Python microservices on PaaS done right

Michał Bultrowicz

About me

- Work at Intel Technology Poland.
- I do backend services.
- Sadly, mainly in Java.
- I did some C++ security...
- ...and multiplatform distributed automated testing soft.
- I really, really like Python.
- It’s my first time presenting.

Thanks for the help

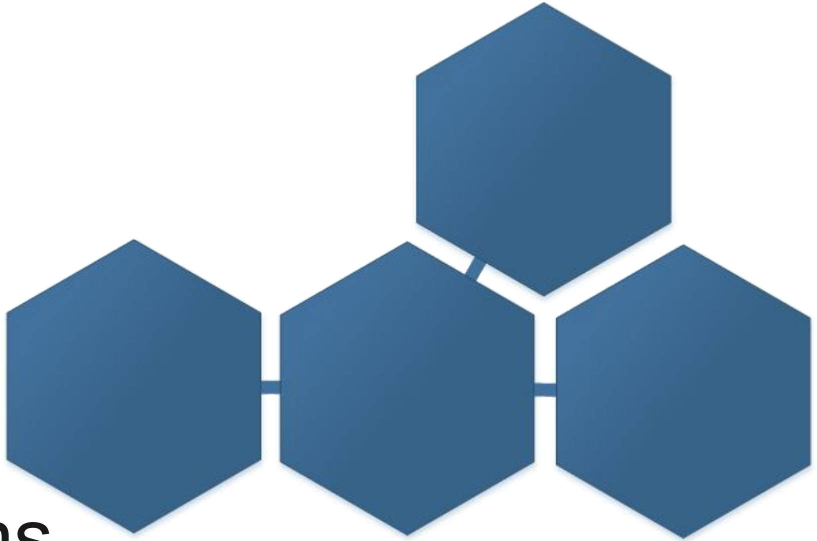
Izabela Irzyńska

Agenda

1. Microservices introduction.
2. PaaS introduction.
3. Ingredients of a sane project (with microservices and PaaS).
4. Using Python for that project.
5. Other tools and procedures that you need.

