Kubernetes + Python = ❤

CLOUD NATIVE PRAGUE

2019-09-05

HENNING JACOBS

@try_except_

ZALANDO AT A GLANCE

~ 5.4 billion EUR
revenue 2018

> 250 million
visits per month

> 15.000
employees in Europe

> 79%
of visits via mobile devices

> 26 million
active customers

> 300.000
product choices

~ 2.000
brands

17
countries

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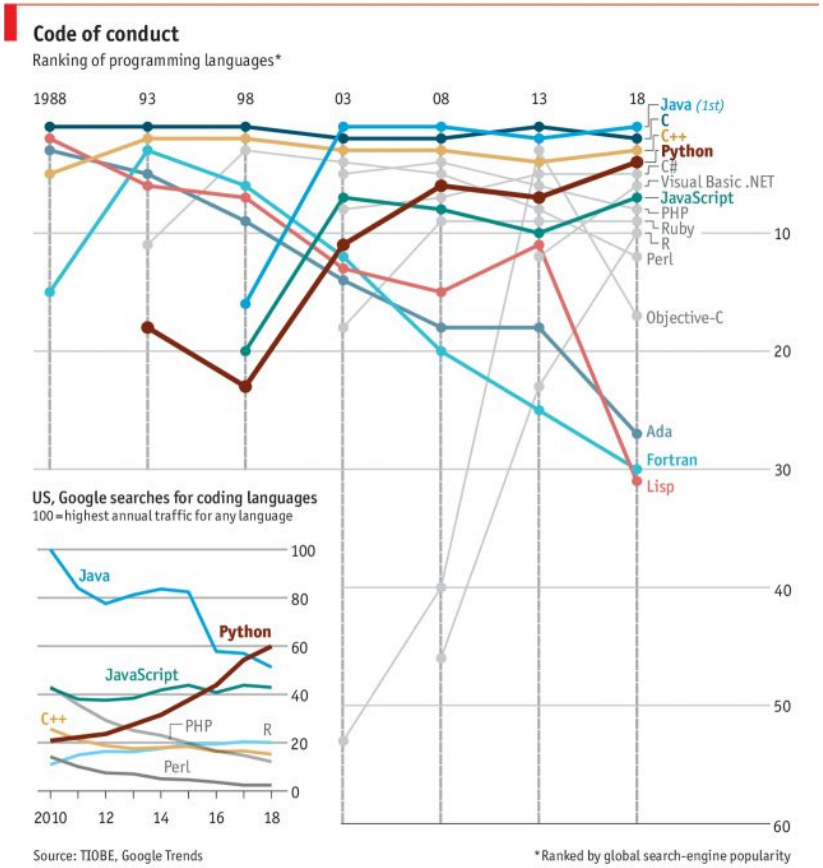
SCALE

396 Accounts

140 Clusters

PYTHON

- Very popular
- Easy to learn
- Huge community



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PYTHON

Michael Gasch
@embano1

Antwort an @try_except_ und @ZalandoTech

thx! asked in several sessions on preferred language from vSphere admin perspective and it is: Python 😀
cc/ @tom_schwaller

Tweet übersetzen

2:59 nachm. · 31. Aug. 2019 · Twitter for iPhone

PYTHON IN ZALANDO

61 (Go) vs 257 (Python) profiles

14k (Go) vs **52k** (Python) internal GitHub hits

Machine Learning / Data Science

patroni

A template for PostgreSQL High Availability with ZooKeeper, etcd, or Consul

kubernetes consul raft postgresql zookeeper etcd haproxy

Python MIT 298 2,703 77 (6 issues need help) 7 Updated 4 hours ago

connexion

Swagger/OpenAPI First framework for Python on top of Flask with automatic endpoint validation & OAuth2 support

python microservices web swagger openapi api-rest flask-extensions

Python 438 2,530 212 (15 issues need help) 51 Updated 4 days ago

RUNNING PYTHON ON KUBERNETES

```python
from aiohttp import web


async def hello(request):
    return web.Response(text="Hello, world")


async def health(request):
    return web.Response(text="OK")


app = web.Application()
app.add_routes([web.get("/", hello)])
app.add_routes([web.get("/health", health)])
# disable SIGTERM handling for disruption-free rolling updates
web.run_app(app, handle_signals=False)
```

RUNNING PYTHON ON KUBERNETES

```
FROM python:3.7-alpine

RUN pip install aiohttp

COPY web.py /

ENTRYPOINT ["python", "web.py"]
```

⇒ ~114 MiB Docker image

DEPLOYMENT MANIFEST

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: aiohttp-helloworld
spec:
  replicas: 1
  selector:
    matchLabels:
      application: aiohttp-helloworld
  template:
    metadata:
      labels:
        application: aiohttp-helloworld
    spec:
      containers:
        - name: mycontainer
          image: hjacobs/aiohttp-helloworld:latest
          imagePullPolicy: IfNotPresent  # For our E2E tests.
          readinessProbe:
            httpGet:
              path: /health
              port: 8080
          resources:
            limits:
              memory: 50Mi
            requests:
              cpu: 5m
              memory: 50Mi
          securityContext:
            readOnlyRootFilesystem: true
            runAsNonRoot: true
            runAsUser: 1000
```

Never without a readinessProbe

Security "stuff"

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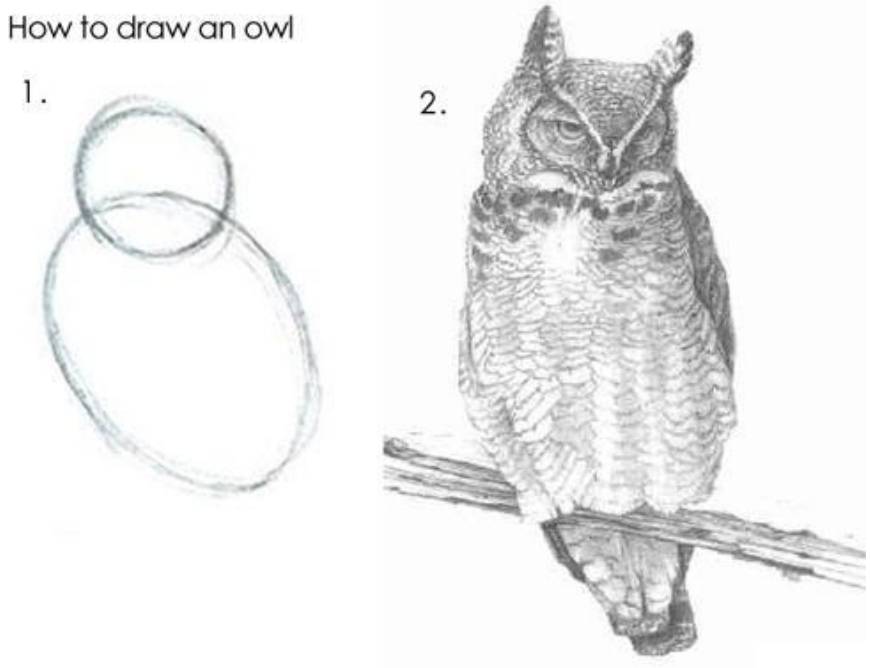
HELLO, WORLD

```
kubectl apply -f deployment.yaml

kubectl port-forward service/aiohttp-helloworld 8080:80

http localhost:8080
```

HTTPie

```
HTTP/1.1 200 OK
Content-Length: 12
Content-Type: text/plain; charset=utf-8
Date: Thu, 05 Sep 2019 09:42:42 GMT
Server: Python/3.7 aiohttp/3.5.4

Hello, world
```

HOW TO USE KUBERNETES



1. run "Hello World"

2. configure the rest of your app

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IS IT FAST ENOUGH?

```
echo 'GET http://localhost:8080' | vegeta attack -rate 200 | vegeta report

Requests      [total, rate]             3300, 200.06
Duration      [total, attack, wait]     16.498s, 16.494, 3.261ms
Latencies     [mean, 50, 95, 99, max]   3.185ms, 3.229ms,
                                        4.182ms, 4.791ms,
                                        21.153ms
Bytes In      [total, mean]             39600, 12.00
Bytes Out     [total, mean]             0, 0.00
Success       [ratio]                   100.00%
Status Codes  [code:count]              200:3300
```

local run on my laptop, single Pod in kind cluster

RUNNING PYTHON ON KUBERNETES

```python
from aiohttp import web


async def hello(request):
    return web.Response(text="Hello, world")


async def health(request):
    return web.Response(text="OK")


app = web.Application()
app.add_routes([web.get("/", hello)])
app.add_routes([web.get("/health", health)])
# disable SIGTERM handling for disruption-free rolling updates
web.run_app(app, handle_signals=False)
```

"GRACEFUL" TERMINATION IN KUBERNETES

1. kubectl delete pod
2. **SIGTERM** + remove endpoints
3. grace period (default: 30s)
4. **SIGKILL**

kube-proxy/ iptables, Load Balancer update

⇒ **Going down on SIGTERM leads to request errors** 

TESTING THE ROLLING UPDATE

tests/e2e/test_update.py::test_rolling_update_no_signal_handling

Elapsed: 41.60 seconds
Successes: 2056
Errors: 0
Requests/s: 49.42 rps

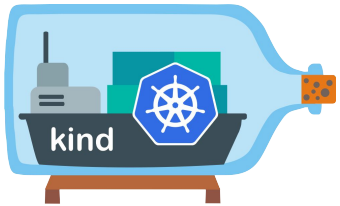
tests/e2e/test_update.py::test_rolling_update_with_signal_handling

Elapsed: 15.16 seconds
Successes: 816
Errors: **2**
Requests/s: 53.95 rps

ALTERNATIVE: THE PRESTOP TRICK

```yaml
containers:
  - name: mycontainer

    ...

    # alternative approach to ensure safe rolling updates
    # add additional sleep of 20 seconds
    # the hook will be executed before sending SIGTERM
    lifecycle:
      preStop:
        exec:
          command: ["sleep","20"]
```

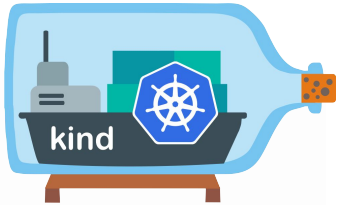
TESTING WITH PYTEST AND KIND




```python
import requests


def test_web_hello_world(kind_cluster):
    kind_cluster.load_docker_image("hjacobs/aiohttp-helloworld:latest")
    kind_cluster.kubectl("apply", "-f", "deployment.yaml")

    # wait for rolling update
    kind_cluster.kubectl("rollout", "status", "deployment/aiohttp-helloworld")

    # now check whether our app returns the expected text
    with kind_cluster.port_forward("service/aiohttp-helloworld", 80) as port:
        response = requests.get(f"http://localhost:{port}/")
        response.raise_for_status()
        assert response.text == "Hello, world"
```

```
docker build -t hjacobs/aiohttp-helloworld:latest .
Sending build context to Docker daemon  94.88MB
Step 1/4 : FROM python:3.7-alpine
 ---> 39fb80313465
Step 2/4 : RUN pip install aiohttp
 ---> Using cache
 ---> 75e094c4447b
Step 3/4 : COPY web.py /
 ---> Using cache
 ---> dc25bceb0482
Step 4/4 : ENTRYPOINT ["python", "web.py"]
 ---> Using cache
 ---> f6160a68a628
Successfully built f6160a68a628
Successfully tagged hjacobs/aiohttp-helloworld:latest
poetry install
Installing dependencies from lock file

Nothing to install or update

poetry run pytest -r=a \
               --log-cli-level info \
               --log-cli-format '%(asctime)s %(levelname)s %(message)s' \
               --cluster-name=aiohttp-helloworld
============================================================================================================================ test session starts =============================
platform linux -- Python 3.7.3, pytest-5.1.2, py-1.8.0, pluggy-0.12.0
rootdir: /home/hjacobs/workspace/kubernetes-and-python/01-running-python-on-kubernetes/aiohtttp-helloworld
plugins: kind-19.9.0
collected 1 item

tests/test_web.py::test_web_hello_world
------------------------------------------------------------------------------------------------------------------------------ live log setup ---------------------------------
21:10:19 INFO Creating cluster aiohttp-helloworld..
------------------------------------------------------------------------------------------------------------------------------ live log call ----------------------------------
21:10:43 INFO Loading Docker image hjacobs/aiohttp-helloworld:latest in cluster (usually ~5s)..
PASSED
------------------------------------------------------------------------------------------------------------------------------ live log teardown ------------------------------
21:11:26 INFO Deleting cluster aiohttp-helloworld..


