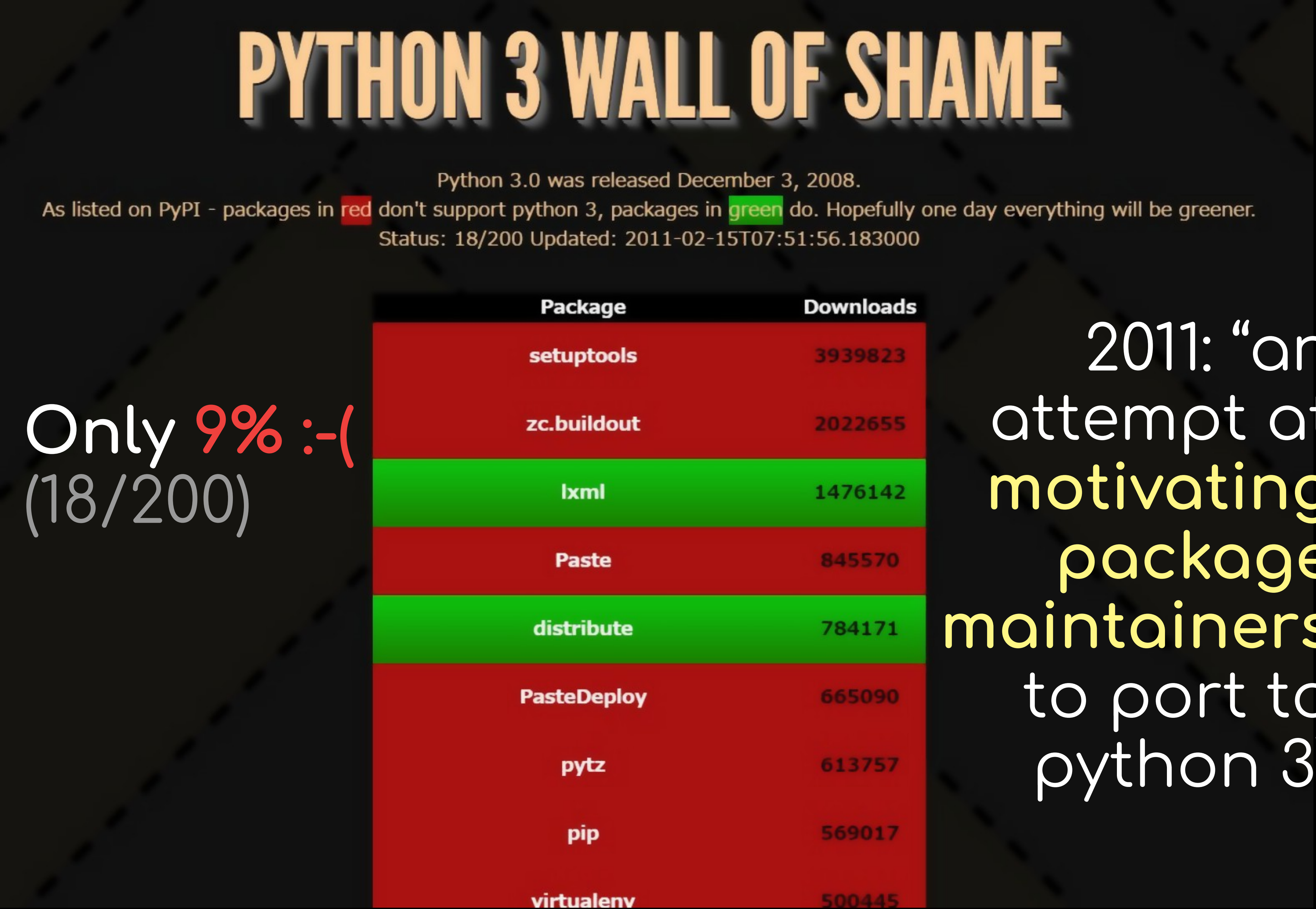
Some projects were forked to add Python 3 support.

