Kubernetes Navigation Stories

DevOpsStage 2019

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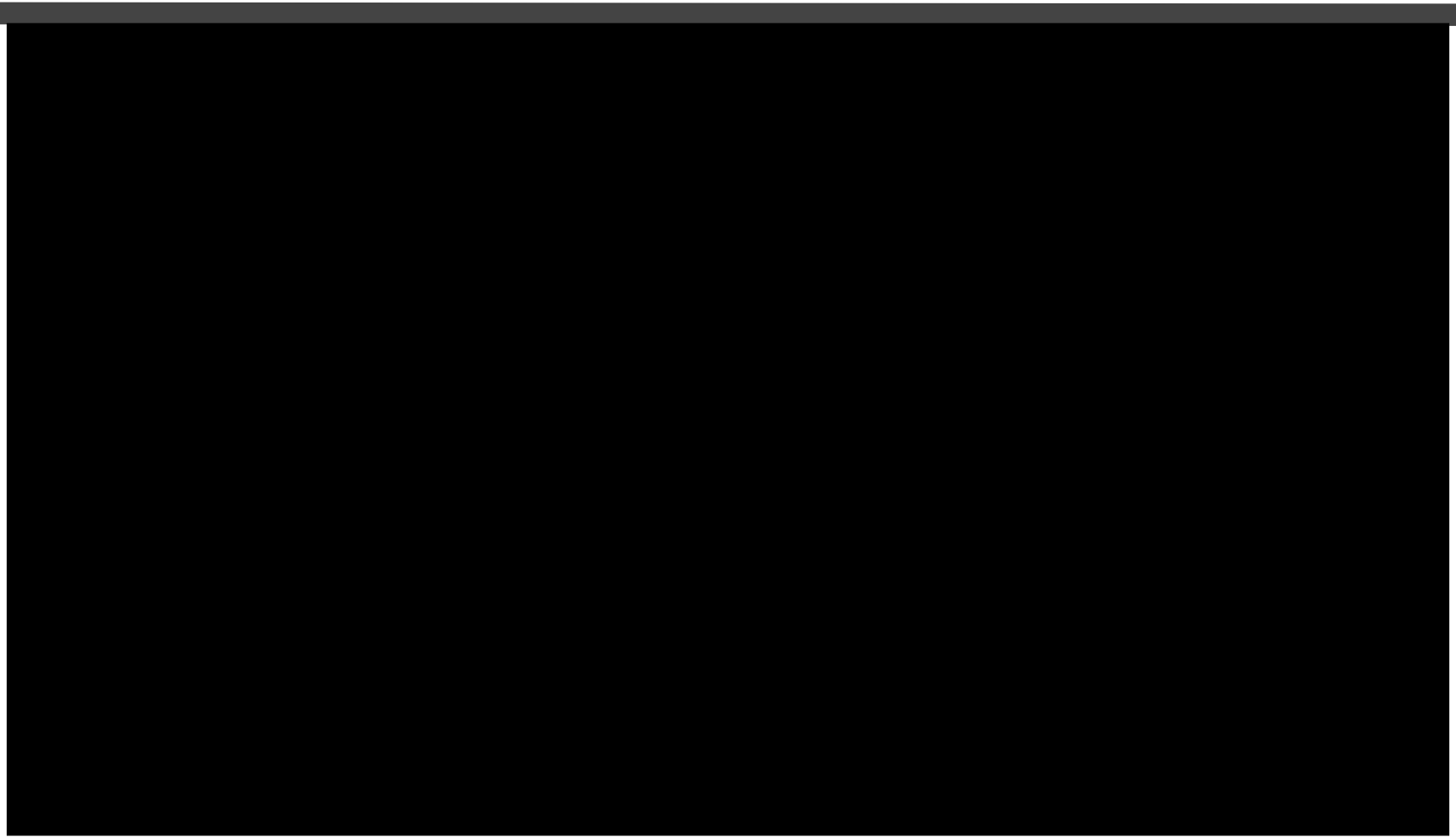


ThredUP Technology

- 70 Software Engineers
- 5 Infrastructure Engineers
- 50 applications
- 100 EC2 nodes