Microservices

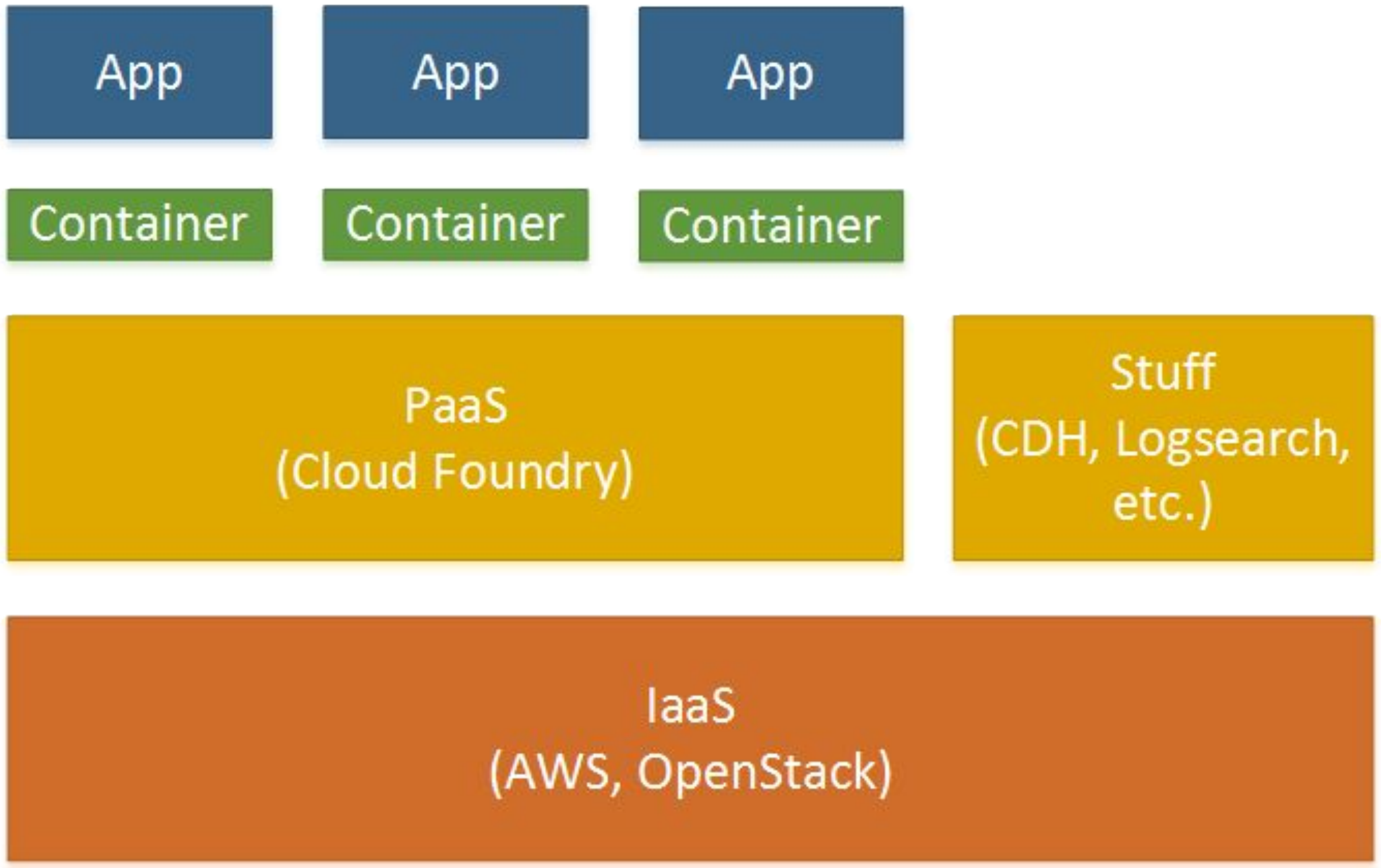
- Independant
- Cooperating
- Scale well (e.g. Netflix)
- “Small”
- 12factor.net
- Way to handle big teams



Platform as a Service

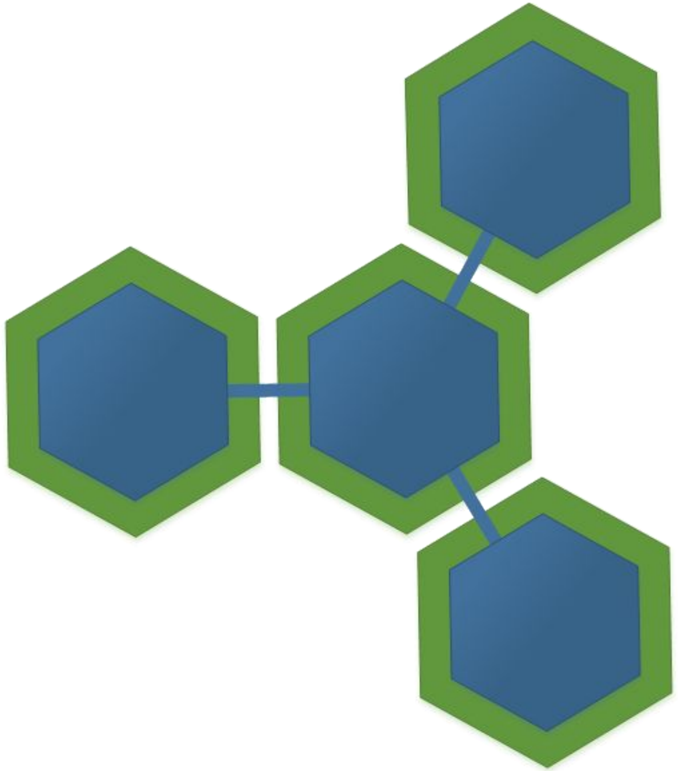
- Cloud for applications, not (virtual) machines
- Encapsulates applications
- Eases connecting apps together
- Simplifies deployment
- Helps with logging

http://www.paasify.it/vendors


App
App
App
Container
Container
Container
PaaS
(Cloud Foundry)
Stuff
(CDH, Logsearch, etc.)
IaaS
(AWS, OpenStack)