- Same upstream, two names:
  dnspython → dnspython3
- Community fork:
  PIL → Pillow
- Upstream does not reply:
  MySQL-python → mysqlclient

Python 2.6 and 3.2

- Python 2.6 was the stable version when 3.0 was released
- It requires **unittest2** and more backports
- It requires heavy usage of the **six** module
- Python 3.2 requires **six.u("unicode")**; u"unicode" is a syntax error

Winter



PYTHON 3 WALL OF SHAME

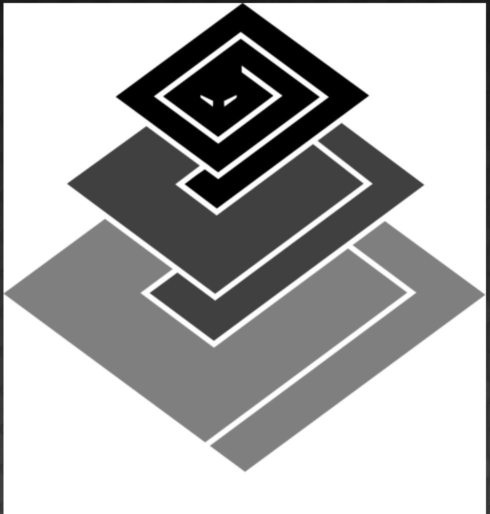
Python 3.0 was released December 3, 2008.
As listed on PyPI - packages in red don't support python 3, packages in green do. Hopefully one day everything will be greener.
Status: 18/200 Updated: 2011-02-15T07:51:56.183000

Package	Downloads
setuptools	3939823
zc.buildout	2022655
lxml	1476142
Paste	845570
distribute	784171
PasteDeploy	665090
pytz	613757
pip	569017
virtualenv	500445

Only 9% :-(
(18/200)

2011: “an attempt at motivating package maintainers to port to python 3”

Big Python 2 projects



Twisted

Heavy usage of **bytes**

Incomplete **Unicode** support

Python 3 trolls

- Python 3 doesn't bring anything
- Python 3 introduces new Unicode issues
- Using bytes is simpler

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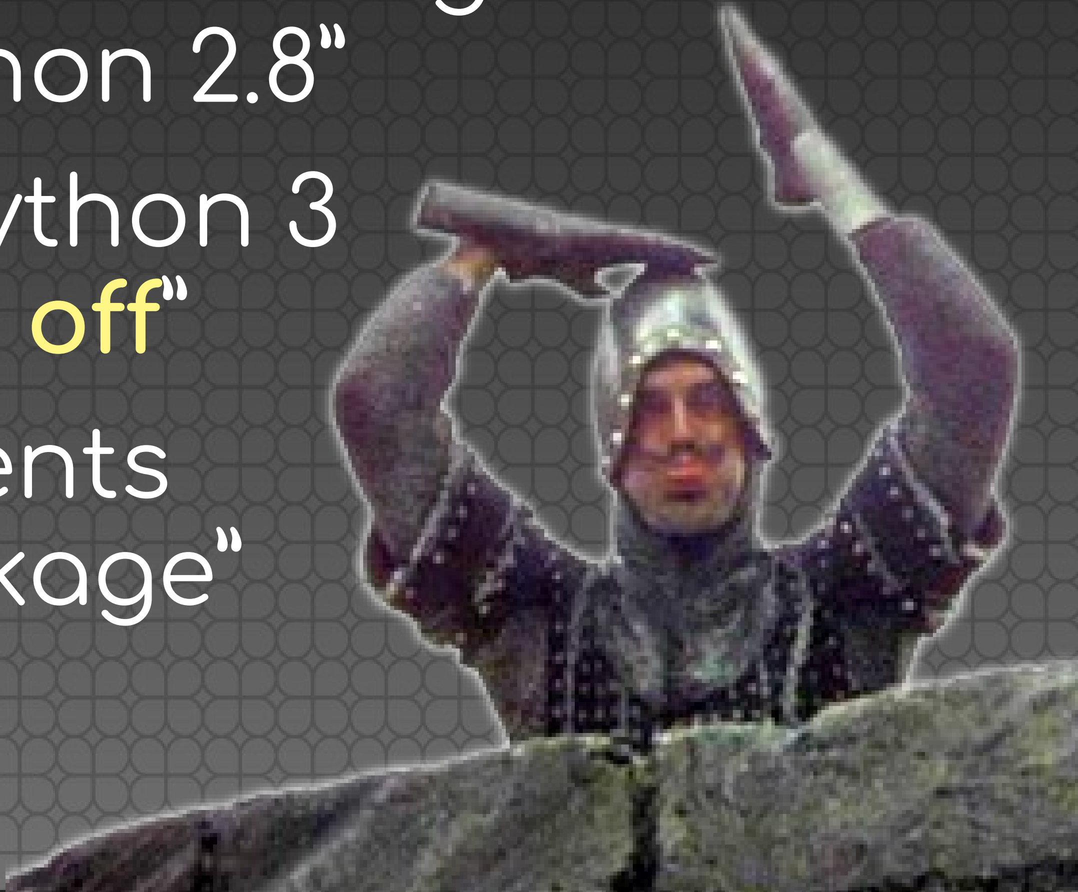
Python 2.8 idea