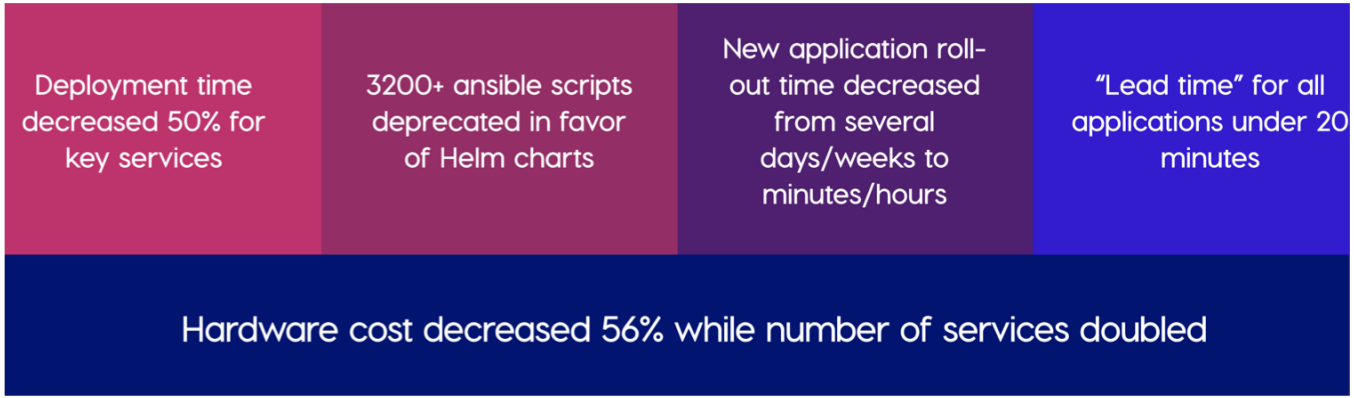
Stack

- NodeJS, react
- Ruby, .NET, Java
- RabbitMQ, SQS
- Redis
- MySQL Aurora

100% in k8s since mid-2018

CNCF Case study

https://www.cncf.io/thredup-case-study/



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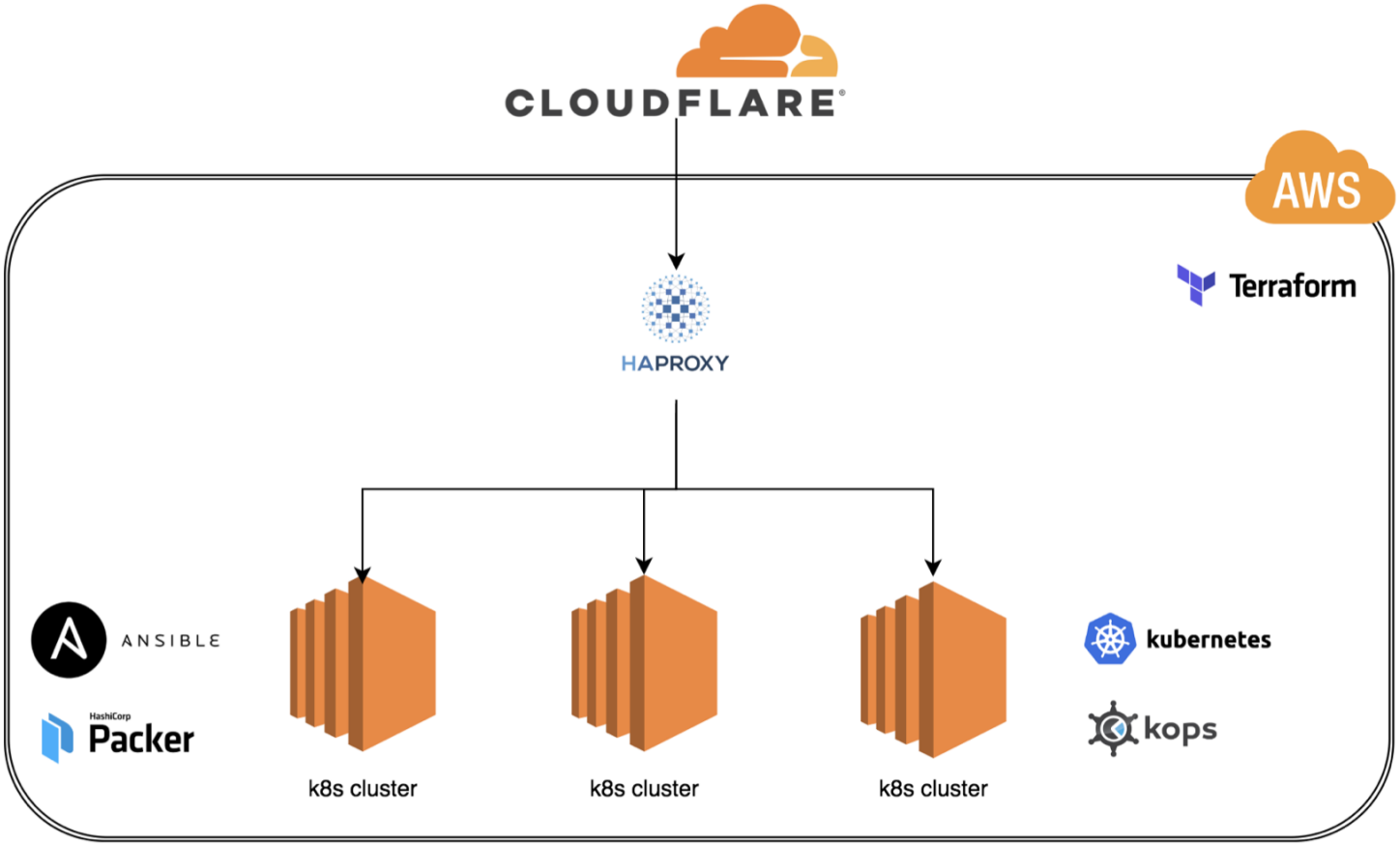
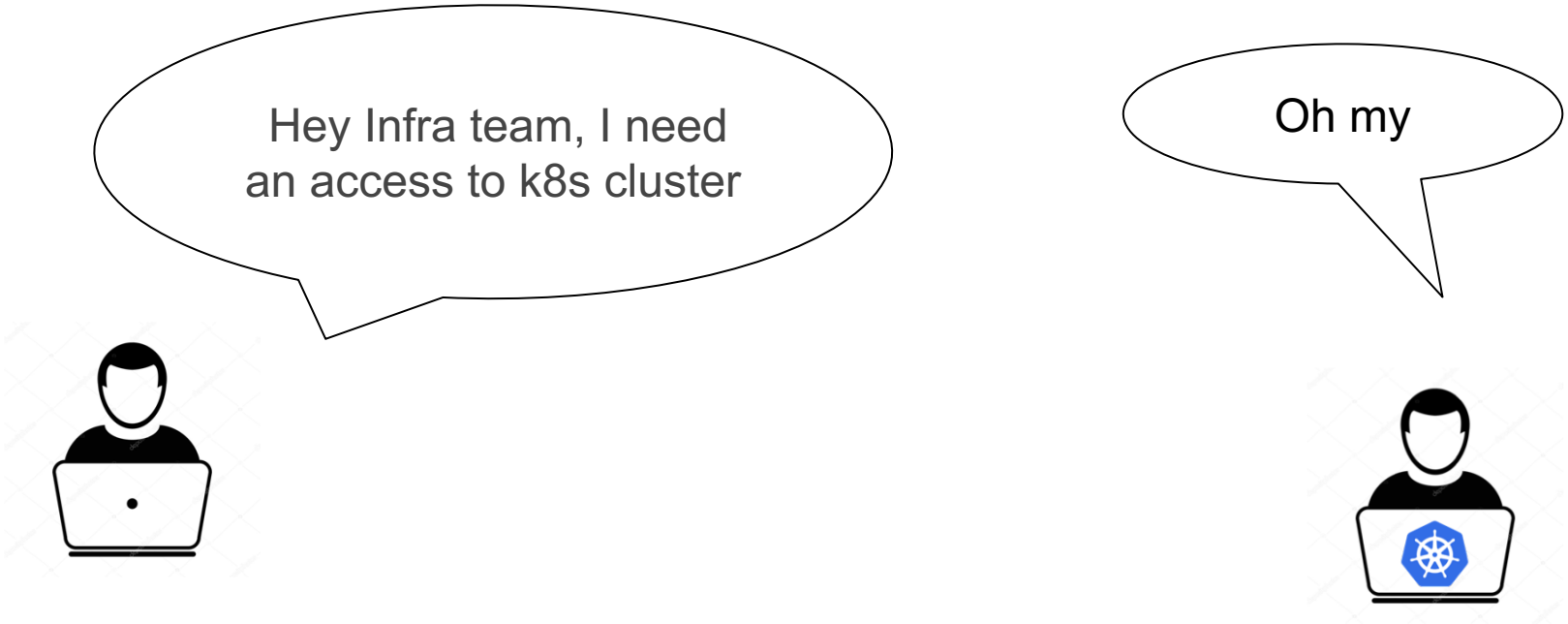
ThredUP Infrastructure