============================================================================================================================ 1 passed in 67.97s (0:01:07) ============================
```

TESTING WITH PYTEST AND KIND



pytest-kind

build passing | pypi v19.9.1 | python 3.7 | license GPL-3.0 | calver YY.MM.MICRO

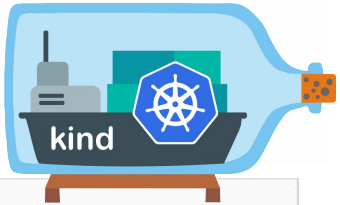
Test your Python Kubernetes app/operator end-to-end with kind and pytest.

`pytest-kind` is a plugin for pytest which provides the `kind_cluster` fixture. The fixture will install kind 0.5.1, create a Kubernetes 1.15 cluster, and provide convenience functionality such as port forwarding.

https://pypi.org/project/pytest-kind/

USING KIND CLUSTER DIRECTLY

pytest-kind




```python
from pytest_kind import KindCluster

cluster = KindCluster("myclustername")
cluster.create()
cluster.kubectl("apply", "-f", "..")
# ...
cluster.delete()
```

https://pypi.org/project/pytest-kind/

ACCESSING KUBERNETES FROM PYTHON

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ACCESSING KUBERNETES FROM PYTHON

- Official Kubernetes client - github.com/kubernetes-client/python
- Pykube-ng - github.com/hjacobs/pykube

```
du -csh /../../lib/python3.7/site-packages/kubernetes/
23M    total

du -csh /../../lib/python3.7/site-packages/pykube/
160K   total
```

LISTING CONTAINER IMAGES

```python
from kubernetes import client, config, watch

config.load_kube_config()
v1 = client.CoreV1Api()
ret = v1.list_namespaced_pod(args.namespace)
for pod in ret.items:
    images = [c.image for c in pod.spec.containers]
    print(pod.metadata.name, ", ".join(images))
```

```python
from pykube import HTTPClient, KubeConfig, Pod

api = HTTPClient(KubeConfig.from_file())

for pod in Pod.objects(api).filter(namespace=args.namespace):
    images = [c["image"] for c in pod.obj["spec"]["containers"]]
    print(pod.name, ", ".join(images))
```

OFFICIAL CLIENT VS PYKUBE-NG

Kubernetes Python Client

- "Official"
- Generated (Swagger Codegen)
- Less "Pythonic"
- urllib3
- Supports many auth methods
- Heavy (23 MiB)
- Python 2.7 and 3

pykube-ng

- Kel project 2015
- Dynamic
- More "Pythonic"
- requests
- Limited auth methods
- Light (160 KiB)
- Only Python 3

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INTERACTIVE CONSOLE

```
$ pip3 install pykube-ng

$ python3 -m pykube
Pykube v19.9.1, loaded "/home/hjacobs/.kube/config" with context "mycluster".

    Example commands:
      [d.name for d in Deployment.objects(api)]             # get names of deployments in default namespace
      list(DaemonSet.objects(api, namespace='kube-system'))  # list daemonsets in "kube-system"
      Pod.objects(api).get_by_name('mypod').labels          # labels of pod "mypod"

    Use Ctrl-D to exit
>>>
```

WRITING A SIMPLE CONTROLLER

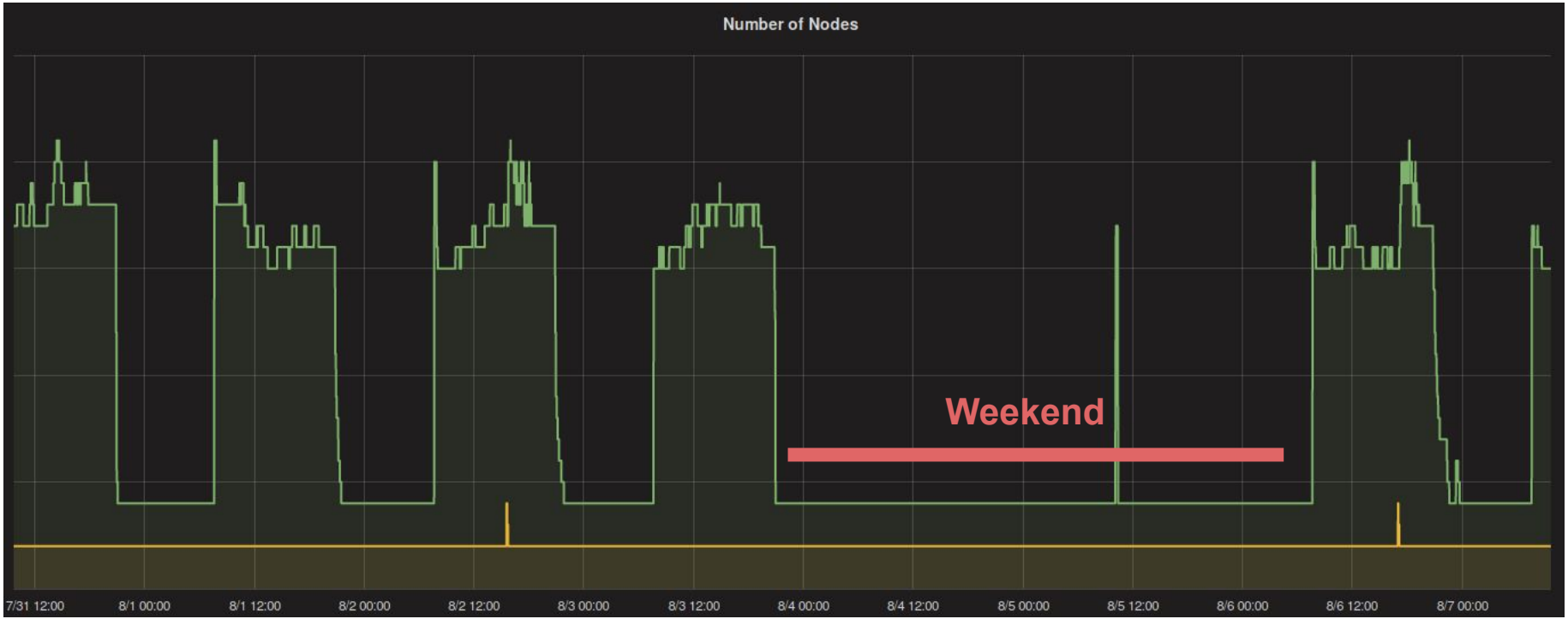
```
import datetime, os, pykube, time

while True:
    # loads in-cluster auth or local ~/.kube/config for testing
    config = pykube.KubeConfig.from_env()
    api = pykube.HTTPClient(config)

    # no timezone handling!
    weekday = datetime.datetime.today().isoweekday()
    is_weekend = weekday in (6, 7)

    for deploy in pykube.Deployment.objects(api, namespace=pykube.all):
        if "scale-down-on-weekend" in deploy.annotations and is_weekend:
            print(f"Updating deployment {deploy.namespace}/{deploy.name}..")
            deploy.replicas = 0
            deploy.update()
    time.sleep(15)
```

DOWNSCALING DURING OFF-HOURS



github.com/hjacobs/kube-downscaler

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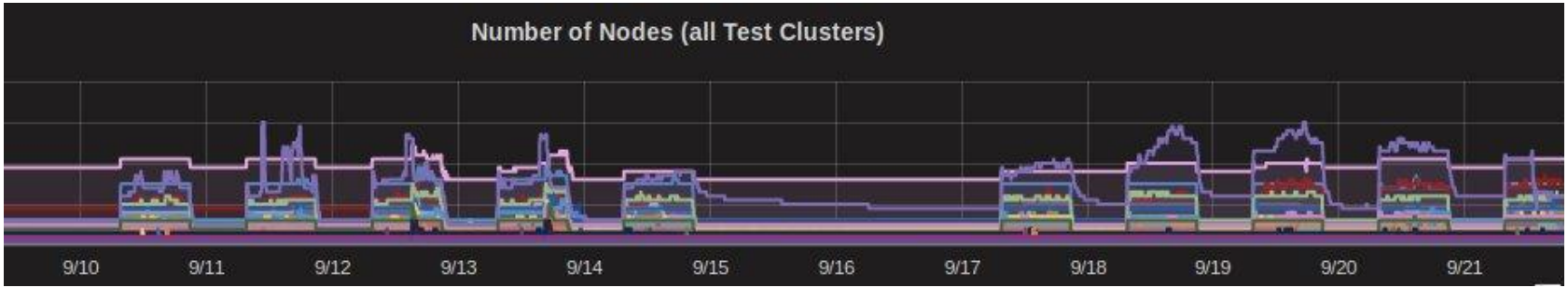
DOWNSCALING DURING OFF-HOURS

```
DEFAULT_UPTIME="Mon-Fri 07:30-20:30 CET"
```

```
annotations:
    downscaler/exclude: "true"
```

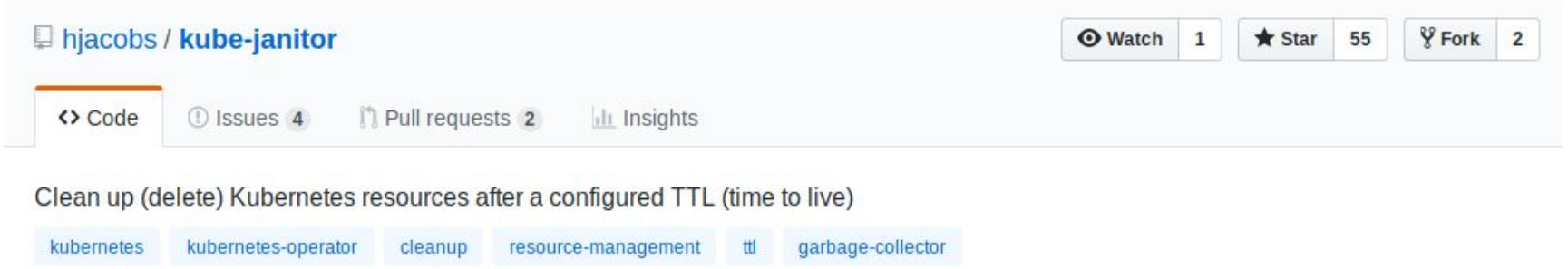


github.com/hjacobs/kube-downscaler

HOUSEKEEPING

- Delete prototypes after X days
- Clean up temporary deployments
- Remove resources without owner

KUBERNETES JANITOR



- **TTL** and **expiry date** annotations, e.g.
  - set time-to-live for your test deployment
- **Custom rules**, e.g.
  - delete everything without "app" label after 7 days

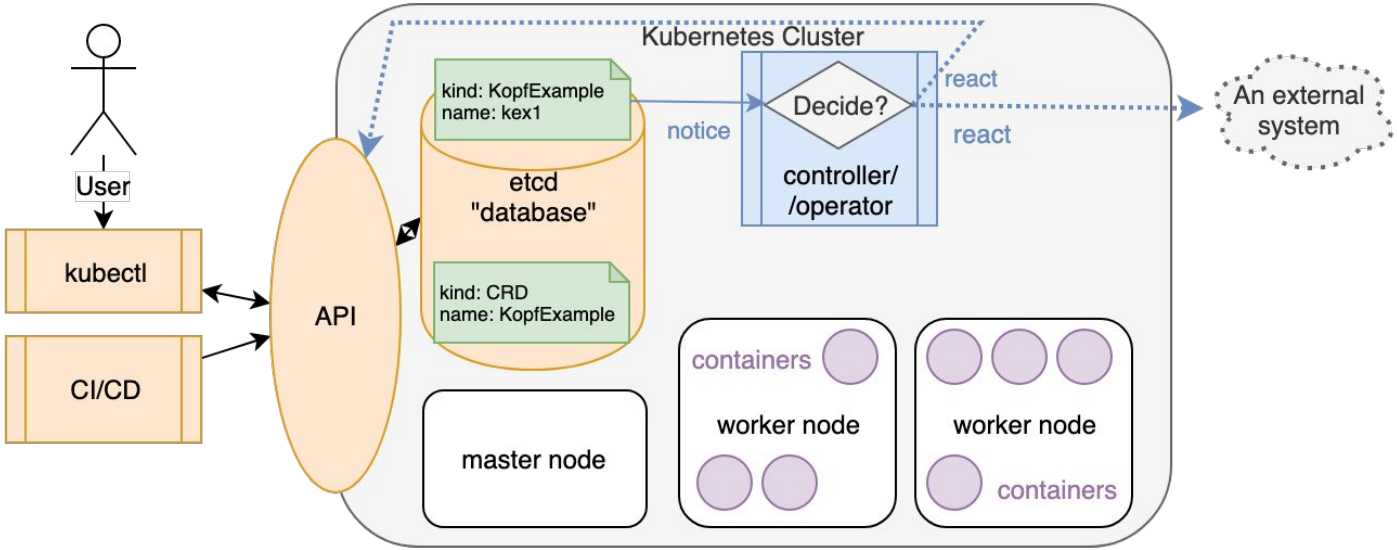
github.com/hjacobs/kube-janitor

JANITOR TTL ANNOTATION

