Building Serverless applications with Python

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Italy, Otto

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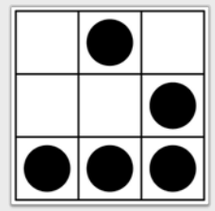
Andrii Soldatenko

- Senior Python Developer at toptal
- CTO at Persollo
- Co-organizer PyCon Belarus 2017 PyCon Belarus '17
- Speaker at many PyCons and open source contributor
- blogger at https://asoldatenko.com



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…in the next few years we're going to see the first billion-dollar startup with a single employee, the founder, and that engineer will be using **serverless** technology.

James Governor
Analyst & Co-founder at RedMonk

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Origins of “Serverless”

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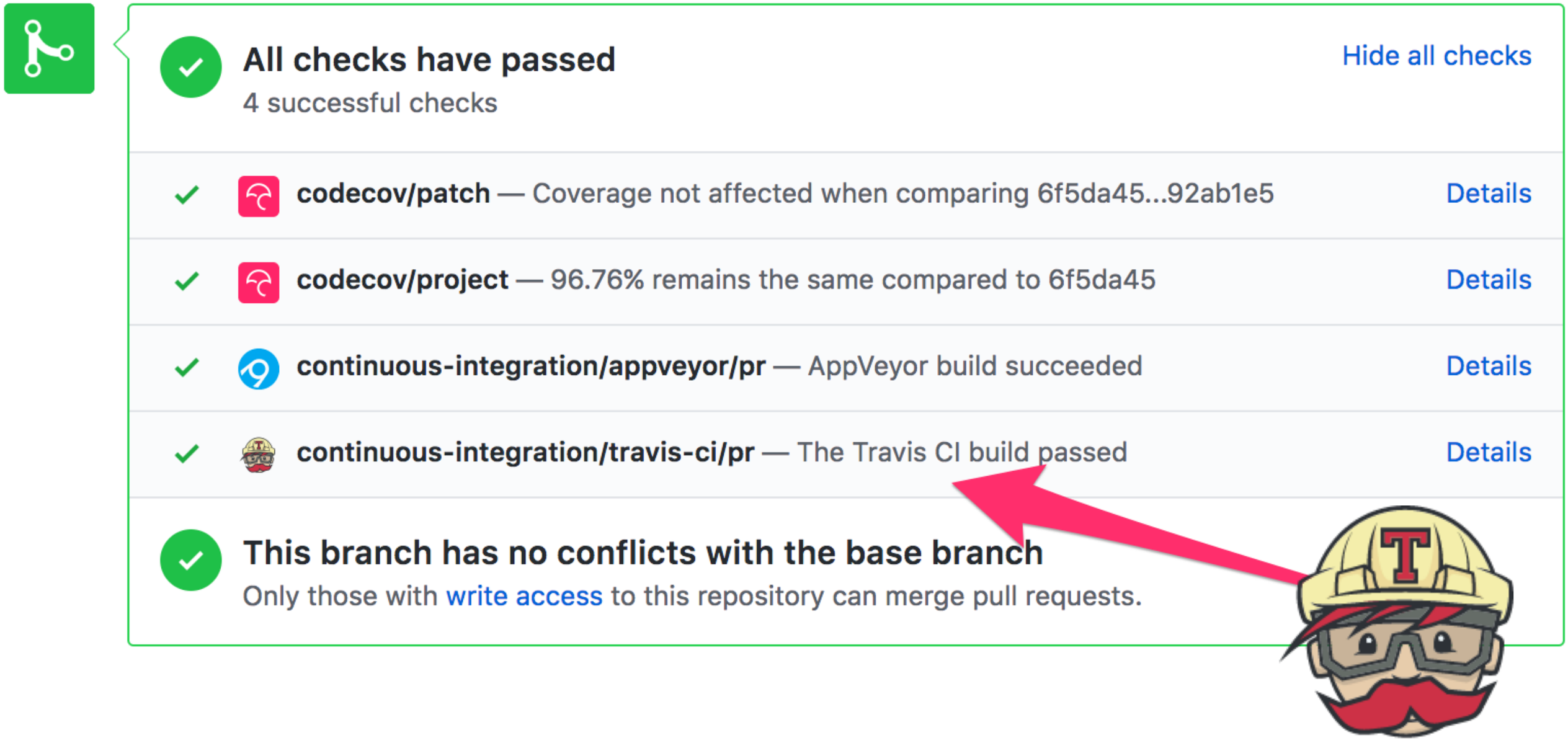
Origins of

serverless

http://readwrite.com/2012/10/15/why-the-future-of-software-and-apps-is-serverless/