Microservices on PaaS

- The way to go
- Increase the benefits
- Easy scaling
- Adaptability
- Testable
- Measurable



Not a silver bullet

- Really painful without good automation
- Communication overhead
- Performance overhead
- Risky to start without a monolith

http://martinfowler.com/bliki/MonolithFirst.html

Microservices requirements

1. Twelve factor applications
2. Automated multi-tier testing
3. Continuous delivery pipeline
4. Insight/metrics
5. Proper management
6. Platform versioning

Why use Python for that?

- As many features/libraries as anything else (or more).
- Fast prototyping.
- Easy testing (but static type checking wouldn’t hurt...).
- Good at loose coupling
- Deterministic garbage collection (weakref)
- It’s enjoyable.
- More...

Sufficient performance

- Don’t trust me! Or anyone! (with benchmarks)
- Falcon + uWSGI vs. Spring Boot + Tomcat

	Req/s	mean ms/req	failed reqs	50th pct < (ms)	75th pct < (ms)	95th pct < (ms)	99th pct < (ms)	Max
Falcon	722	1490	2.8%	59	1038	11782	22376	52193
Spring	585	5924	0.7%	5421	6484	11293	28092	39639

The app

- Enter Falcon!
- Light!
- Fast!
- No magic!
- ...young…
- I’m not on the team

```
# app.py

import falcon
import json

class SampleResource:

    @staticmethod
    def on_get(req, resp):
        resp.body = 'Hello world\n'


app = falcon.API()
app.add_route('/', SampleResource())
```

http://falconframework.org/

```python
# app.py

import falcon
import json

class SampleResource:

    @staticmethod
    def on_get(req, resp):
        resp.body = 'Hello world\n'

    # THE NEW THING
    @staticmethod
    def on_post(req, resp):
        """
        Given JSON input returns a JSON with only the keys that start with "A" (case insensitive).
        """
        if req.content_type != 'application/json':
            raise falcon.HTTPUnsupportedMediaType('Media type needs to be application/json')
        # PYTHON 3
        body_json = json.loads(req.stream.read().decode('utf-8'))
        resp.body = json.dumps({key: value for key, value in body_json.items() if key.lower().startswith('a')})


app = falcon.API()
app.add_route('/', SampleResource())
```

CloudFoundry app

```
example_app
├── example_app
│   └── app.py
├── tests
│   ├── test_app.py
│   └── requirements.txt
├── service_tests
│   ├── test_service.py
│   └── requirements.txt
├── requirements.txt
├── tox.ini
├── manifest.yml
├── runtime.txt
└── .cfignore
```

manifest.yml

```yaml
---
applications:
- name: example-app
  command: uwsgi --http :$VCAP_APP_PORT --module example_app:app # etc.
  memory: 128M
  buildpack: python_buildpack
  services:
    - redis30-example
    - other-example-app-service
  env:
    LOG_LEVEL: "INFO"
    VERSION: "0.0.1"
```