```
# let's try out nginx, but only for 1 hour
kubectl run nginx --image=nginx
kubectl annotate deploy nginx janitor/ttl=1h
```


github.com/hjacobs/kube-janitor

EXTENDING KUBERNETES WITH OPERATORS



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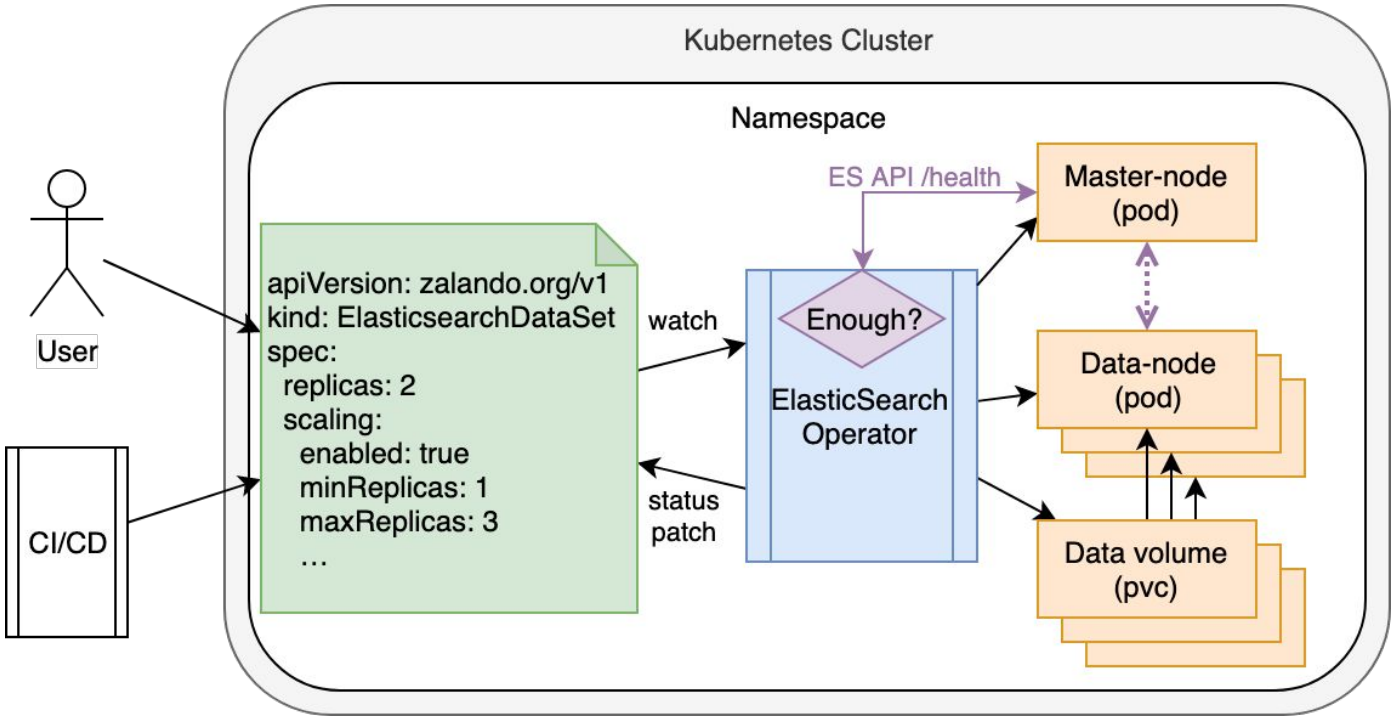
ELASTICSEARCH OPERATOR



github.com/zalando-incubator/es-operator

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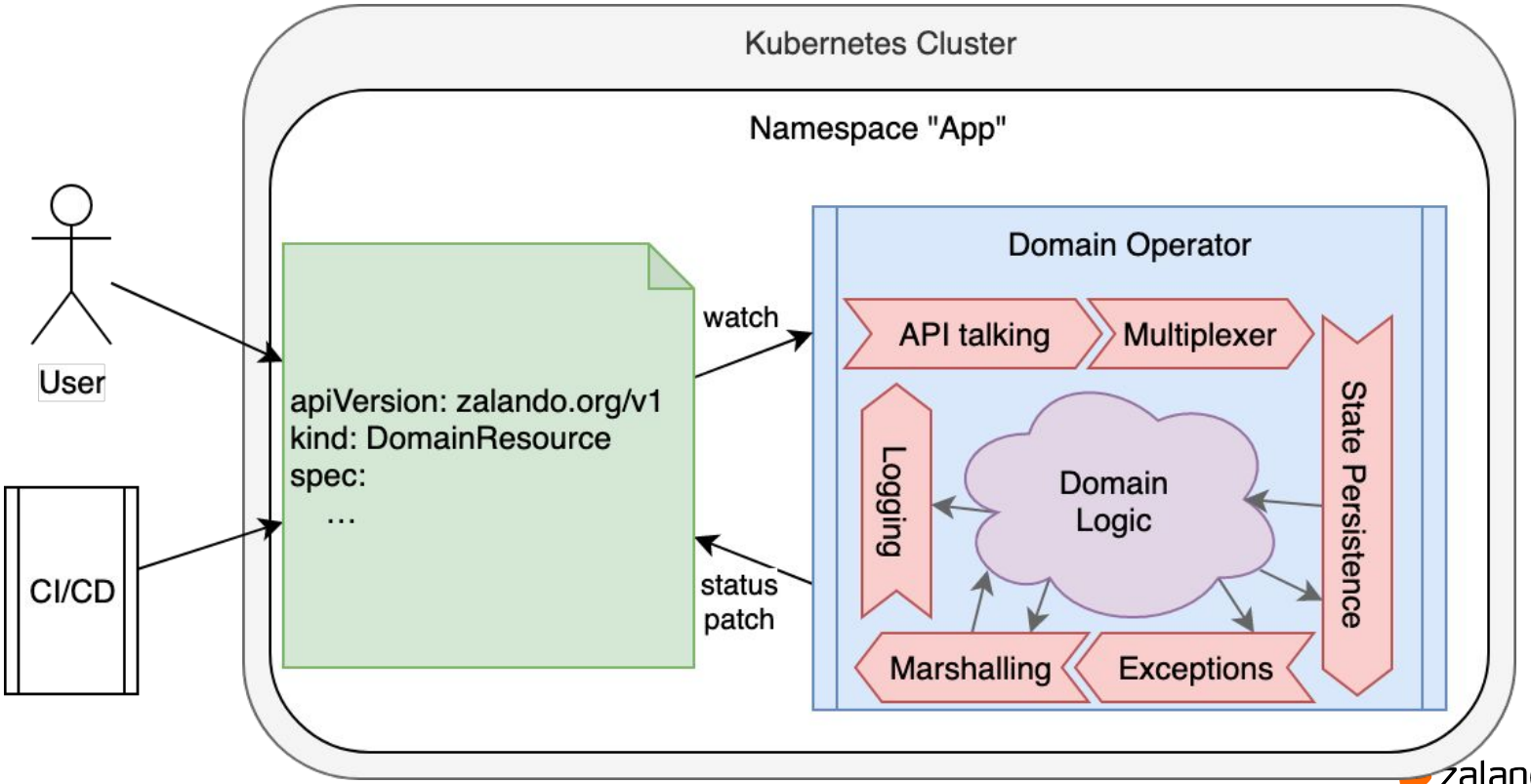
WRITING AN OPERATOR



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MAKE A FRAMEWORK!

Kubernetes Operator Pythonic Framework (Kopf)

Kopf —Kubernetes Operator Pythonic Framework— is a framework and a library to make Kubernetes operators development easier, just in few lines of Python code.

github.com/zalando-incubator/kopf

KOPF: SIMPLE SPY-HANDLERS

React on events from K8s API.
Raw payload, no interpretation. Fire-and-forget, ignore errors.

```python
import kopf


@kopf.on.event('zalando.org', 'v1', 'kopfexamples')
def event_fn_with_error(**kwargs):
    raise Exception("Oops!")


@kopf.on.event('zalando.org', 'v1', 'kopfexamples')
def normal_event_fn(event, **kwargs):
    print(f"Event received: {event!r}")

```

KOPF: CONVENIENT CAUSE AND DIFF HANDLERS

```python
import kopf

@kopf.on.create('zalando.org', 'v1', 'kopfexamples')
def create_fn_1(spec, **kwargs):
    print(f'CREATED 1st: field={spec.field}')

@kopf.on.create('zalando.org', 'v1', 'kopfexamples')
def create_fn_2(meta, **kwargs):
    print(f'CREATED 2nd: name={meta["name"]}')

@kopf.on.update('zalando.org', 'v1', 'kopfexamples')
def update_fn(old, new, diff, **kwargs):
    print(f'UPDATED: diff={diff}')

@kopf.on.delete('zalando.org', 'v1', 'kopfexamples')
def delete_fn_1(**kwargs):
    print('DELETED')

@kopf.on.field('zalando.org', 'v1', 'kopfexamples', field='spec.field')
def field_fn(old, new, **kwargs):
    print(f'FIELD CHANGED: {old} -> {new}')
```

RUNNING FROM DEVELOPMENT ENVIRONMENT

```python
import kopf


@kopf.on.create('zalando.org', 'v1', 'kopfexamples')
def create_fn(spec, **kwargs):
    print(f"And here we are! Creating: {spec}")
    return {'message': 'hello world'}  # will be the new status
```

```yaml
# A demo custom resource for
apiVersion: zalando.org/v1
kind: KopfExample
metadata:
  name: kopf-example-1
  labels:
    somelabel: somevalue
spec:
  duration: 1m
  field: value
  items:
  - item1
  - item2
```

```
$ kopf run scripts.py [--verbose]
```

```
And here we are! Creating: {'duration': '1m', 'field': 'value',
'items': ['item1', 'item2']}

[2019-02-25 14:06:54,742] kopf.reactor.handlin [INFO    ]
[asf-preprocessing/kopf-example-1] Handler create_fn succeeded.