Travis CI


All checks have passed
4 successful checks
Hide all checks
codecov/patch — Coverage not affected when comparing 6f5da45...92ab1e5
Details
codecov/project — 96.76% remains the same compared to 6f5da45
Details
continuous-integration/appveyor/pr — AppVeyor build succeeded
Details
continuous-integration/travis-ci/pr — The Travis CI build passed
Details
This branch has no conflicts with the base branch
Only those with write access to this repository can merge pull requests.


P
S
F
$\dot{M} = \sqrt{\mu}/a^{3/2} = n/k$
$\dot{E} = \sqrt{\mu}/r\sqrt{a}$
$r^2\dot{V} = x_\omega \dot{y}_\omega - y_\omega \dot{x}_\omega = \sqrt{\mu p}$
$\dot{r}r = x_\omega \dot{x}_\omega + y_\omega \dot{y}_\omega = e y_\omega \sqrt{\mu/p} = \sqrt{\mu a}\, e \sin E$
$r\dot{x}_\omega = -y_\omega \sqrt{\mu/p} = -\sqrt{\mu a} \sin E$
$r\dot{y}_\omega = (x_\omega + er)\sqrt{\mu/p}$
$\dot{y}_\omega = (\cos v + e)\sqrt{\mu/p}$
$\dot{x}_\omega = -(\sin v)\sqrt{\mu/p}$
$c = ae = CF = CF_2$
$\mu = m_1 + m_2$
$n = \frac{2\pi}{p} = k\sqrt{\mu}\, a^{-3/2}$
$\tau = k(t - t_0)$
$\ddot{x} = \frac{d\dot{x}}{d\tau} = -\frac{\mu x}{r^3}$
$\frac{d\dot{x}}{d\tau} = -k^2 \mu \frac{x}{r^3}$

Later in 2014...

Amazon introduce AWS Lambda

https://techcrunch.com/2015/11/24/aws-lamda-makes-serverless-applications-a-reality/

What about conferences?

http://serverlessconf.io/

How Lambda works

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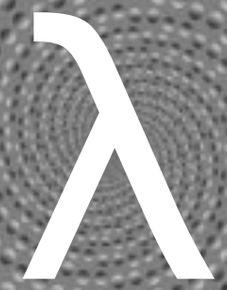