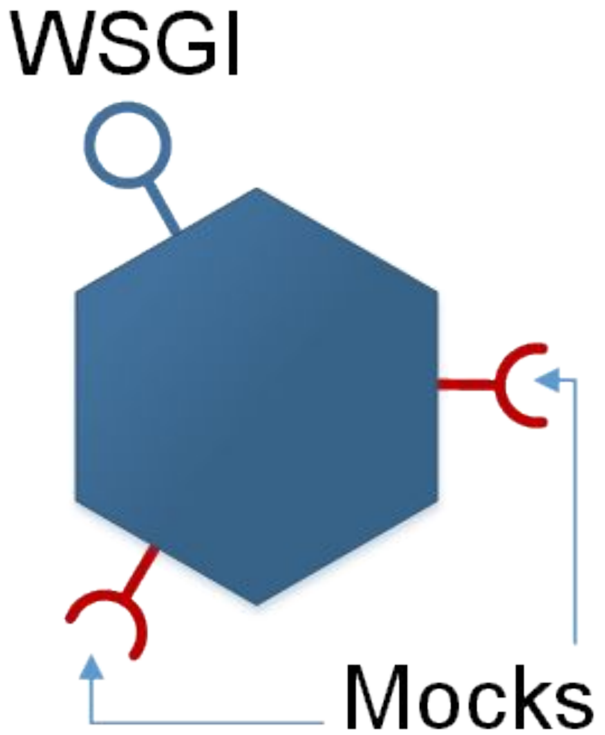
Continuous delivery

DO IT OR DIE

CD flow

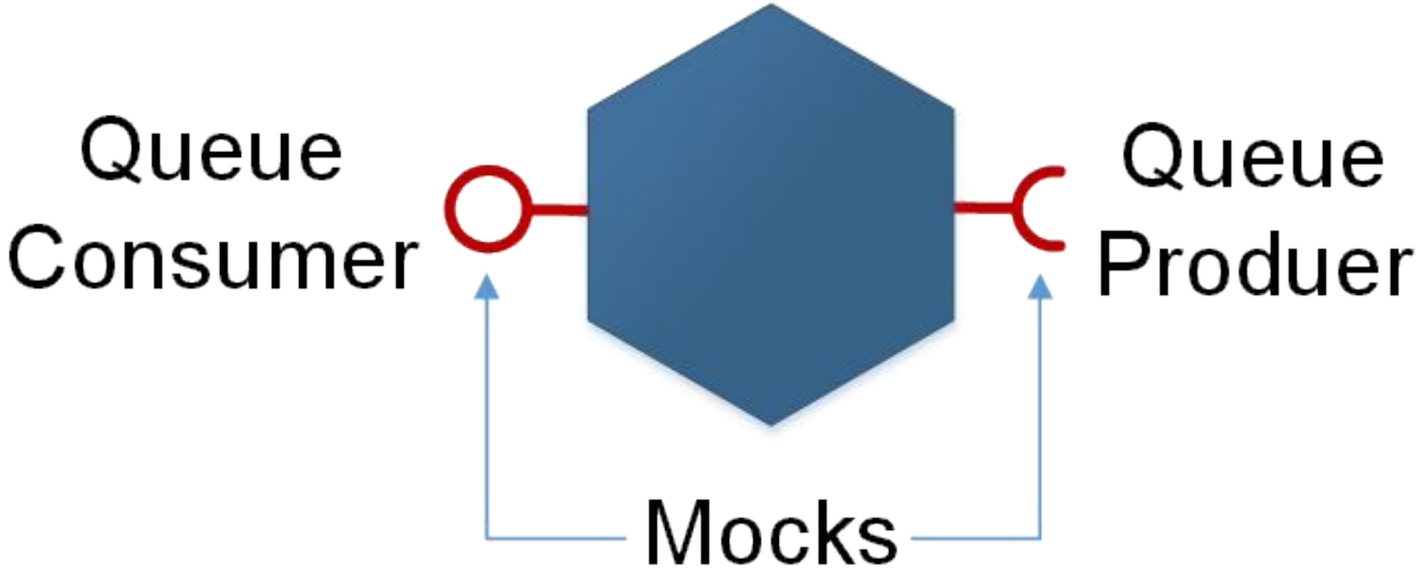
```
$ git clone --recursive <app_repo>
$ tox
$ bumpversion micro
$ cf push
$ python3 test_e2e.py
$ cf target <production_env>
$ cf push
```