[2019-02-25 14:06:54,856] kopf.reactor.handlin [INFO    ]
[asf-preprocessing/kopf-example-1] All handlers succeeded for
creation.
```

```
$ kubectl apply -f ../obj.yaml
$ kubectl describe -f ../obj.yaml
```

```
Name:         kopf-example-1
...
Status:
  create_fn:
    Message:  hello world
Events:
  Type    Reason   Age   From  Message
  ----    ------   ----  ----  -------
  Normal  Success  81s   kopf  Handler create_fn succeeded.
```

"HELLO WORLD" EXAMPLE: CRD

```yaml
apiVersion: apiextensions.k8s.io/v1beta1
kind: CustomResourceDefinition
metadata:
  name: helloworlds.example.org
spec:
  scope: Namespaced
  group: example.org
  versions:
    - name: v1
      served: true
      storage: true
  names:
    kind: HelloWorld
    plural: helloworlds
    singular: helloworld
    shortNames:
      - hw
```

github.com/zalando-incubator/kopf

8 LINES OF PYTHON

```python
import kopf


@kopf.on.create("example.org", "v1", "helloworlds")
def on_create(spec, **kwargs):
    print(f"Create handler is called with spec: {spec}")
    return {"message": f"Hello {spec['name']}!"}


@kopf.on.update("example.org", "v1", "helloworlds")
def on_update(body, **kwargs):
    print(f"Update handler is called with body: {body}")
```


github.com/zalando-incubator/kopf

4 LINES OF DOCKER

```
FROM python:3.7-alpine

RUN pip install kopf

COPY handlers.py /

ENTRYPOINT ["kopf", "run", "handlers.py"]
```


github.com/zalando-incubator/kopf

CRD OBJECT

```yaml
apiVersion: example.org/v1
kind: HelloWorld
metadata:
    name: test-1
spec:
    name: "Prague"
```

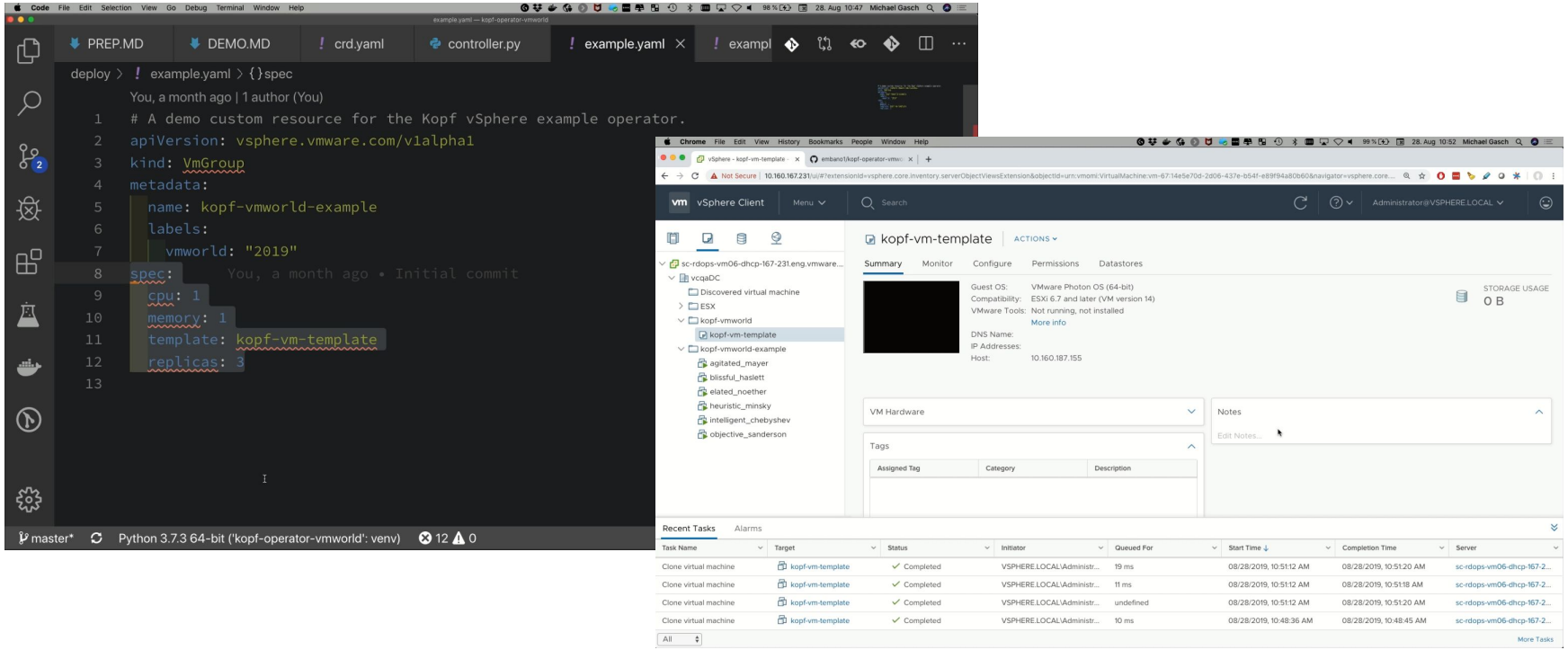

github.com/zalando-incubator/kopf

STATUS: "HELLO PRAGUE!"

```
apiVersion: example.org/v1
kind: HelloWorld
metadata:
  annotations:
    kopf.zalando.org/last-handled-configuration: '{"spec": {"name": "Prague"}}'
    kubectl.kubernetes.io/last-applied-configuration: |
      {"apiVersion":"example.org/v1","kind":"HelloWorld","metadata":{"annotations":{},"name":"test-1","namespace":"default"},'
  creationTimestamp: 2019-09-04T19:32:59Z
  generation: 2
  name: test-1
  namespace: default
  resourceVersion: "763"
  selfLink: /apis/example.org/v1/namespaces/default/helloworlds/test-1
  uid: 2c313666-118c-4a25-8c58-fbcea6ffd686
spec:
  name: Prague
status:
  kopf: {}
  on_create:
    message: Hello Prague!
```


github.com/zalando-incubator/kopf

VMWORLD 2019 SESSION WITH KOPF



github.com/embano1/kopf-operator-vmworld

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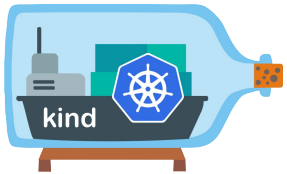
KOPF: FEATURES

- Custom & built-in resources supported (CRDs, Pods, Services, etc)
- Agnostic to API clients: kubernetes-client, pykube-ng, raw HTTP, etc
- Immediate reaction to changes and events
- Predefined behavioural patterns:
  - Simple spy-handlers for event watching
  - Advanced cause & diff detection for actual change tracking
  - Retry-until-success approach to handlers
- Operator resilience:
  - Restores its state on restarts
- Operator testing toolkit (minimally sufficient)

github.com/zalando-incubator/kopf

TESTING WITH KIND

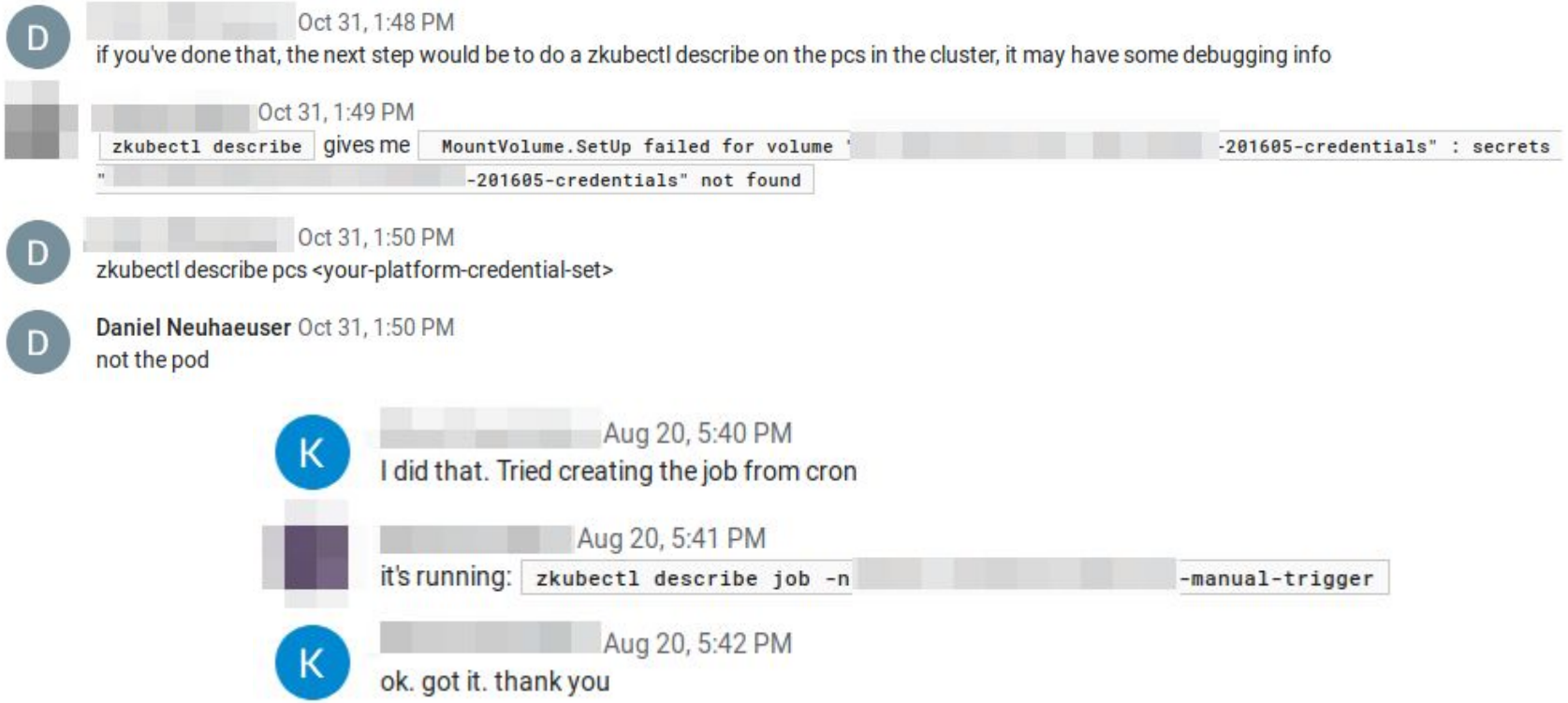
```python
from pykube.objects import NamespacedAPIObject


class HelloWorld(NamespacedAPIObject):
    version = "example.org/v1"
    kind = "HelloWorld"
    endpoint = "helloworlds"


def test_web_hello_world(kind_cluster):
    kind_cluster.load_docker_image("kopf-example")
    kind_cluster.kubectl("apply", "-f", "deploy/")

    kind_cluster.kubectl("rollout", "status", "deployment/kopfexample-operator")

    kind_cluster.kubectl("apply", "-f", "example.yaml")

    for i in range(10):
        obj = HelloWorld.objects(kind_cluster.api).get(name="test-1")
        if "status" in obj.obj:
            break
        time.sleep(2)