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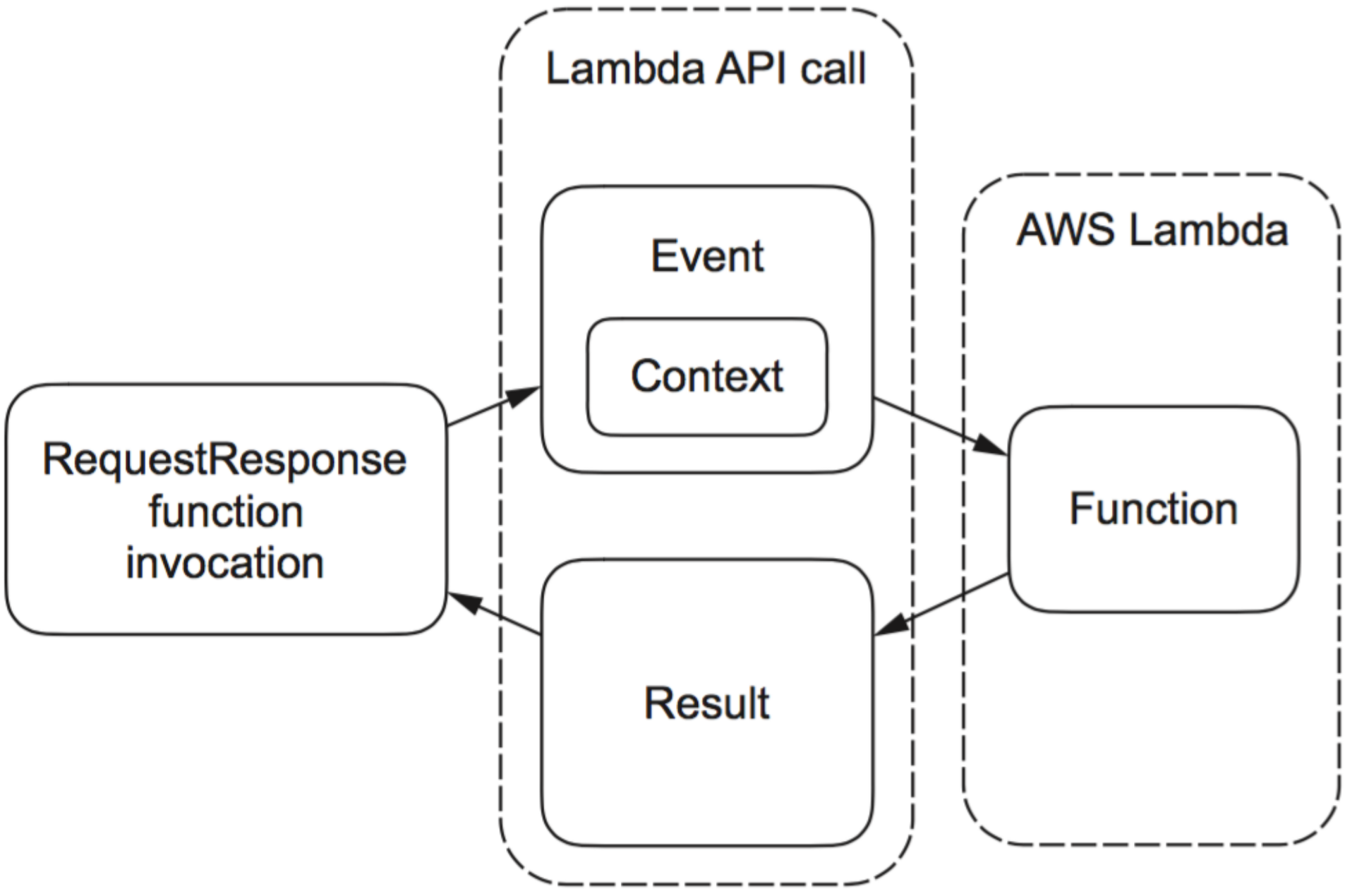
How Lambda works



How Lambda works

- function name;
- memory size
- timeout;
- role;

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Your first λ function

```
def lambda_handler(event, context):
    message = 'Hello {}!'.format(event['name'])
    return {'message': message}
```

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Deploy λ function

```
#!/usr/bin/env bash
python -m zipfile -c hello_python.zip hello_python.py

aws lambda create-function \
   --region us-west-2 \
   --function-name HelloPython \
   --zip-file fileb://hello_python.zip \
   --role arn:aws:iam::278117350010:role/lambda-s3-
execution-role  \
   --handler hello_python.my_handler \
   --runtime python2.7 \
   --timeout 15 \
   --memory-size 512
```

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Invoke λ function

```
aws lambda invoke \
        --function-name HelloPython \
        --payload '{"name":"PyCon
Italy"}' output.txt

cat output.txt
{"message": "Hello PyCon Italy!"}%
```

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Amazon API Gateway

Resource	HTTP verb	AWS Lambda
/books	GET	get_books
/book	POST	create_book
/books/{ID}	PUT	chage_book
/books/{ID}	DELETE	delete_book