- Python 2.7 is alive: let's continue the development!
- 2014: LWN article "Debating a "transitional" Python 2.8"
- "concerns that Python 3 would never take off"
- "Python 3 represents under 2% of package"



No Python 2.8!

- 2011: PEP 404 (“PEP not found ;-)”) “Python 2.8 Un-release Schedule”
- 2013: 80% of top 50 projects supports Python 3
- 2014: Python 2.7 end of life extended by 5 years to 2020

Spring

Problem #1 solved!

“How to install a dependency?”
“How to install setuptools?”

- 2011: **pip 1.0** released
- 2014: Python 2.7.9 and 3.4 now come with **ensurepip**
- pip: **defacto installer**
- Linux distros with pip

New approach

- Stop promoting 2to3: don't remove Python 2 support
- Add Python 3 support
- New tools like modernize and sixer
- Incremental changes tested by a CI

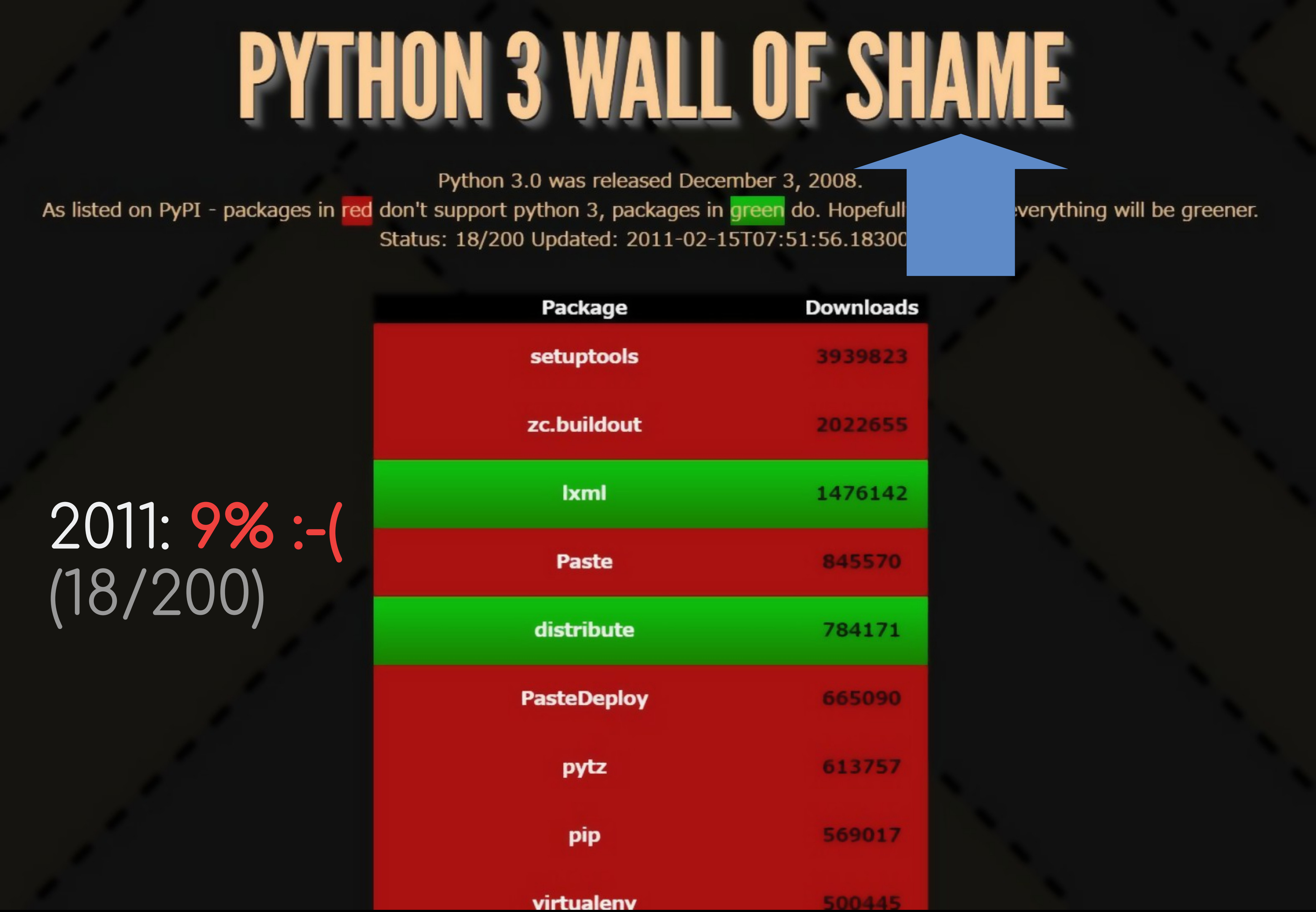
Large code base

- For legacy code bases: first **add new tests** to reduce the risk of regression
- Dropbox is working on **mypy** and **typing** to annotate types in their large code base

Building bridges

- 2012: Python 3.3 reintroduces **u"unicode"**
- 2015: Python 3.5 adds **bytes % args** (PEP 461)
- More py3k warnings added to Python 2.7
- More 2.7 backports: unittest2, enum34, ...

Summer



PYTHON 3 WALL OF SHAME

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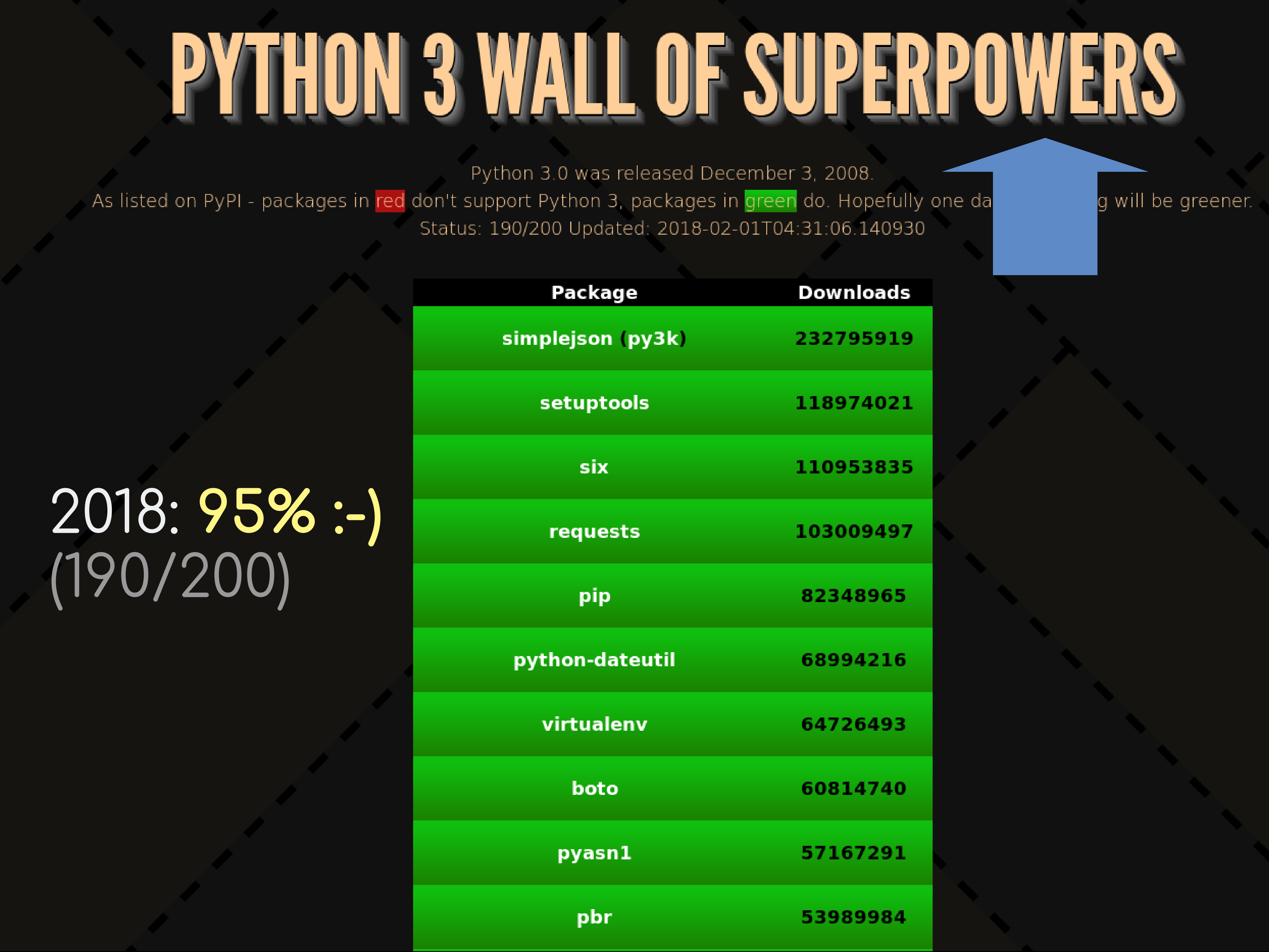
2011: 9% :-(
(18/200)