    assert obj.obj["status"]["on_create"]["message"] == "Hello Prague!"
```



Kubernetes Web View

"kubectl for the web"

MOTIVATION: CHAT PING-PONG



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MOTIVATION: PENDING PODS INCIDENT

Title of Incident: Multiple Kubernetes test clusters have “Pending” pods, deployments are stuck
Ticket(s):
Document Owner:
Contributor:
Team(s):
Folder:

Short summary

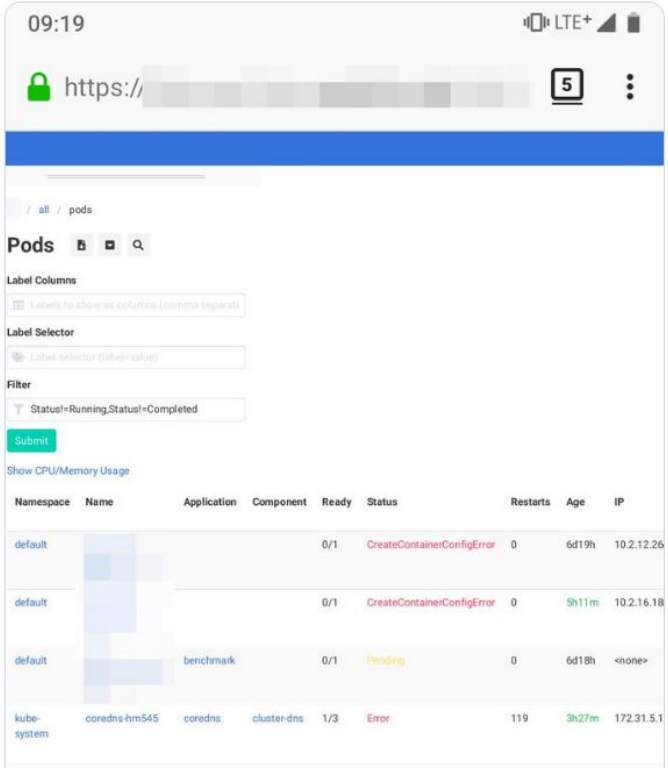
Due to a mistake in copying the custom Ubuntu AMI the test clusters were configured to run a PR branch of the AMI which was deregistered. As a result test clusters could not create new instances to replace existing spot instances whose lease had expired leading to almost complete unavailability of test clusters.

⇒ I want to see all "Pending" Pods across all clusters!

Henning Jacobs
@try_except_

How many incidents happen when you are on the way 🚋 to work? While the mobile UX of kube-web-view is not perfect yet, troubleshooting problematic #Kubernetes pods is already helpful 😊

Tweet übersetzen



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SOME USE CASES

Support interactions with colleagues

- share links
- avoid human mistakes (wrong cluster login on CLI, "-n" param, ..)
- deep link to resource YAML

Incident response and investigation

- find a resource by name across clusters to help troubleshoot
- find pending pods across all clusters
- help identify if a problem is only in one cluster or multiple ones

KUBERNETES WEB UIS IN 2019

Posted: 2019-08-12 22:24 | More posts about kubernetes

This post takes a look at different open source Kubernetes web UIs, my requirements, and why I created Kubernetes Web View to help with support and troubleshooting across multiple clusters.

Use Cases

At Zalando, we have a large number of Kubernetes users (900+) and clusters (100+). There are two main use cases where I would wish for some web tool support: 1) support interactions with colleagues 2) incident response and investigation.

Support

I observed that support interactions in chat often look like:

- A: Help our service XYZ is not reachable
- B: What do you see when you do `kubectl describe ingress ...`?

Or similar for CRDs:

- A: I am facing an issue with identity service, ...
- B: What is the output of `kubectl describe platformcredentialsset ...`?

These interactions follow a pattern of using the `kubectl` command line to investigate and pinpoint a problem. This requires context switches on both sides: participants have to switch between terminal and web chat, plus they don't see the same situation.

I would wish for a Kubernetes web frontend to help with this:

- users **can share links** and see the same situation
- **avoid human mistakes** during support: login to wrong cluster on the command line, typos in CLI commands, etc
- **allow crafting custom views** to send to colleagues, i.e. add label columns, show multiple resource types on one page
- ideally the web tool should allow **deep links into specific YAML sections** (e.g. to point to a wrong spec causing the issues)

Incident Response & Investigation

Incident response for infrastructure requires gaining situational awareness, the ability to assess impact, and finding patterns across clusters. Some real-life example situations:

srcco.de/posts/kubernetes-web-uis-in-2019.html

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Search

Search Text pipeline-id=l-2pqt9gs2ia81aef95hwcbtrdjv Search!

Resource Types ☐ CronJob ☐ DaemonSet ☑ Deployment ☑ Ingress ☐ Namespace ☐ Node ☐ Pod ☐ ReplicaSet ☑ Service ☐ StatefulSet ✕ unselect all

kube-web-view (Deployment)

[redacted]aces/default/deployments/kube-web-view
Created: 2019-07-26 12:34:50
application: kube-web-view | deployment-id: d-293jpa847d74p32js5bxo1modc | pipeline-id: l-2pqt9gs2ia81aef95hwcbtrdjv

kube-web-view (Ingress)

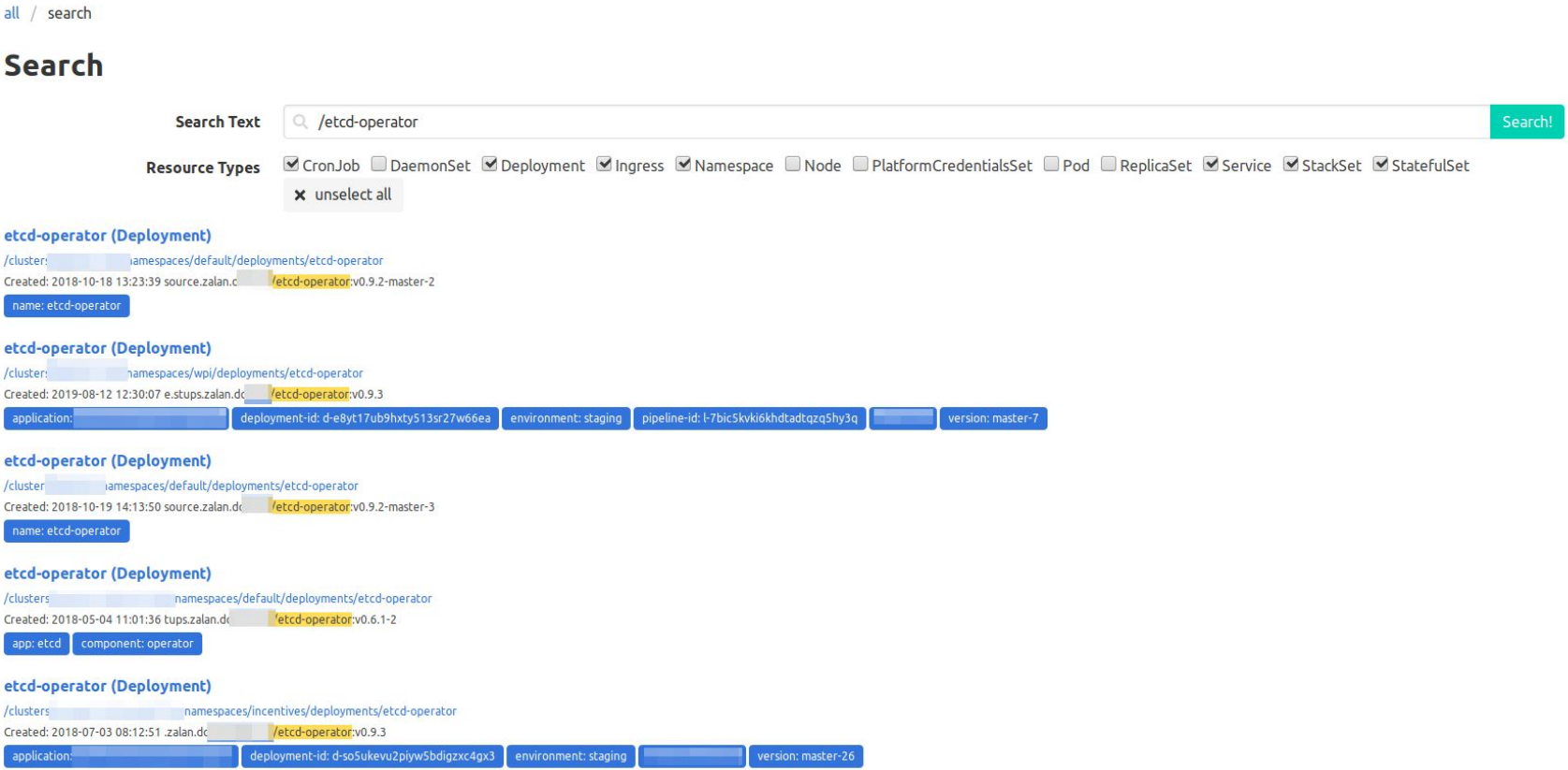
[redacted]aces/default/ingresses/kube-web-view
Created: 2019-07-26 12:34:51
deployment-id: d-293jpa847d74p32js5bxo1modc | pipeline-id: l-2pqt9gs2ia81aef95hwcbtrdjv

kube-web-view (Service)

[redacted]paces/default/services/kube-web-view
Created: 2019-07-24 06:38:20
deployment-id: d-293jpa847d74p32js5bxo1modc | pipeline-id: l-2pqt9gs2ia81aef95hwcbtrdjv

3 results found. Searched 3 resource types in 146 clusters in 2.090 seconds.

SEARCHING FOR DOCKER IMAGE



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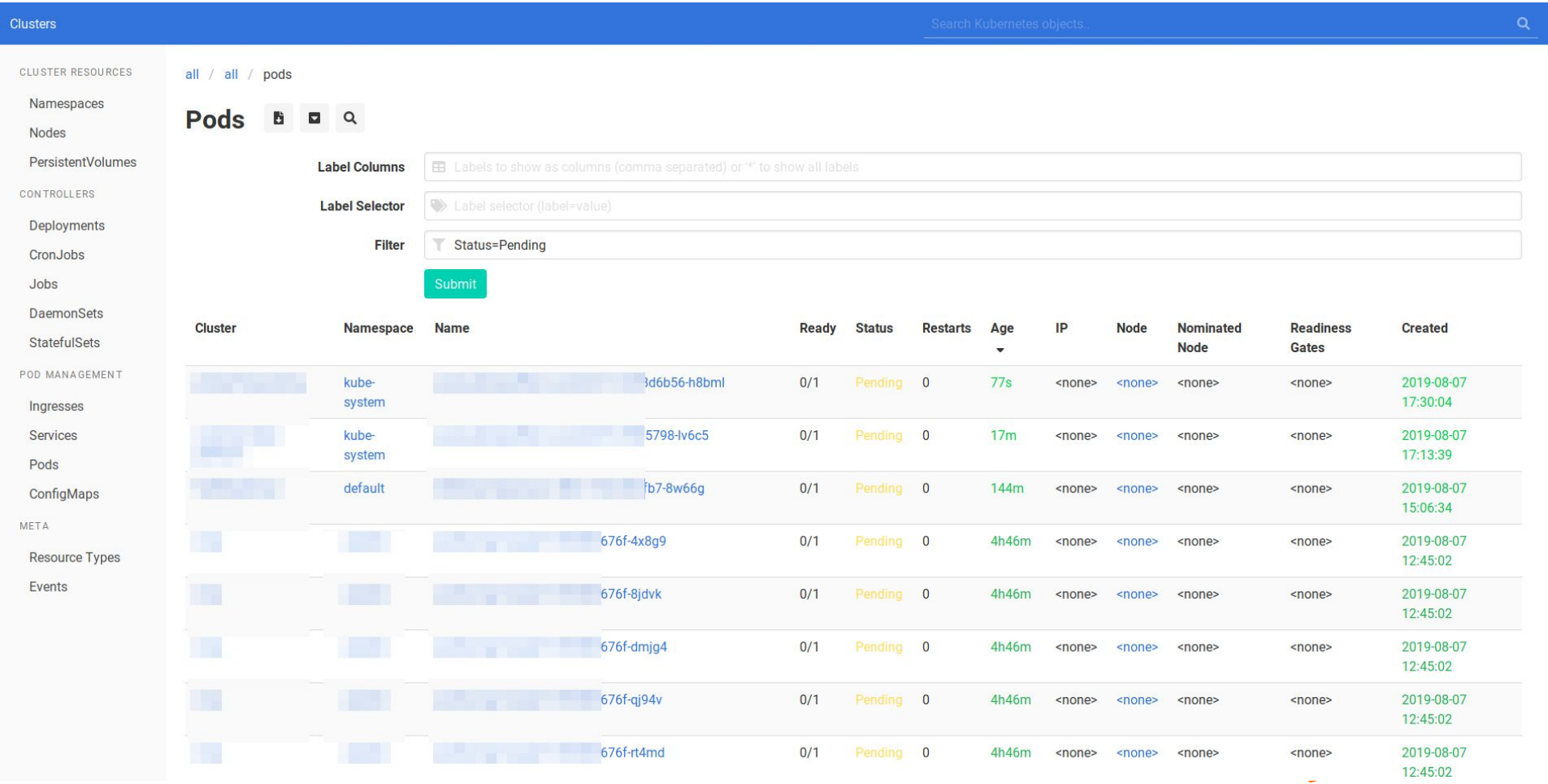
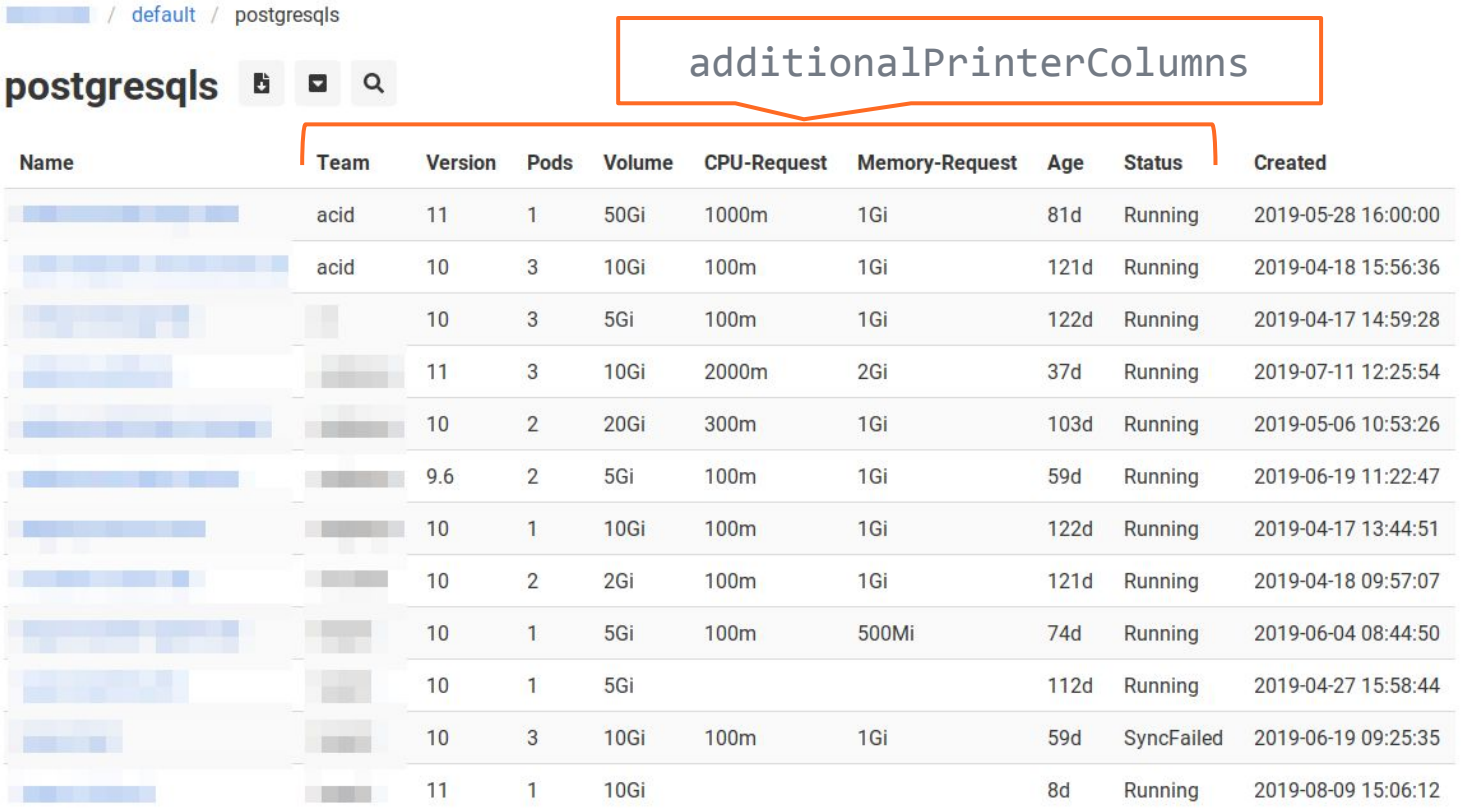

Clusters
Search Kubernetes objects..
CLUSTER RESOURCES
Namespaces
Nodes
PersistentVolumes
CONTROLLERS
Deployments
CronJobs
Jobs
DaemonSets
StatefulSets
POD MANAGEMENT
Ingresses
Services
Pods
ConfigMaps
META
Resource Types
Events
all / all / pods
Pods
Label Columns
Labels to show as columns (comma separated) or '*' to show all labels
Label Selector
Label selector (label=value)
Filter
Status=Pending
Submit
Cluster
Namespace
Name
Ready
Status
Restarts
Age
IP
Node
Nominated Node
Readiness Gates
Created
kube-system
3d6b56-h8bml
0/1
Pending
0
77s
<none>
<none>
<none>
<none>
2019-08-07 17:30:04
kube-system
5798-lv6c5
0/1
Pending
0
17m
<none>
<none>
<none>
<none>
2019-08-07 17:13:39
default
fb7-8w66g
0/1
Pending
0
144m
<none>
<none>
<none>
<none>
2019-08-07 15:06:34
676f-4x8g9
0/1
Pending
0
4h46m
<none>
<none>
<none>
<none>
2019-08-07 12:45:02
676f-8jdvk
0/1
Pending
0
4h46m
<none>
<none>
<none>
<none>
2019-08-07 12:45:02
676f-dmjg4
0/1
Pending
0
4h46m
<none>
<none>
<none>
<none>
2019-08-07 12:45:02
676f-qj94v
0/1
Pending
0
4h46m
<none>
<none>
<none>
<none>
2019-08-07 12:45:02
676f-rt4md
0/1
Pending
0
4h46m
<none>
<none>
<none>
<none>
2019-08-07 12:45:02

CRDS



Name	Team	Version	Pods	Volume	CPU-Request	Memory-Request	Age	Status	Created
	acid	11	1	50Gi	1000m	1Gi	81d	Running	2019-05-28 16:00:00
	acid	10	3	10Gi	100m	1Gi	121d	Running	2019-04-18 15:56:36
		10	3	5Gi	100m	1Gi	122d	Running	2019-04-17 14:59:28
		11	3	10Gi	2000m	2Gi	37d	Running	2019-07-11 12:25:54
		10	2	20Gi	300m	1Gi	103d	Running	2019-05-06 10:53:26
		9.6	2	5Gi	100m	1Gi	59d	Running	2019-06-19 11:22:47
		10	1	10Gi	100m	1Gi	122d	Running	2019-04-17 13:44:51
		10	2	2Gi	100m	1Gi	121d	Running	2019-04-18 09:57:07
		10	1	5Gi	100m	500Mi	74d	Running	2019-06-04 08:44:50
		10	1	5Gi			112d	Running	2019-04-27 15:58:44
		10	3	10Gi	100m	1Gi	59d	SyncFailed	2019-06-19 09:25:35
		11	1	10Gi			8d	Running	2019-08-09 15:06:12

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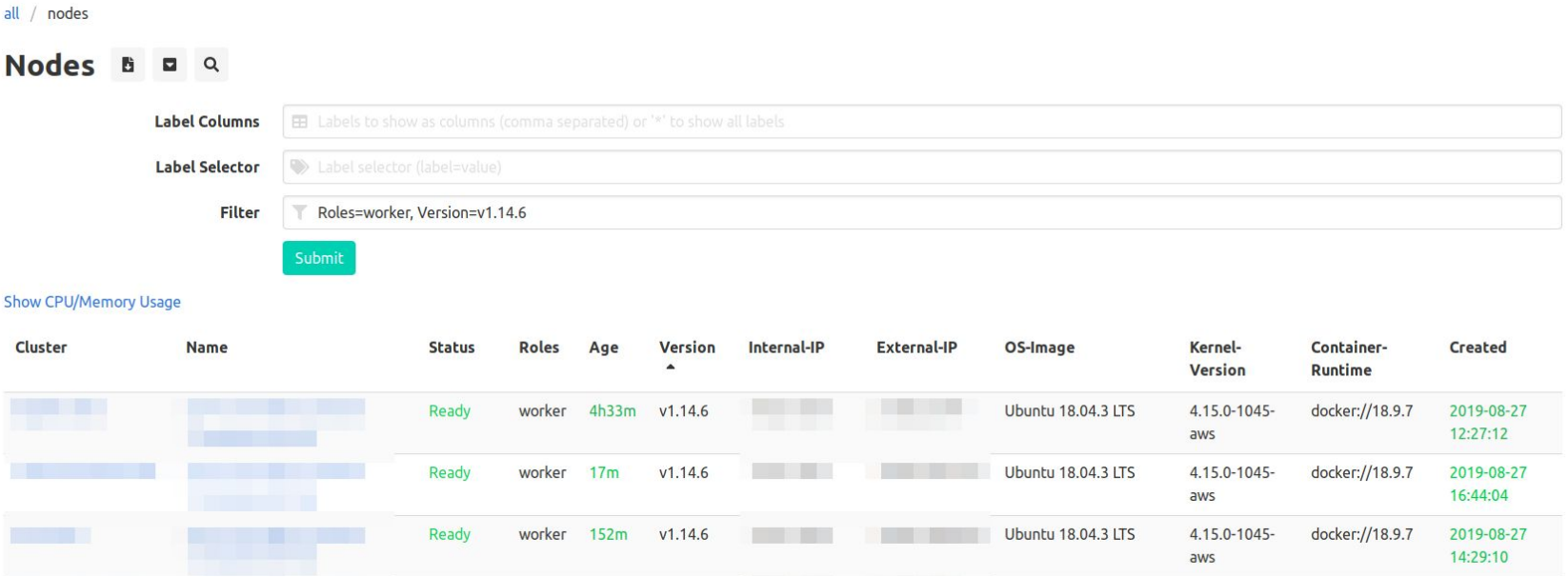
UPGRADE TO KUBERNETES 1.14

"Found 1223 rows for 1 resource type in 148 clusters in 3.301 seconds."



Cluster	Name	Status	Roles	Age	Version	Internal-IP	External-IP	OS-Image	Kernel-Version	Container-Runtime	Created
[redacted]	[redacted]	Ready	worker	4h33m	v1.14.6	[redacted]	[redacted]	Ubuntu 18.04.3 LTS	4.15.0-1045-aws	docker://18.9.7	2019-08-27 12:27:12
[redacted]	[redacted]	Ready	worker	17m	v1.14.6	[redacted]	[redacted]	Ubuntu 18.04.3 LTS	4.15.0-1045-aws	docker://18.9.7	2019-08-27 16:44:04
[redacted]	[redacted]	Ready	worker	152m	v1.14.6	[redacted]	[redacted]	Ubuntu 18.04.3 LTS	4.15.0-1045-aws	docker://18.9.7	2019-08-27 14:29:10

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RESOURCE YAML VIEW

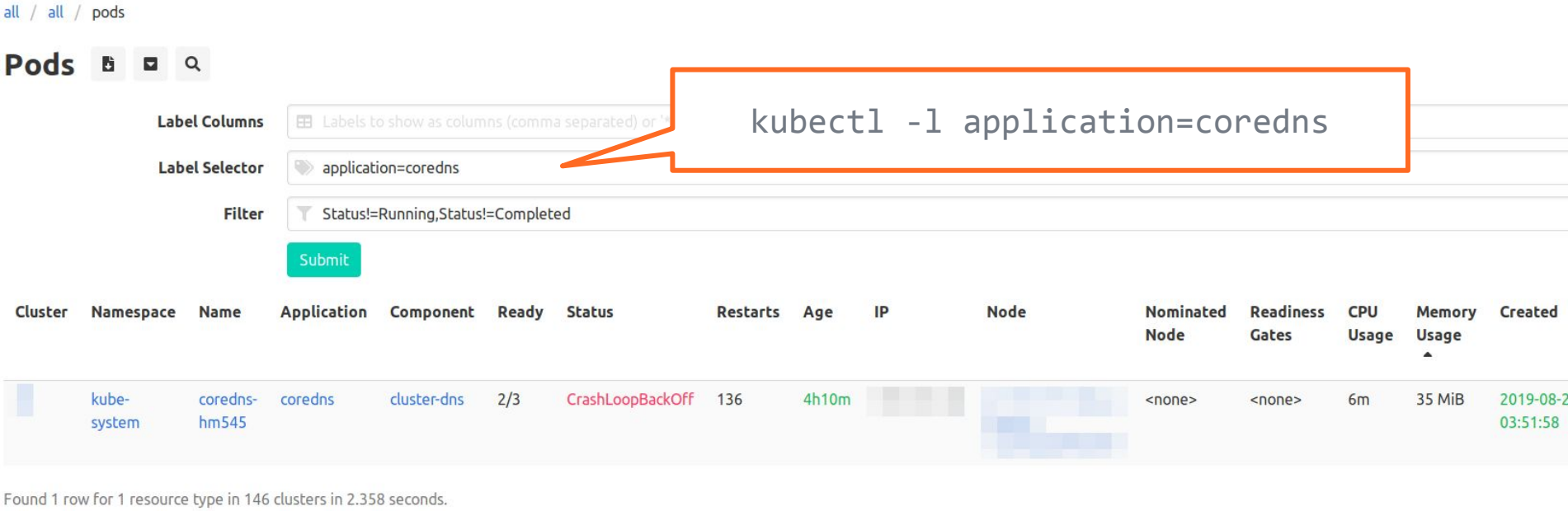
teapot / e2e-tests-zalando-kube-admission-controller-cvbcz / pods / deployment-info-test-fabc1348-b2ae-11e9-a3a6-784f4384f2b4-mj9z5

deployment-info-test-fabc1348-b2ae-11e9-a3a6-784f4384f2b4-mj9z5

Default YAML Logs