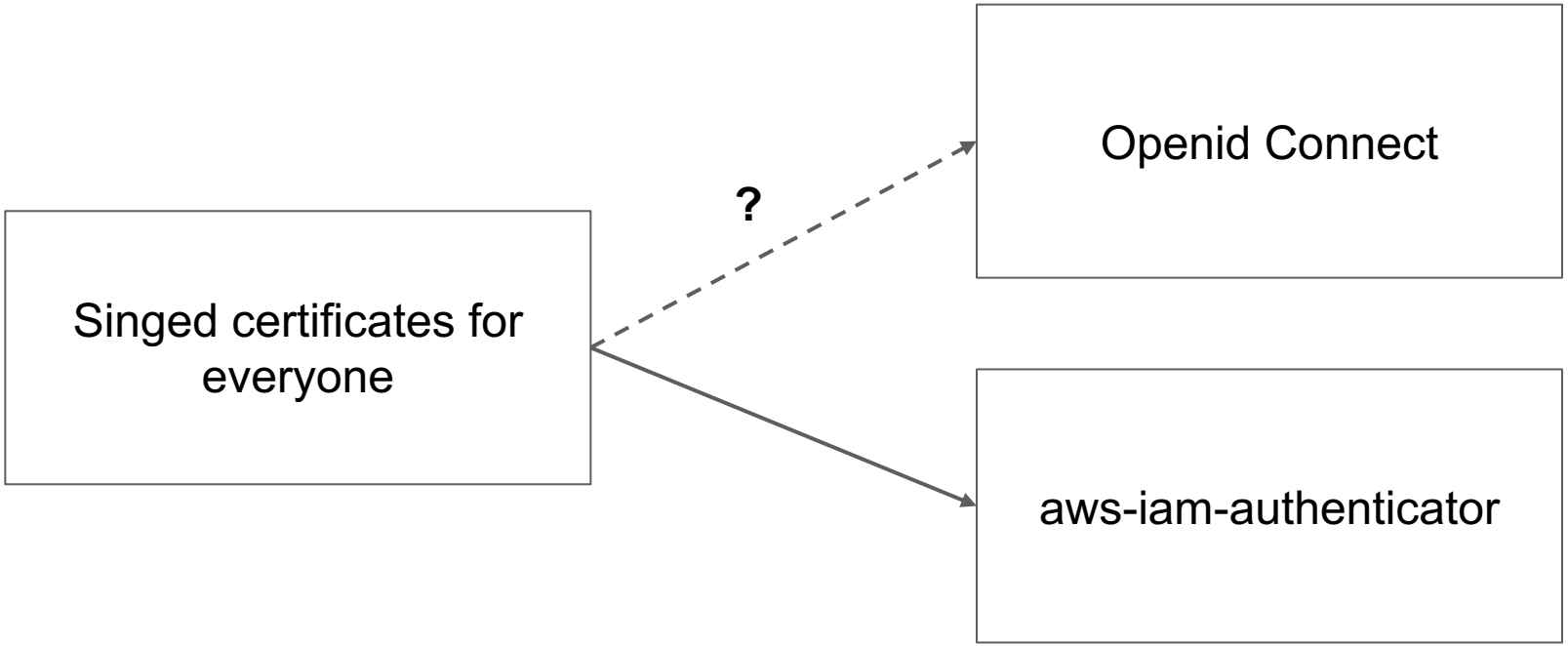
Life after Kubernetes migration

- **Fixing shortcuts and gaps**
  - IAM
  - Secrets management
- **Developers experience**
  - Staging environment
  - Local development
- **Infrastructure optimization**
  - Auto-scaling
  - Spot Instances
  - Security
  - Networking