Unit testing - HTTP

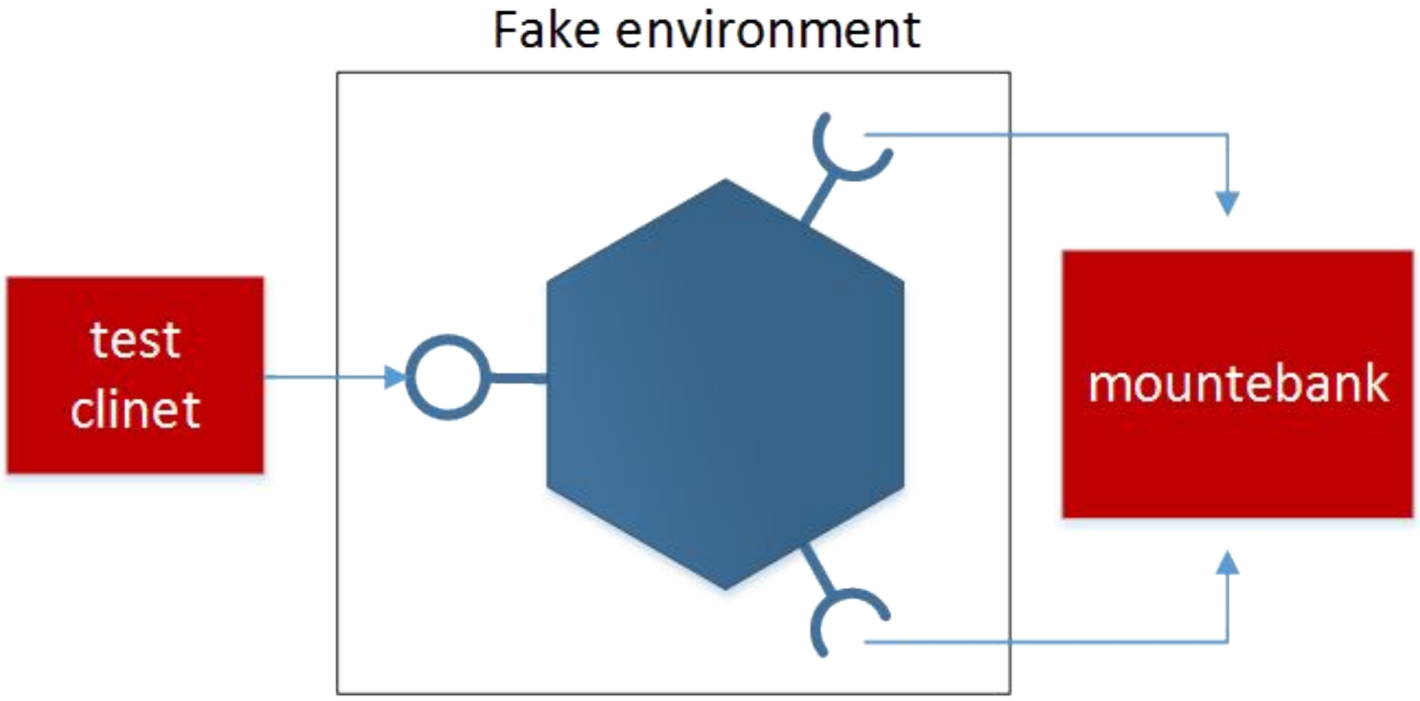


```python
#test_app.py

import json
from falcon import testing
from falcon_app.app import app

class SampleTest(testing.TestBase):

    def setUp(self):
        super().setUp()
        self.api = app

    def test_sample_post(self, original_dict, expected_dict):
        response = self.simulate_request(
            '/',
            decode='utf-8',
            method='POST',
            body=json.dumps({'abra': 123, 'kadabra': 4}),
            headers=[('Content-type', 'application/json')]
        )

        self.assertEqual(
            response,
            json.dumps({'abra': 123})
        )
```