```yaml
apiVersion: v1
kind: Pod
metadata:
  annotations:
    kubernetes.io/psp: e2e-test-privileged-psp
  creationTimestamp: '2019-08-15T08:40:17Z'
  generateName: deployment-info-test-fabc1348-b2ae-11e9-a3a6-784f4384f2b4-dd77cb479-
  labels:
    application: e2e-test-application
    pod-template-hash: dd77cb479
  name: deployment-info-test-fabc1348-b2ae-11e9-a3a6-784f4384f2b4-mj9z5
  namespace: e2e-tests-zalando-kube-admission-controller-cvbcz
  ownerReferences:
  - apiVersion: apps/v1
    blockOwnerDeletion: true
```

MULTIPLE CONDITIONS



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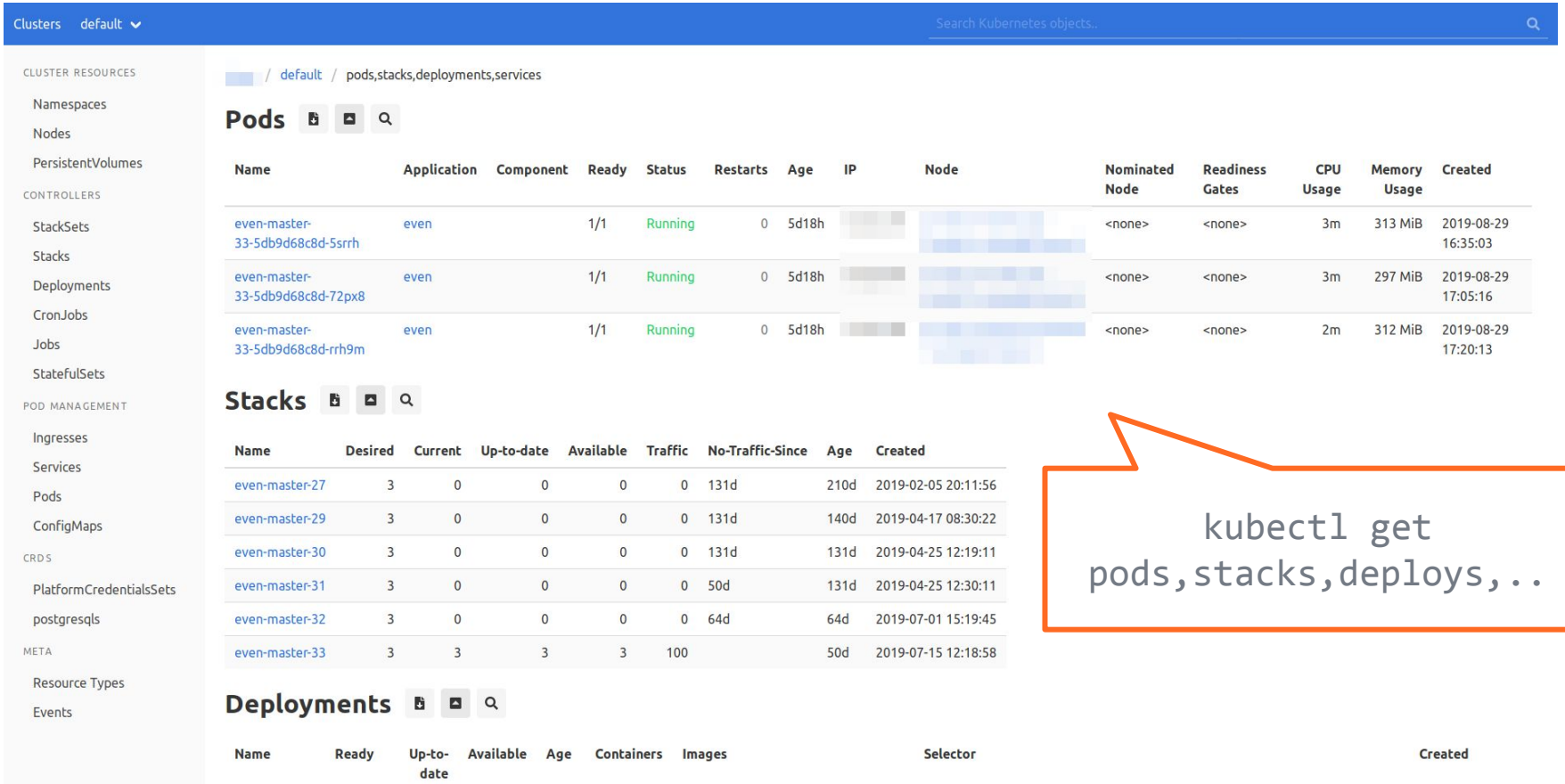
MULTIPLE RESOURCE TYPES



LABEL & CUSTOM COLUMNS

labelcols=**application**
customcols=CPU+Requests=**join(', ', spec.containers[*].resources.requests.cpu)**

Pods

Namespace	Name	Application	Ready	Status	Restarts	Age	IP	Node	CPU Usage	Memory Usage	CPU Requests	Memory Requests	Created
default	kube-ops-view-7b9dd46fd8-kmv89	kube-ops-view	1/1	Running	0	13d	10.42.0.54	k3s-demo	11m	37 MiB	50m	50Mi	2019-08-22 07:53:43
default	kube-ops-view-redis-577f846477-lrgk2	kube-ops-view-redis	1/1	Running	0	39d	10.42.0.6	k3s-demo	86m	663 MiB	50m	50Mi	2019-07-27 14:43:17
default	kube-resource-report-5f77c8f5d9-lwtnl	kube-resource-report	2/2	Running	0	24d	10.42.0.44	k3s-demo	0m	36 MiB	5m, 5m	50Mi, 20Mi	2019-08-11 11:37:24
default	kube-web-view-599d9ff485-46w44	kube-web-view	1/1	Running	0	38h	10.42.0.59	k3s-demo	1m	39 MiB	5m	100Mi	2019-09-03 16:29:26
default	nginx-c9767ffdf-22tgk		1/1	Running	0	39d	10.42.0.20	k3s-demo	0m	2 MiB	2m	20M	2019-07-27 20:59:56

uses JMESPath expression

URL STRUCTURE