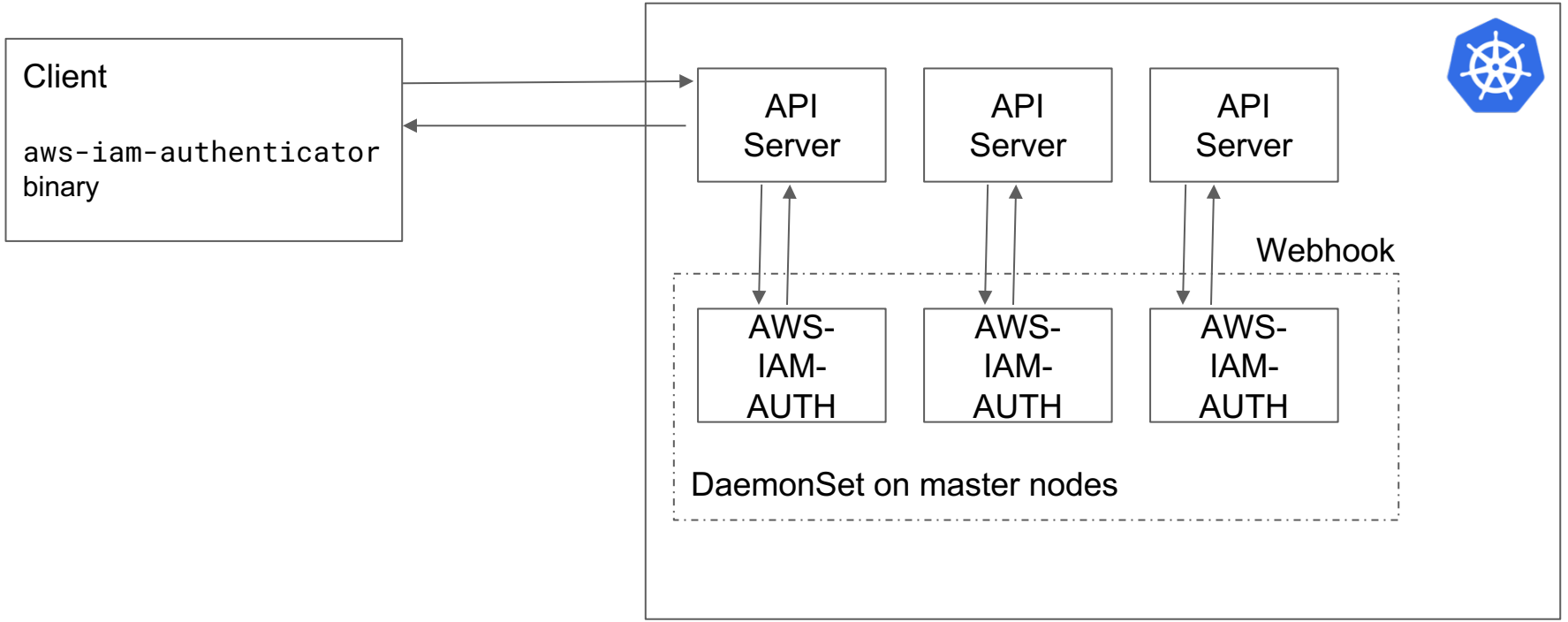
Authentication



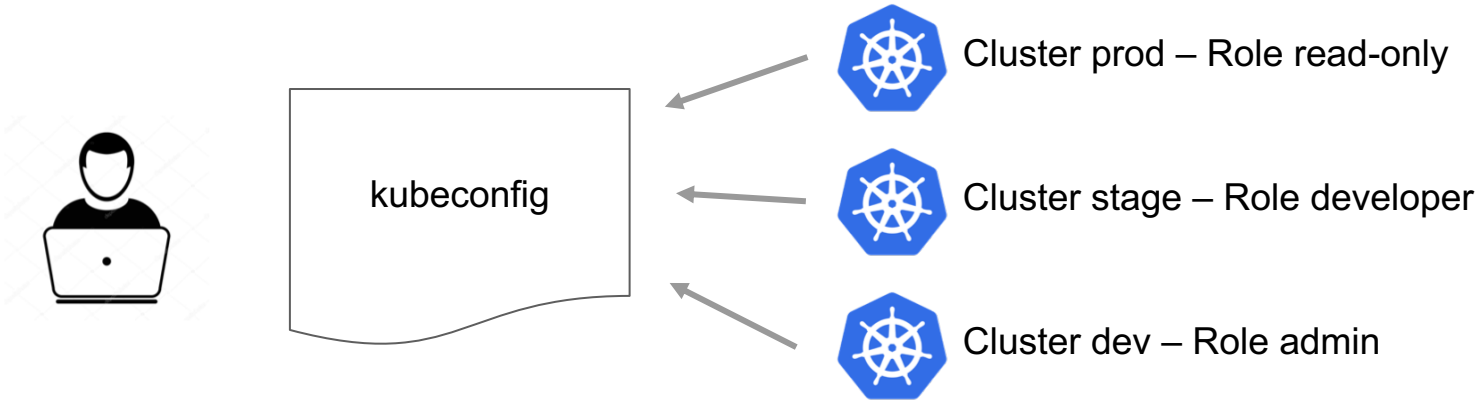
Auth mechanisms



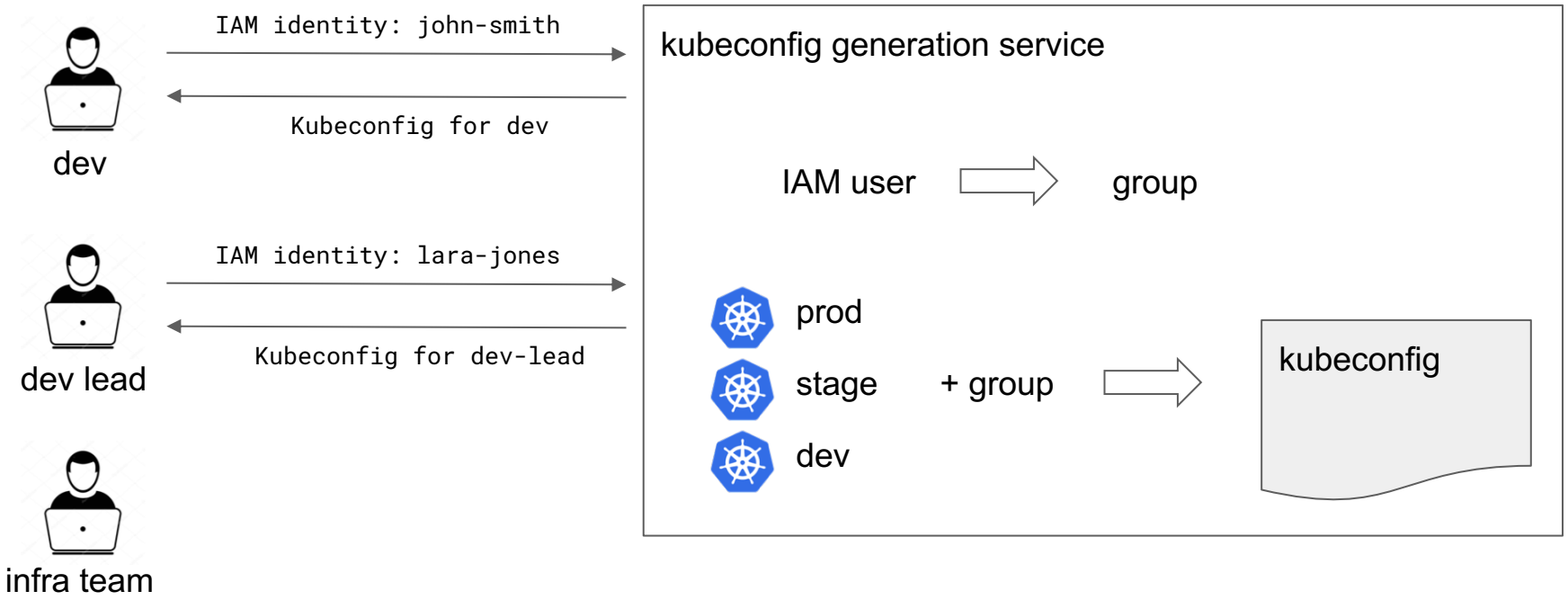