PYTHON 3 WALL OF SUPERPOWERS

Python 3.0 was released December 3, 2008.

As listed on PyPI - packages in red don't support Python 3, packages in green do. Hopefully one da g will be greener.

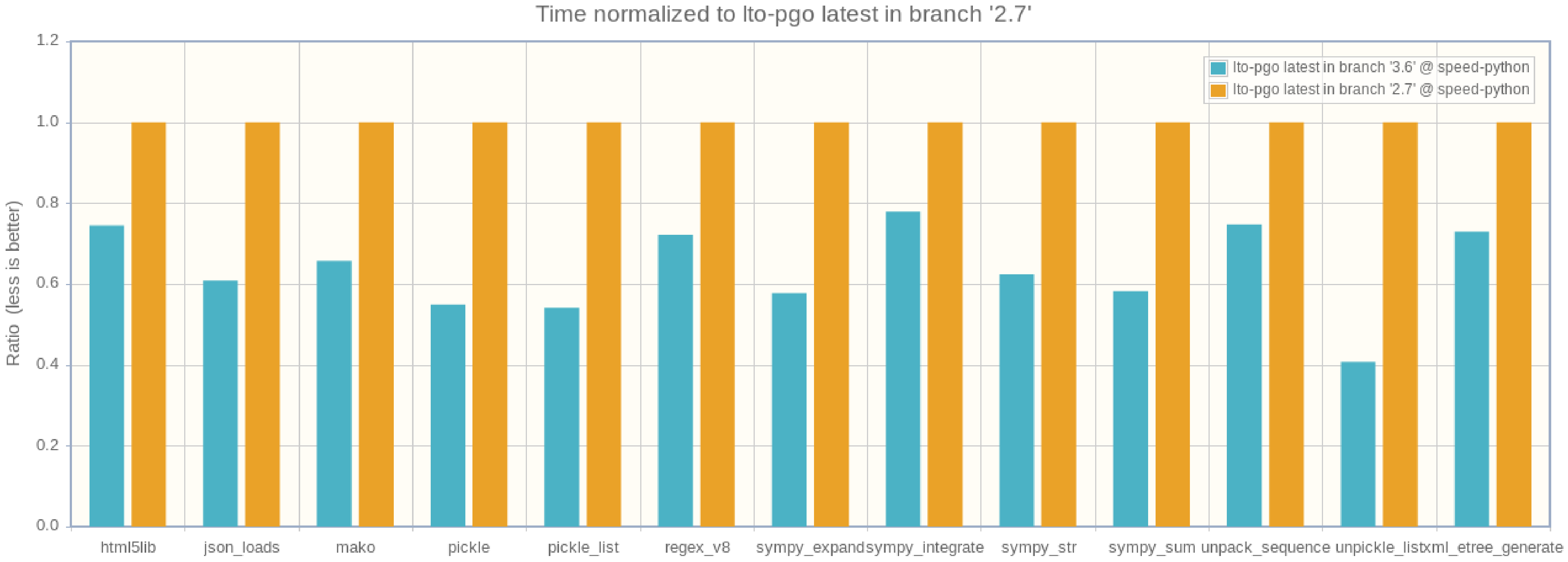
Status: 190/200 Updated: 2018-02-01T04:31:06.140930