```
/clusters/{cluster}/namespaces/{namespace}/{resource-type}
```

cluster: cluster aliases separated by "," or "_all"

namespace: namespace name or "_all"

resource-type: plural names separated by "," or "all" (like kubectl get all)

https://kube-web-view.readthedocs.io/

QUERY PARAMETERS FOR LIST VIEW

sort: column name to sort by, optionally with ":desc"

labelcols: additional label columns (comma separated) or "*"

selector: label selector (like kubectl -l), will be passed to Kubernetes API

filter: post-processing filter, either a simple string, Column=Value or Column!=Value

hidecols: hide certain columns

customcols: custom columns using JMESPath

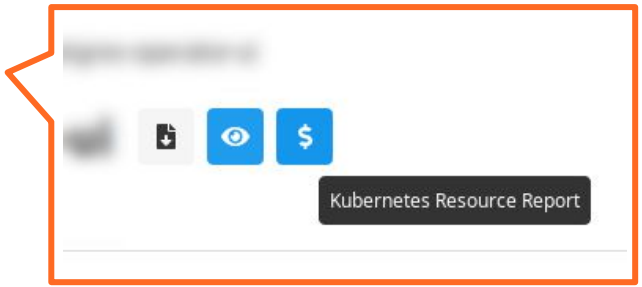
limit: number of rows to show

https://kube-web-view.readthedocs.io/en/latest/features.html#listing-resources

CUSTOMIZATION

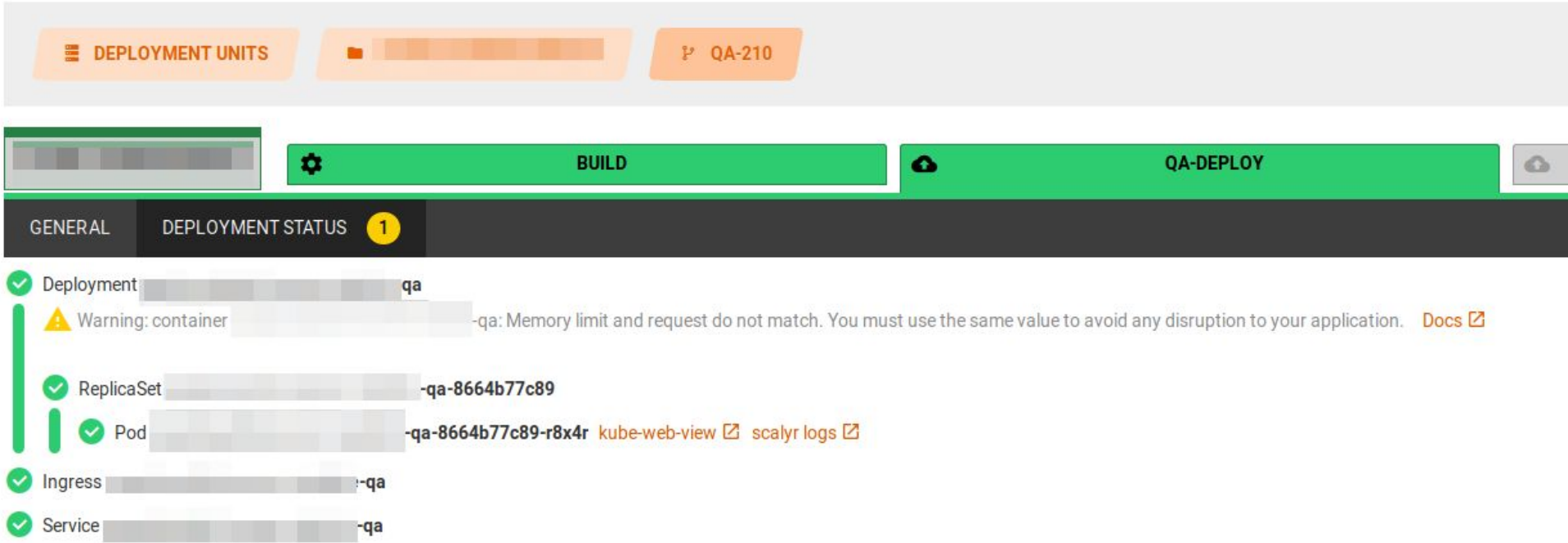
Nearly all aspects can be customized for your org via CLI options:

- External **Links** (monitoring dashboards, ..)
- Default Label and Custom **Columns**
- **Sidebar**, HTML templates
- **OAuth2** integration



kube-web-view.readthedocs.io/en/latest/customization.html

LINKING FROM DEPLOYMENT STATUS



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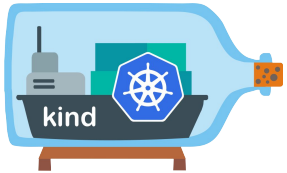
KUBE-WEB-VIEW.DEMO.J-SERV.DE

local / default / pods

Pods

Name	Application	Ready	Status	Restarts	Age
kube-ops-view-7b9dd46fd8-vfqgt	kube-ops-view	1/1	Running	0	46h
kube-ops-view-redis-577f846477-lrgk2	kube-ops-view-redis	1/1	Running	0	15d
kube-resource-report-5f77c8f5d9-lwtnl	kube-resource-report	2/2	Running	0	8h
kube-web-view-75b996b8c8-z2sgt	kube-web-view	1/1	Running	0	57s
nginx-c9767ffdf-22tgk		1/1	Running	0	14d
nginx-c9767ffdf-8qzqr		1/1	Running	0	14d

TESTING WITH PYTEST-KIND AND PURE HTML

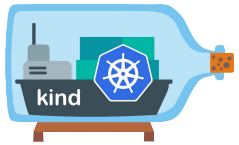