AWS-IAM-Authenticator



AWS-IAM-Authenticator – kubeconfig



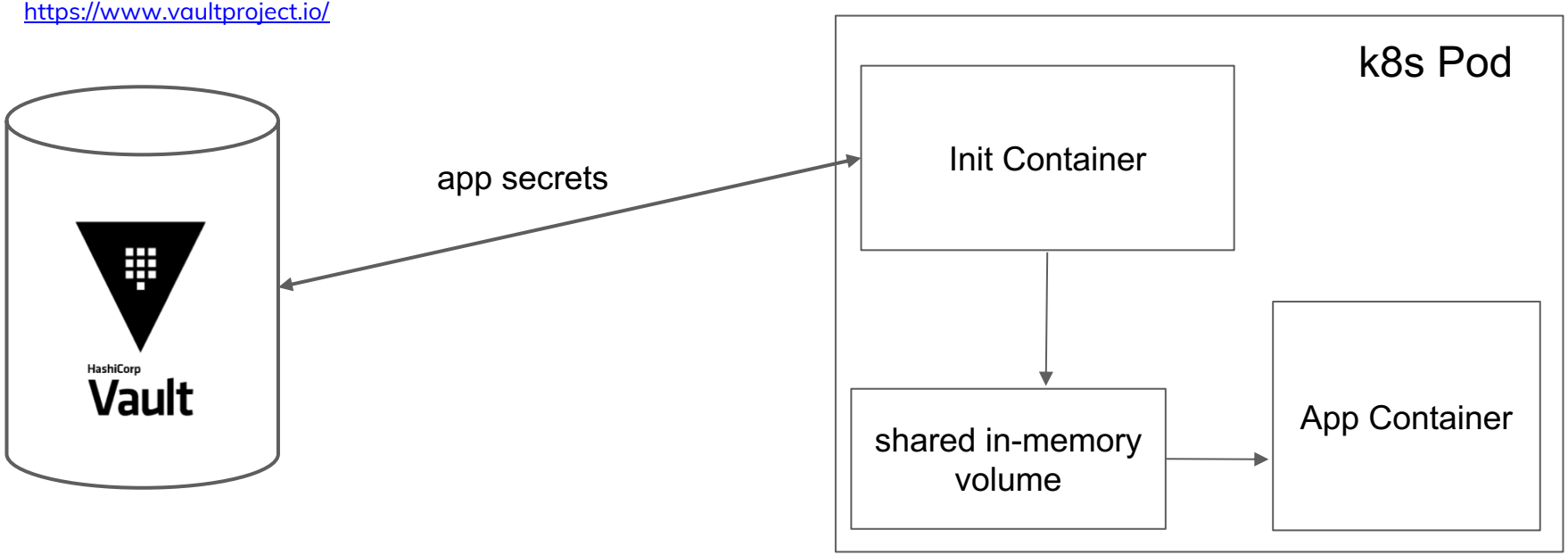
AWS-IAM-Authenticator – kubeconfig generation