Unit testing - pub/sub



Service testing



Tox config

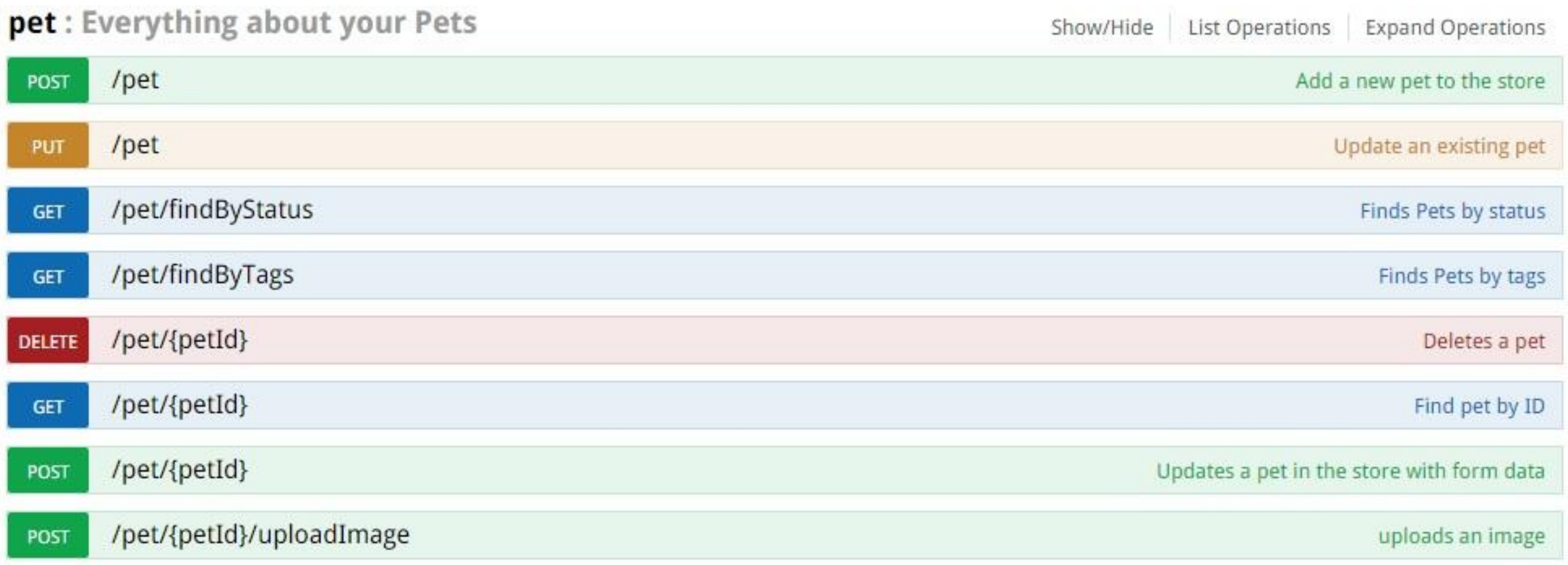
- Unit and service test
- Only one Python version.
- No packaging (skipsdist=True)
- Full app analysis (coverage, pylint, etc.)
- Run on dev and CI machines