Chalice python micro framework

https://github.com/awslabs/chalice

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Chalice python micro framework

```
$ cat app.py
from chalice import Chalice

app = Chalice(app_name='hellopyconit')
```

```
@app.route('/books', methods=['GET'])
def get_books():
    return {'hello': 'from python library'}
...
...
...
```

https://github.com/awslabs/chalice

Chalice python micro framework

```
...
...
...
@app.route('/books/{book_id}', methods=['POST', 'PUT', 'DELETE'])
def process_book(book_id):
    request = app.current_request
    if request.method == 'PUT':
        return {'msg': 'Book {} changed'.format(book_id)}
    elif request.method == 'DELETE':
        return {'msg': 'Book {} deleted'.format(book_id)}
    elif request.method == 'POST':
        return {'msg': 'Book {} created'.format(book_id)}
```

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Chalice deploy

```
chalice deploy
Updating IAM policy.
Updating lambda function...
Regen deployment package...
Sending changes to lambda.
API Gateway rest API already
found.
Deploying to: dev
https://8rxbsnge8d.execute-api.us-
west-2.amazonaws.com/dev/
```

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Try our books API

```
curl -XGET https://8rxbsnge8d.execute-
api.us-west-2.amazonaws.com/dev/books
{"hello": "from python library"}%
```

```
curl -XGET https://8rxbsnge8d.execute-
api.us-west-2.amazonaws.com/dev/books/15
{"message": "Book 15"}%

curl -XDELETE https://8rxbsnge8d.execute-
api.us-west-2.amazonaws.com/dev/books/15
{"message": "Book 15 has been deleted"}%
```

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Chalice under the hood

- botocore;
- typing;

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Chalice under the hood

chalice delete #40

Open **pauldeden** opened this issue on Jul 12, 2016 · 5 comments

pauldeden commented on Jul 12, 2016 — Contributor

I love the simplicity of the chalice CLI, but feel there is one more command to add to complete the feature set. That is a `chalice delete` (or named something similar) command.

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AWS Serverless Application Model

MEET SAM.

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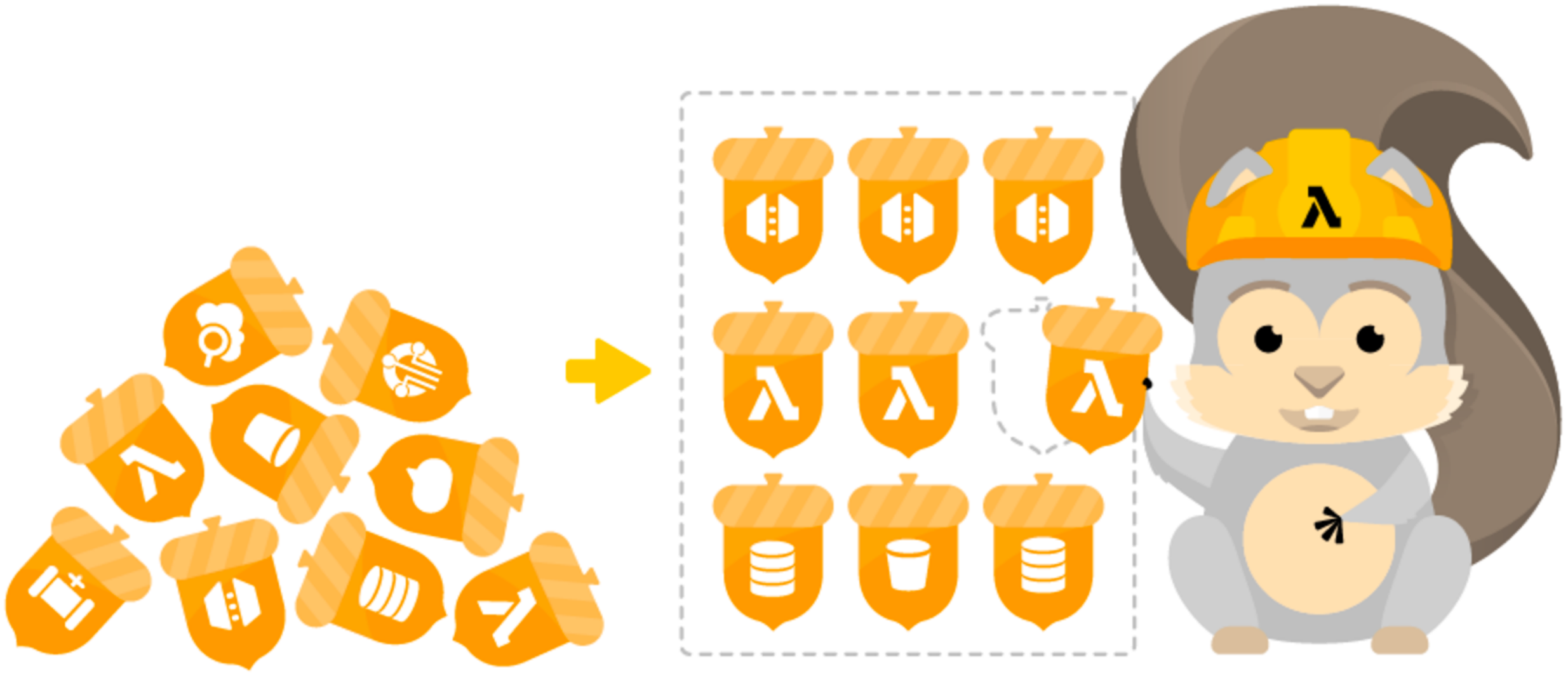
AWS SAM