Secrets Management

Hashicorp Vault

https://www.vaultproject.io/



https://github.com/cruise-automation/daytona

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SOPS – Secrets OPerationS

https://github.com/mozilla/sops

```
# secrets.production.yaml
app_secrets:
 db_username: cart_service
 db_password: supersecret
```

Supported formats:

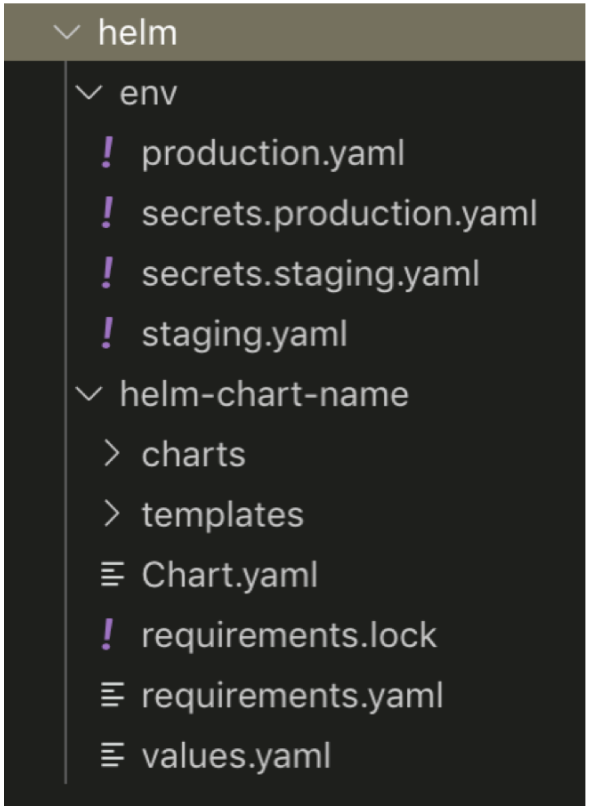
YAML
JSON
.env

SOPS – Encryption

```
$ sops -e --kms <AWS-KMS-ARN> secrets.production.yaml

app_secrets:
    db_username:
ENC[AES256_GCM,data:KuhPWLhijVc/9wa6,iv:V7YS/QglsuYwpmBcTZjOwFz8p10yt+qOcRgg+/OL4Uo=,tag
:jchhWABpUVYK4kpRKlrYPQ==,type:str]
    db_password:
ENC[AES256_GCM,data:TWjWb4up6nx+gSk=,iv:VoI9vnYrIdYxjTmSsqFzbXZ9z8LsZp4ud8LgVocxGAs=,tag
:PVNKEAq3OvWGiUSmM3aHpw==,type:str]
sops:
    kms:
    -   arn: AWS-KMS-ARN
        created_at: '2019-09-26T09:00:30Z'
        enc:
AQICAHhGGWsaRwq5wtMieLutm2hnsC2WqAifhQ6HgfjDUdbvpQE5pwGLIOabNseXxCnNWo0YAAAAfjB8BgkqhkiG
9w0BBwagbzBtAgEAMGgGCSqGSIb3DQEHATAeBglghkgBZQMEAS4wEQQMhPJ/IHKNPgmqzN8vAgEQgDvTzDYH71MH
x5nGWHjzNjpNDjnTw3pgS8IPf26qVhcdrO7Uv1g7yjKsJIVdcD00/hSNCgg6+KgulNgHmw==
    gcp_kms: []
```