```python
def test_filter_pods_with_custom_columns(session):
    """
    Test that filtering on custom columns works
    """
    response = session.get(
        "/clusters/local/namespaces/default/pods?customcols=Images=spec.containers[*].image&filter=hjacobs/"
    )
    response.raise_for_status()
    check_links(response, session)
    ths = response.html.find("main table thead th")
    # note: pods have an extra "Links" column (--object-links)
    assert ths[-3].text == "Images"

    rows = response.html.find("main table tbody tr")
    for row in rows:
        cells = row.find("td")
        assert cells[-3].text.startswith("['hjacobs/")
```

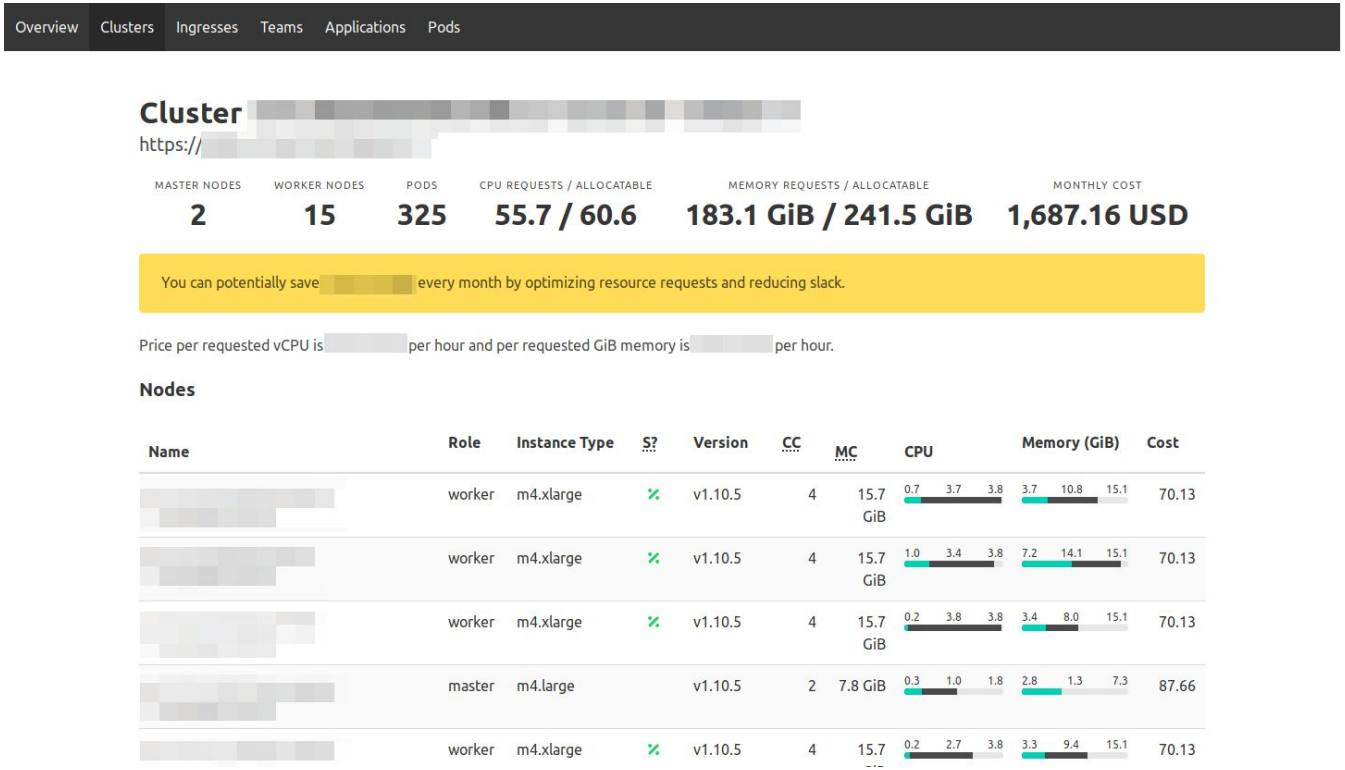
KUBERNETES + PYTHON?

- Pykube
- asyncio / aiohttp
- pytest-kind
- Jinja2 templates



codeberg.org/hjacobs/kube-web-view/

KUBERNETES RESOURCE REPORT



github.com/hjacobs/kube-resource-report

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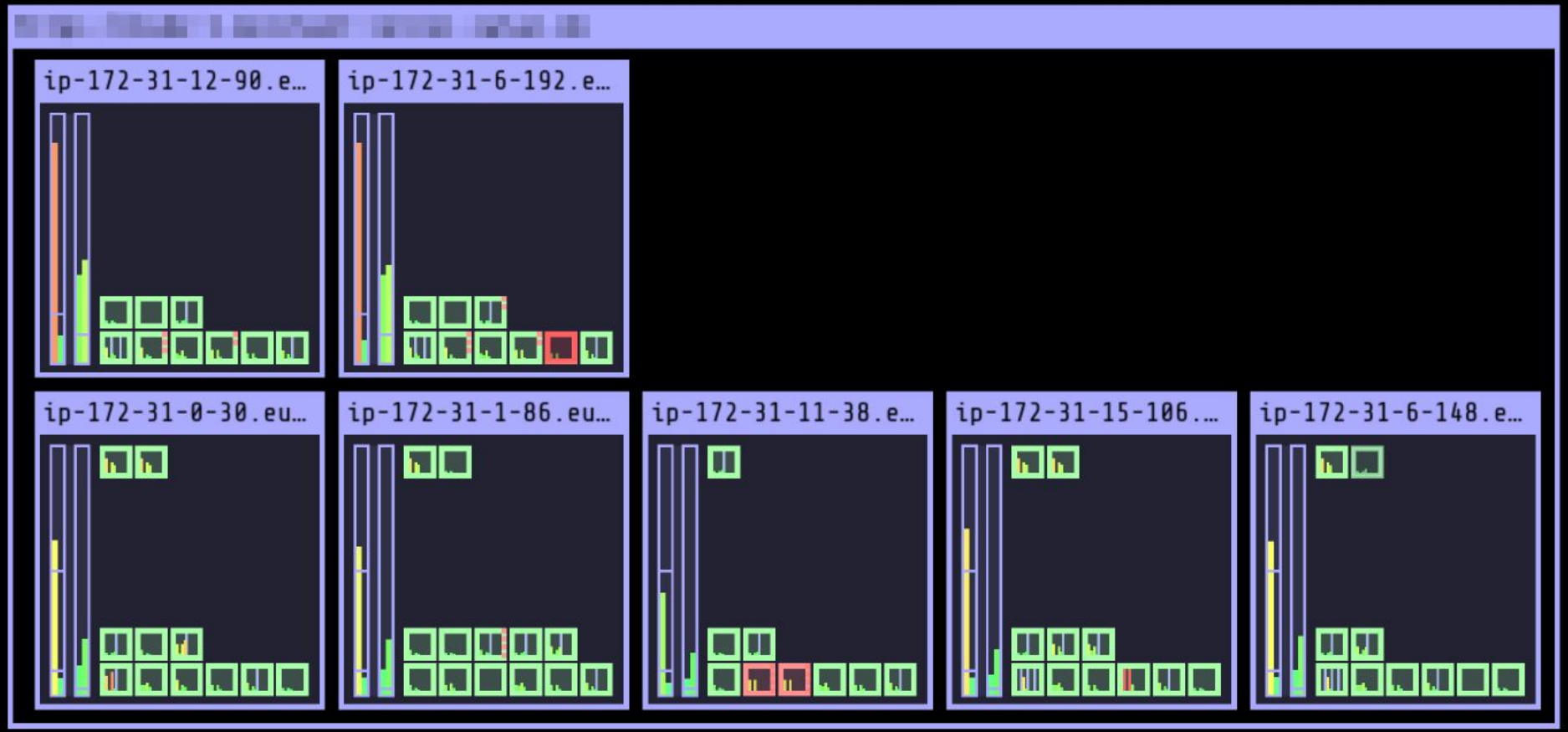
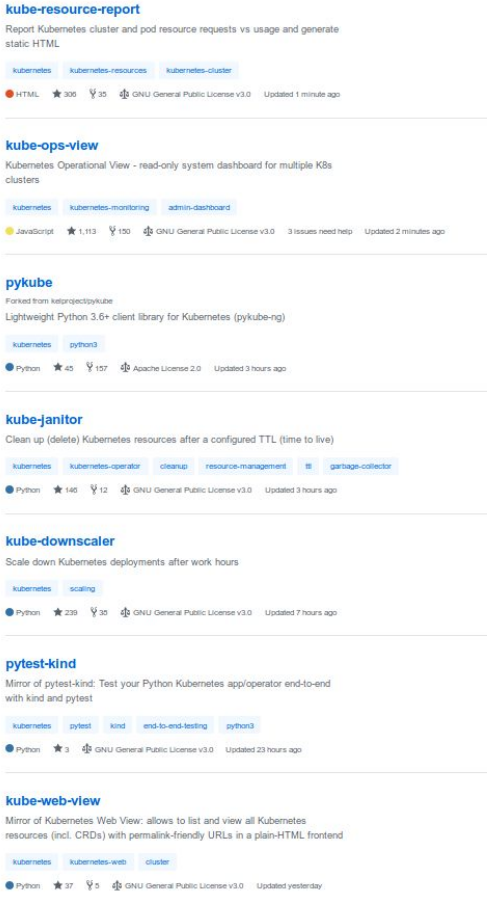


https://github.com/hjacobs/kube-ops-view

https://github.com/hjacobs/kube-ops-view

KUBERNETES + PYTHON = ❤

github.com/hjacobs



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KUBERNETES + PYTHON = ❤

code examples from this talk can be found in

codeberg.org/hjacobs/kubernetes-and-python

ZALANDO OPEN SOURCE

Kubernetes on AWS
github.com/zalando-incubator/kubernetes-on-aws

AWS ALB Ingress controller
github.com/zalando-incubator/kube-ingress-aws-controller

External DNS
github.com/kubernetes-incubator/external-dns

Postgres Operator
github.com/zalando/postgres-operator

Elasticsearch Operator
github.com/zalando-incubator/es-operator

Kubernetes Metrics Adapter
github.com/zalando-incubator/kube-metrics-adapter

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QUESTIONS?

HENNING JACOBS

henning@zalando.de

@try_except_

Illustrations by @01k