USE SAM TO BUILD TEMPLATES THAT DEFINE
YOUR SERVERLESS APPLICATIONS.

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AWS lambda Limits

AWS Lambda Resource Limits

Resource	Default Limit
Ephemeral disk capacity ("/tmp" space)	512 MB
Number of file descriptors	1,024
Number of processes and threads (combined total)	1,024
Maximum execution duration per request	300 seconds
Invoke request body payload size (RequestResponse)	6 MB
Invoke request body payload size (Event)	128 K
Invoke response body payload size (RequestResponse)	6 MB

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AWS Lambda without any costs

- The first 400,000 seconds of execution time with 1 GB of memory

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What if you want to run your Django app?

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Top 10 Python libraries of 2016

1. Zappa

Since the release of **AWS Lambda** (and **others** that **have followed**), all the rage has been about **serverless architectures**. These allow microservices to be deployed in the cloud, in a fully managed environment where one doesn't have to care about managing any server, but is assigned stateless, ephemeral *computing containers* that are fully managed by a provider. With this paradigm, events (such as a traffic spike) can trigger the execution of more of these *containers* and therefore give the possibility to handle "infinite" horizontal scaling.

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And again what do you mean “serveless”?

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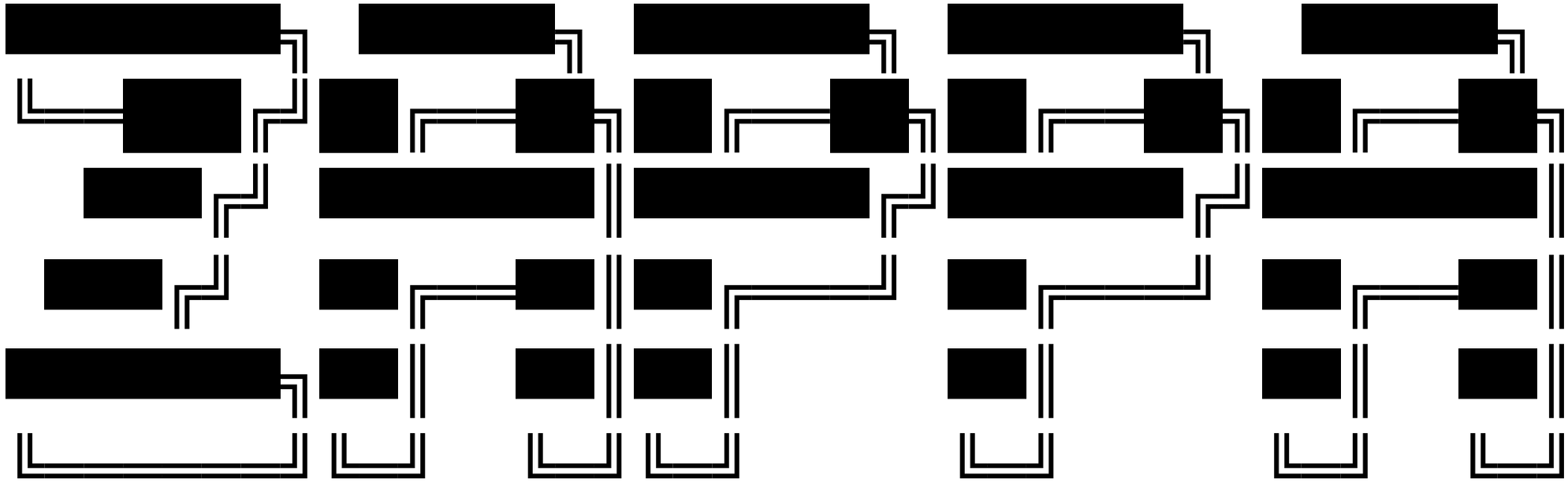
```
➜ pip install zappa
➜ zappa init
```



```
Welcome to Zappa!
...
➜ zappa deploy
```

https://github.com/Miserlou/Zappa

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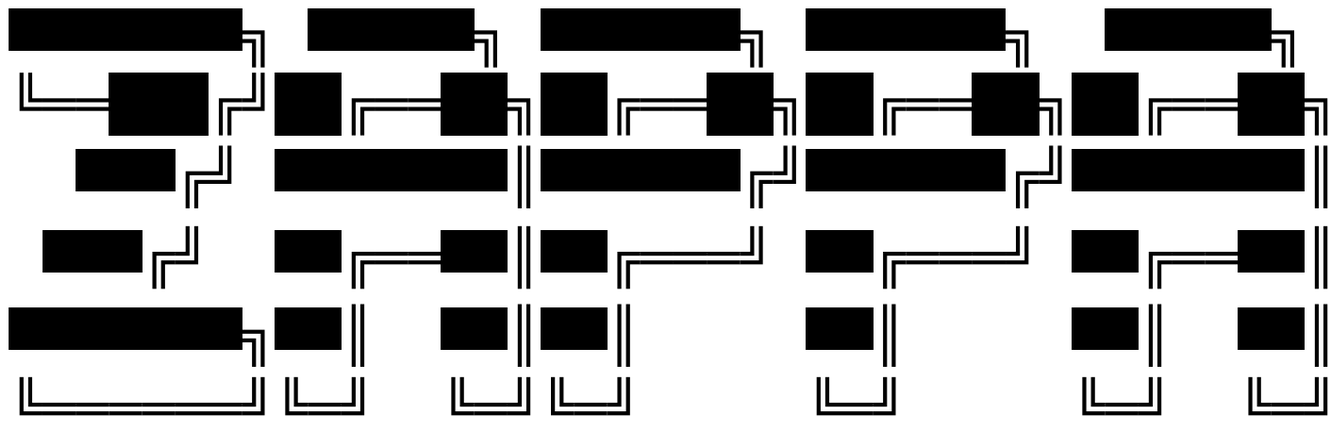

- deploy;
- tailing logs;
- run django manage.py
- ...

https://github.com/Miserlou/Zappa

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AWS lambda Limits

AWS Lambda supports the following runtime versions:

- Node.js – v4.3.2 and 6.10
- Java – Java 8
- Python – Python 2.7
- .NET Core – .NET Core 1.0.1 (C#)