SOPS – helm template and secrets storage



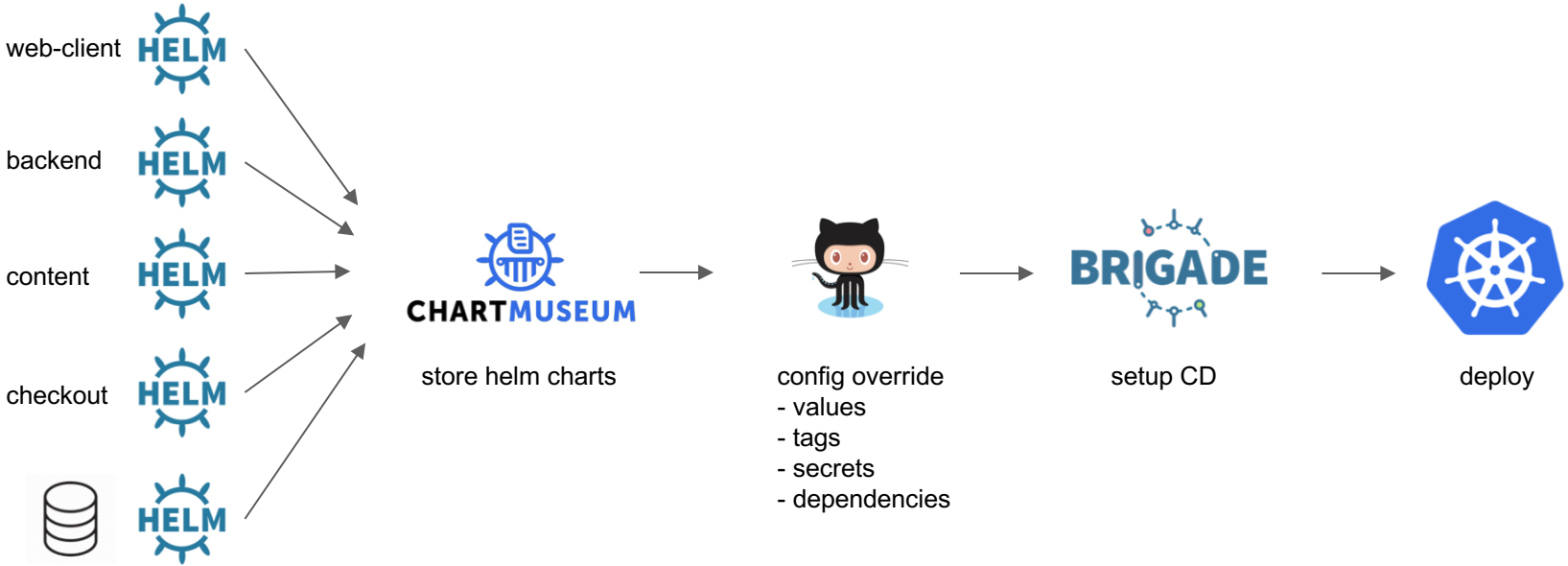

```yaml
apiVersion: v1
{{- with .Values.app_secrets }}
data:
{{ toYaml . | indent 2 }}
{{- end }}
kind: Secret
metadata:
  annotations:
    helm.sh/hook: pre-install,pre-upgrade
    helm.sh/hook-delete-policy: before-hook-creation
  name: {{ template "fullname" . }}
  labels:
    app: {{ template "fullname" . }}
type: Opaque
```

SOPS – Deployment

```
$ sops -d -i ./helm/env/secrets.production.yaml

$ helm upgrade --install --wait --timeout 600 \
               -f ./helm/env/secrets.production.yaml \
               -f ./helm/env/production.yaml \
               app_name ./helm/app_name
```

Staging Environments



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Staging Environment

$git checkout -b devopsstage

$git push -u origin devopsstage

wait 4-5 min

use https://devopsstage.threduptest.com/

Local development

When your service has a lot of dependencies (MySQL, Redis, RabbitMQ and 5 other services)

Local Development

```
macbook: Thredup $ git clone git@github.com:thredup/node-proxy.git
Cloning into 'node-proxy'...
...
macbook: Thredup $ cd node-proxy/
macbook: node-proxy (master) $ npm install
added 6 packages from 8 contributors and audited 6 packages in 0.595s
found 0 vulnerabilities
macbook: node-proxy (master) $ npm test
> proxy@1.0.0 test ~/Thredup/node-proxy
...

macbook: node-proxy (master) $ npm start
> proxy@1.0.0 start
> node server.js
```

Local Development with Docker

```
macbook: Thredup $ docker run -it -v ${PWD}:/app -p 3000:3000
node:12-alpine sh
/ $ apk add --no-cache mysql-dev

/ $ npm install
/ $ npm test
/ $ npm start
> proxy@1.0.0 start
> node server.js
```

Local Development with Docker Compose

```
version: "3.7"
services:
  web:
    image: node:12-alpine
    volumes:
      - ./:/app
    ports:
      - "3000"
    environment:
      REDIS_HOST: "127.0.0.1"
  mysql:
    image: ...
    ...
  redis:
    image: ...
```

Local Development with Docker Compose

```
macbook: Thredup $ docker-compose up -d
…
macbook: Thredup $ docker-compose exec web sh

/ $ npm install
/ $ npm test
/ $ npm start
> proxy@1.0.0 start
> node server.js
```

And then you need another service as a dependency ;-)
...and another one
...