YOLO SWAGGINS

OBEY
OBEY
A
P
SWAG
facebook.com/MrSwaggins

And the fellowship of the bling

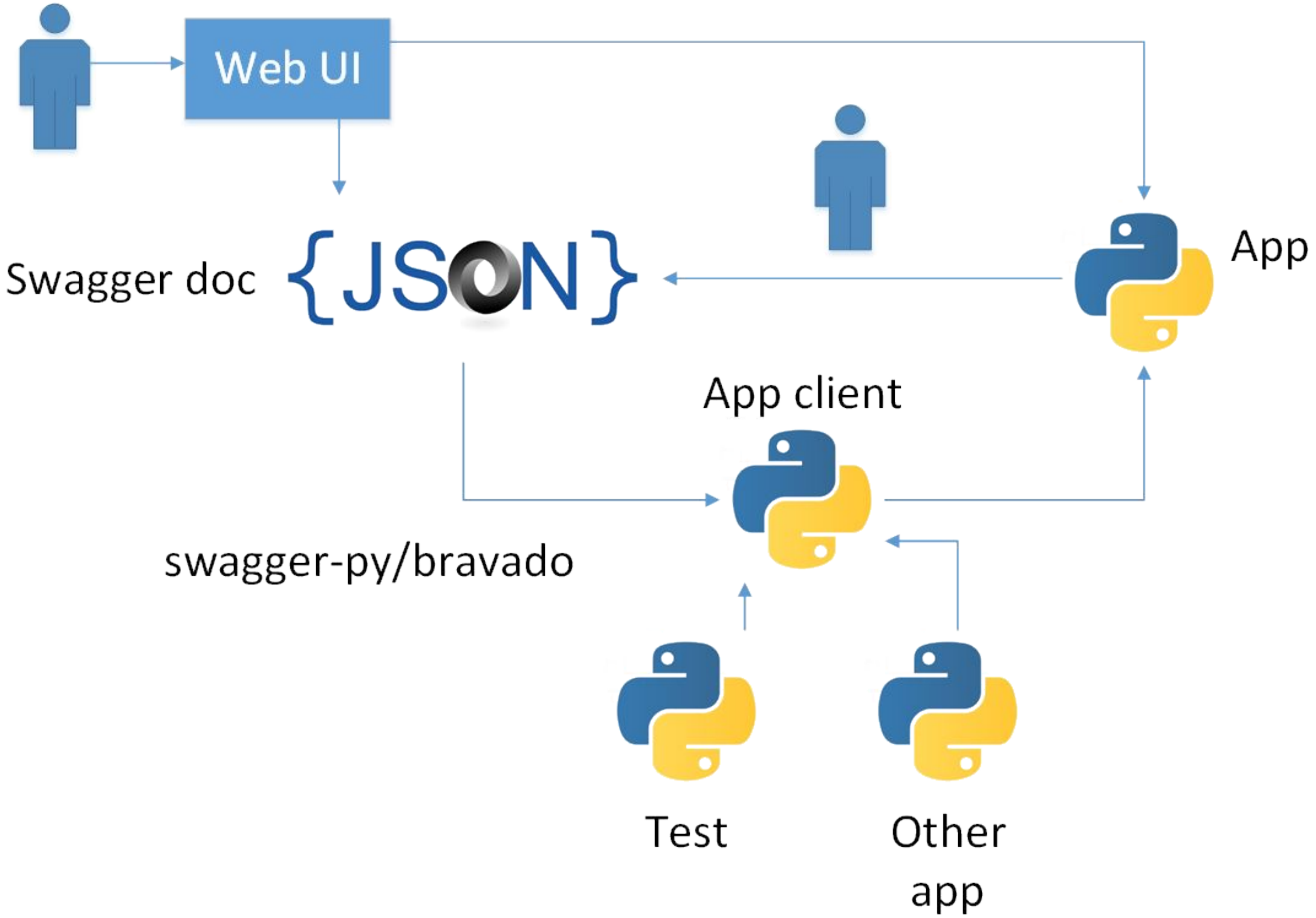
Swagger - live API docs



pet : Everything about your Pets

Show/Hide | List Operations | Expand Operations

POST	/pet	Add a new pet to the store
PUT	/pet	Update an existing pet
GET	/pet/findByStatus	Finds Pets by status
GET	/pet/findByTags	Finds Pets by tags
DELETE	/pet/{petId}	Deletes a pet
GET	/pet/{petId}	Find pet by ID
POST	/pet/{petId}	Updates a pet in the store with form data
POST	/pet/{petId}/uploadImage	uploads an image