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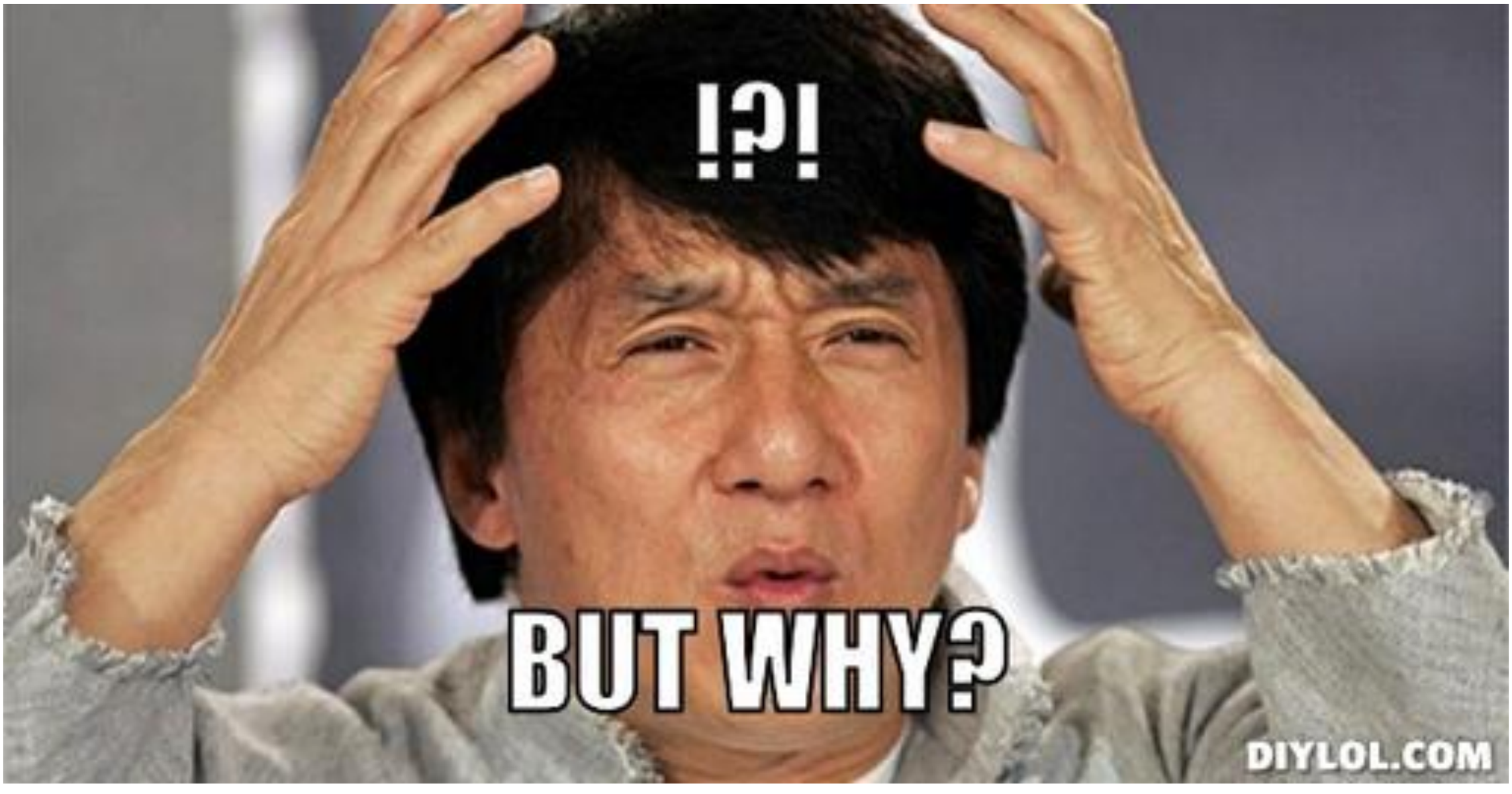
Python 2.7