Package	Downloads
simplejson (py3k)	232795919
setuptools	118974021
six	110953835
requests	103009497
pip	82348965
python-dateutil	68994216
virtualenv	64726493
boto	60814740
pyasn1	57167291
pbr	53989984

2018: 95% :-)

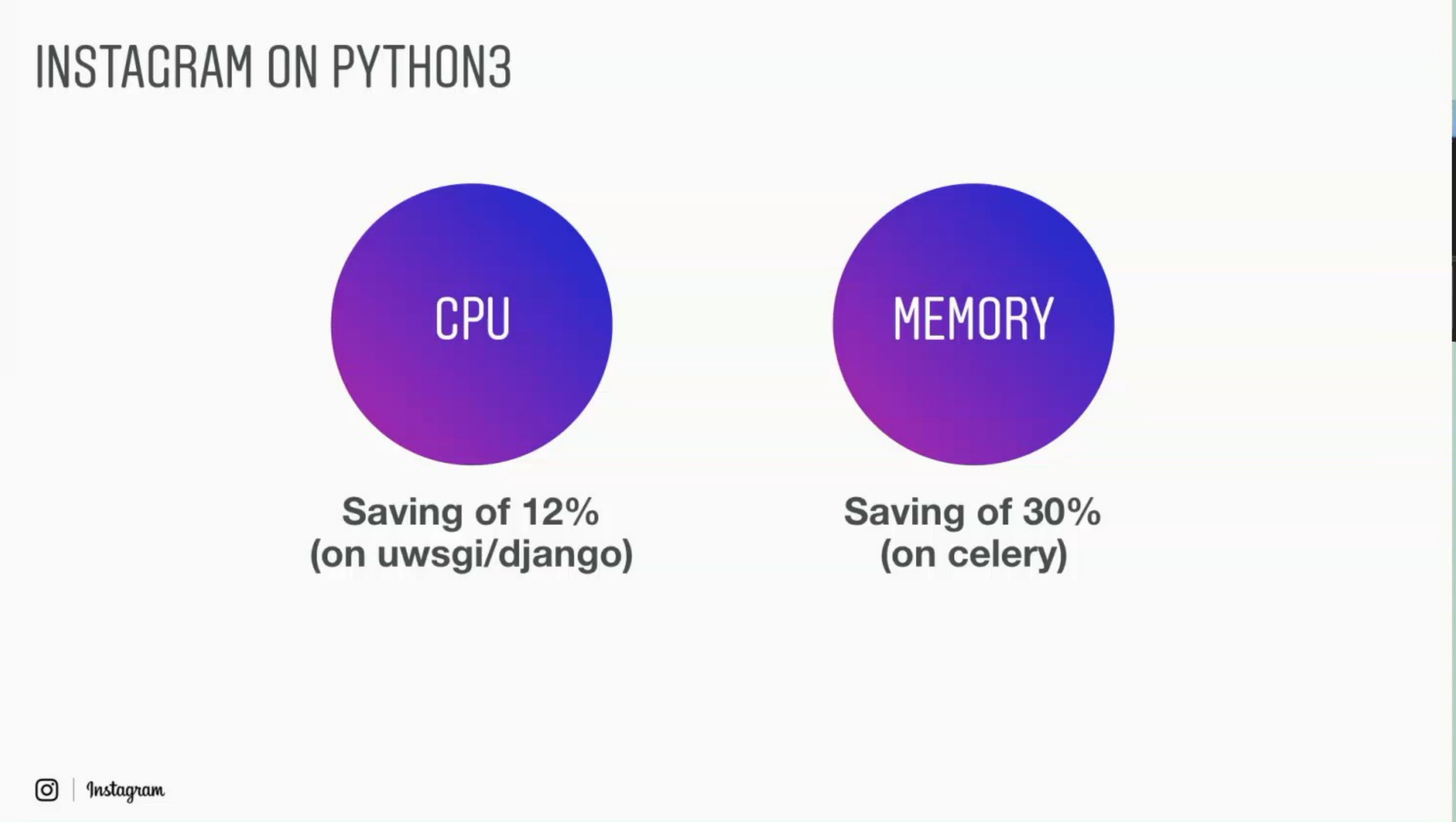
(190/200)