Web UI
Swagger doc
{JSON}
App
App client
swagger-py/bravado
Test
Other app

E2E/acceptance tests

- Done in staging env
- Run after each commit to master
- ...or nightly
- Only crucial journeys through the system
- Owned by everybody, monitored by selected

Monitoring

- In staging and production.
- State of PaaS resources.
- Periodically runs E2E.
- E.g. Zabbix

Logs and metrics

- All apps log to std out
- Cloud Foundry gathers all logs in a stream
- Logsearch: Cloud-scale ELK
- InfluxDB for real-time metrics

Management tips

- Every app needs an owner
- ...and an additional reviewer
- Review mercilessly
- Nobody is unquestionable
- Architecture visualisation

Platform deployments

- Custom implementation
- E.g. a big manifest binding others together
- Can increase the risk of coupling

More info

- Sam Newman, *Building Microservices*, O'Reilly
- http://martinfowler.com/articles/dont-start-monolith.html
- http://martinfowler.com/bliki/MonolithFirst.html
- http://martinfowler.com/articles/microservice-testing/
- http://docs.cloudfoundry.org/
- http://www.logsearch.io/
- http://www.cloudcredo.com/how-to-integrate-elasticsearch-logstash-and-kibana-elk-with-cloud-foundry/
- uWSGI performance: http://blog.kgriffs.com/2012/12/18/uwsgi-vs-gunicorn-vs-node-benchmarks.html, http://cramer.io/2013/06/27/serving-python-web-applications/
- https://speakerdeck.com/gnrfan/restful-microservices-with-python
- EuroPython 2015 talks: "Nameko for Microservices", "Beyond grep: Practical Logging and Metrics", "A Pythonic Approach to Continuous Delivery"

Bonus round!!!

slajdy odtąd już nie będą pokazywane

Good delivery pipeline

1. Unit tests
2. Static analysis
3. Service tests
4. Version bumping
5. Deployment to staging env
6. Acceptance/E2E tests
7. Deployment to production env
8. Production env monitoring

Versioning

- Every master commit is a new version.
- Every version can be released.
- Git tags as releases.
- You need to be able to determine the version of deployed apps.

Code reuse

- Can increase coupling
- Do it only for common utility code

Code reuse - git

- Python artifacts are mostly just source
- Use git submodules
- sys.path.append(‘submodules/dir’) in main package’s __init__.py
- Do it only for common utility code

W sumie wersjonowanie można ogarnąć na zasadzie tagów w Gicie.

Code reuse - PyPi

- Set your own PyPi (e.g. devpi)
- Use git submodules
- sys.path.append(‘submodules/dir’) in main package’s __init__.py
- Do it only for common utility code

W sumie wersjonowanie można ogarnąć na zasadzie tagów w Gicie.

Communication with others

- Swagger for live docs
- Swagger for client generation
- Duplication over reuse
- Queue/async benefits and drawbacks
- API versioning to maintain backwards compatibility (for a time)

Load / performance testing

ELK with CloudFoundry can already give you response times and numbers of requests.

Gatling is good (sorry Locust) because it gives deep info.

You must know what your apps are capable of. At least broadly.

Security

Very important.

- CF używa Oautha (syndicated security)
- My możemy zrobić middleware do Falcona z PyJwt
- Walidacja danych wejściowych (Cerberus/Colander)

Testing

- Unit / component testing
- Integration / contract testing
- Acceptance / E2E tests
- Monitoring tests

Unit testing

- TODO show a falcon unit test (powiedz, że można całą apkę dzięki WSGI testować bardzo szybko, bo nie wymaga faktycznego serwera)
- Most extensive
- External connectors mocked out
- Przy okazji opowiedzieć o interfejsach (WSGI vs. Queues like NATS and Kafka

TODOsy

TODO a bindingi i Cf vs Heroku gdzie wsadzić?

Swagger is language agnostic