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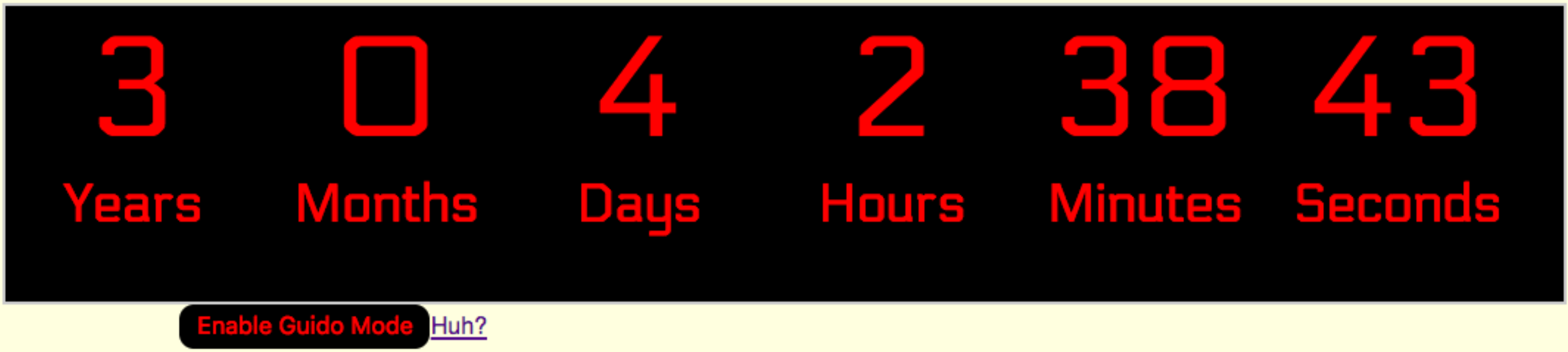
Python 2.7 will retire in...



https://pythonclock.org/

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AWS lambda and Python 3

```
import os

def lambda_handler(event, context):
    txt = open('/etc/issue')
    print txt.read()
    return {'message': txt.read()}
```

Amazon Linux AMI release 2016.03
Kernel \r on an \m

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AWS lambda and Python 3

```
import subprocess

def lambda_handler(event, context):
    args = ('uname', '-a')
    popen = subprocess.Popen(args,
stdout=subprocess.PIPE)
    popen.wait()
    output = popen.stdout.read()
    print(output)
```

Linux ip-10-11-15-179 4.4.51-40.60.amzn1.x86_64 #1 SMP Wed Mar 29 19:17:24 UTC 2017 x86_64 x86_64 x86_64 GNU/Linux

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AWS lambda and Python 3

```
import subprocess

def lambda_handler(event, context):
    args = ('which', 'python3')
    popen = subprocess.Popen(args,
stdout=subprocess.PIPE)
    popen.wait()
    output = popen.stdout.read()
    print(output)
```

YAHOOO!!:

python3: /usr/bin/python3 /usr/bin/python3.4m /usr/bin/python3.4 /usr/lib/python3.4 /usr/lib64/python3.4 /usr/local/lib/python3.4 /usr/include/python3.4m /usr/share/man/man1/python3.1.gz

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Run python 3 from python 2

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Prepare Python 3 for AWS Lambda

```
virtualenv venv -p `which python3.4`
pip install requests

zip -r lambda_python3.zip venv

python3_program.py lambda.py
```

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Run python 3 from python 2

```
cat lambda.py
import subprocess

def lambda_handler(event, context):
    args = ('venv/bin/python3.4',
'python3_program.py')
    popen = subprocess.Popen(args,
stdout=subprocess.PIPE)
    popen.wait()
    output = popen.stdout.read()
    print(output)
```

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Run python 3 from python 2

START RequestId: 44c89efb-1bd2-11e7-bf8c-83d444ed46f1
Version: $LATEST
Python 3.4.0
END RequestId: 44c89efb-1bd2-11e7-bf8c-83d444ed46f1
REPORT RequestId: 44c89efb-1bd2-11e7-bf8c-83d444ed46f1

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Thanks Lyndon Swan for ideas about hacking python 3

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Future of serverless

The biggest problem with Serverless FaaS right now is tooling. Deployment / application bundling, configuration, monitoring / logging, and debugging all need serious work.

MEET SAM.

https://github.com/awslabs/serverless-application-model/blob/master/HOWTO.md

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Thank You

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Questions

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