3.6 faster than 2.7



Results normalized to Python 2.7

lower = faster



INSTAGRAM ON PYTHON3

CPU

Saving of 12%
(on uwsgi/django)

MEMORY

Saving of 30%
(on celery)

Instagram

PORTLAND, OREGON
PYCON 2017

PORTLAND, OREGON
MAY 17 - 25 2017

Lisa Guo and Hui Ding Keynote

Python 2.7 WONTFIX

Backward compatibility prevents to fix Python 2.7 bugs:

- Unicode support
- Hash not randomized by default
- subprocess is not thread safe
- threading.RLock is not signal safe
- Internal clocks are not monotonic

Fixed in Python 3

- 3.3: time.monotonic() (PEP 418)
- 3.4: file descriptors non-inheritable, fork+exec safety (PEP 446)
- 3.5: retry syscalls on EINTR (PEP 475)
- “We are aware of the code breakage this is likely to cause, and doing it anyway for the good of mankind.” – Guido van Rossum PEP 446 approval

2.7 → 3.7 new modules

asyncio, concurrent.futures, contextvars, dataclasses, enum, ensurepip, faulthandler, importlib, importlib.resources, ipaddress, lzma, pathlib, secrets, selectors, statistics, tkinter.ttk, tracemalloc, typing, unittest.mock, venv, zipapp

😍 21 new modules 😍

Ingredients: Pork with Ham, Salt, Water, Modified Potato Starch, Sugar, Sodium Nitrite
SPAM®
Classic
U.S. INSPECTED AND PASSED BY DEPARTMENT OF AGRICULTURE
Serving Suggestion
NET WT 12 OZ (340g)

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f-string (PEP 498)

```
>>> name = "world"; print(f"Hello {name}!")
Hello world!
>>> print(f"Hello {name.title()}!")
Hello World!
>>> x = 1; y = 2; print(f"{x} + {y} = {x + y}")
1 + 2 = 3
>>> msg = f"{1+2}"; print(msg)
3
```

Python 3 coroutines

```
def generator():
    yield from range(5)

async def coroutine():
    return await async_read()

async def async_generator():
    yield …

[… async for it in async_gen()]
[await func() for func in funcs()]
```

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python™

New Python 3 syntax

- def func(arg, *, kw_only=None): …
- **print(msg, file=sys.stderr, end=”)**
- one, *tail = range(5)
  cmd = ['python3', *args, 'script.py']
  mydict = {"key": "value", **other_dict}

New Python 3 syntax

- million = **1_000_000**
- x**: int** = 5
- **with** open(...) as infp**,** open(...) as outfp: ...
- bytes **% args**
- matrix_multiplication = **a @ b**

Bury Python 2?

- Fedora 23 (2015), Ubuntu 17.10 (2017): no python2 in the base system
- python3statement.org
- pythonclock.org
- 2017: IPython 6.0 and Django 2 are Python 3 only

RHEL

RHEL 7.5: Python 2 has been deprecated and **will be replaced with Python 3** in the next Red Hat Enterprise Linux major release.

Software Collections (SCL):

- Python 3.6: RHEL/Centos 7
- Python 3.5: RHEL/Centos 6 & 7
- Supported 3 years (ex: 2.7 SCL gone)

Javascript approach

- Daniel Esposti’s talk "Evolution or stagnation programming languages" (last Friday at Pycon IT)
- Javascript language evolved without breaking the backward compatibility
- Transpilling using Babel & polyfill: run newer Javascript on old JS VM

Python 4?

Questions?

Reach me at:

- Email: vstinner@redhat.com
- Twitter: @VictorStinner
- IRC (Freenode): vstinner

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Sprint

CPython sprint this weekend: join us!

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