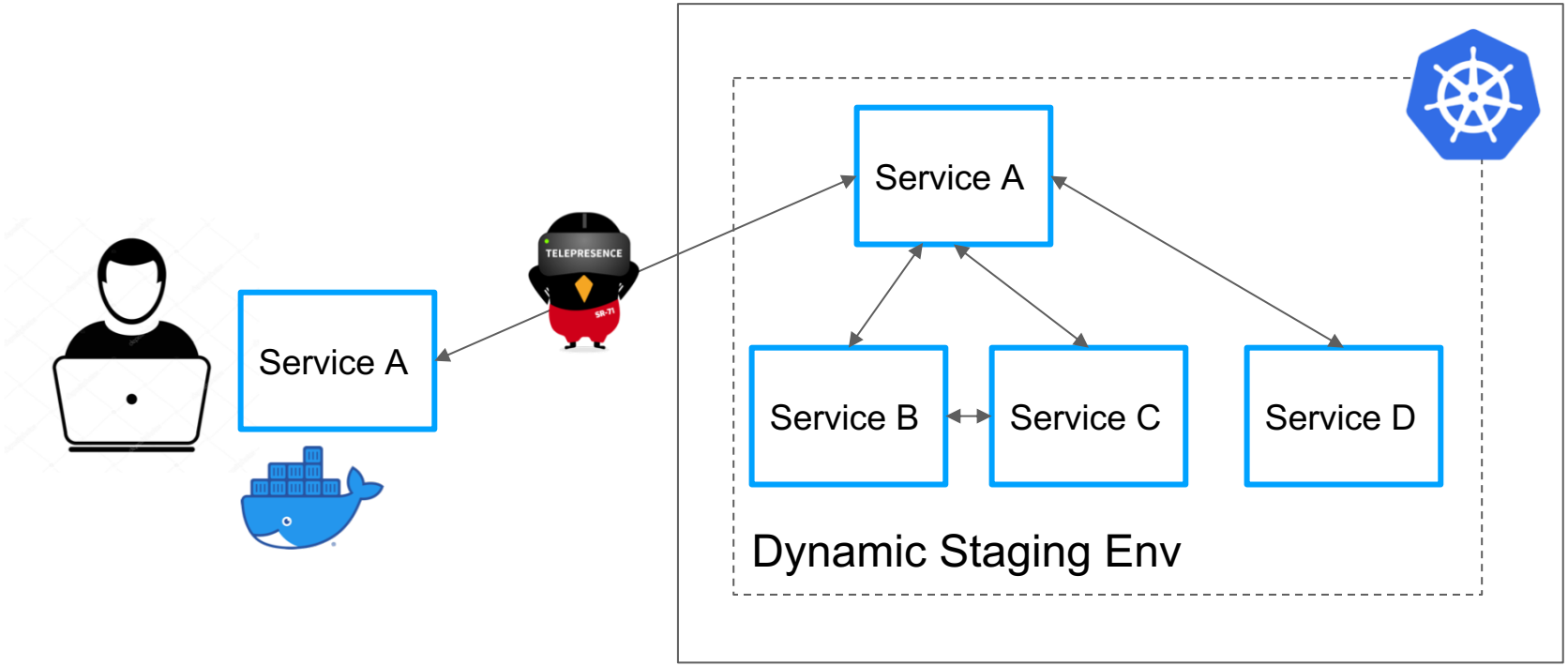
docker-compose.yaml ~ 330 lines

MySQL DB ~25Gb

And you need to keep it
UP TO DATE

Local development - Telepresence

https://www.telepresence.io/



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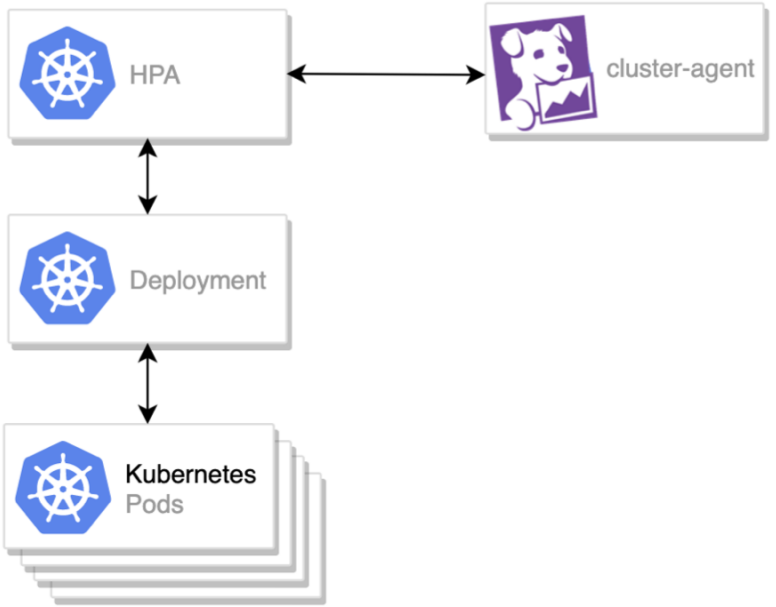
Local development with Telepresence

```
macbook: Thredup $ telepresence --swap-deployment          \
            deployment-name                                \
            --expose 3000                                  \
            --method container                             \
            --docker-run --rm -it -v ${PWD}:/app           \
            000000000001.dkr.ecr.us-east-1.amazonaws.com/cart:latest
...
...
/ $ npm install
/ $ npm test
/ $ npm start
> proxy@1.0.0 start
> node server.js
```

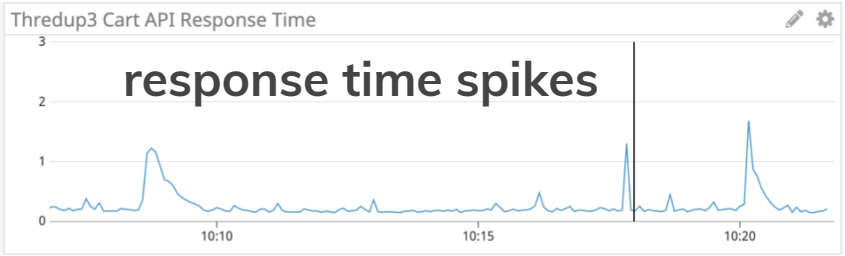
Horizontal Pod Autoscaling (HPA)

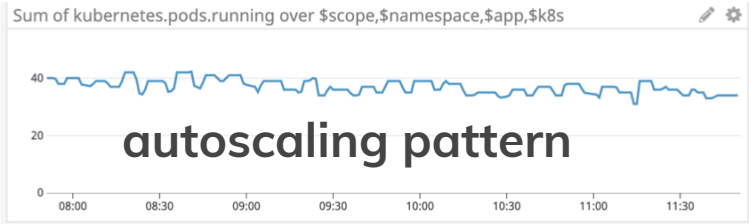
- Do not over-provision
- Be ready for traffic spikes

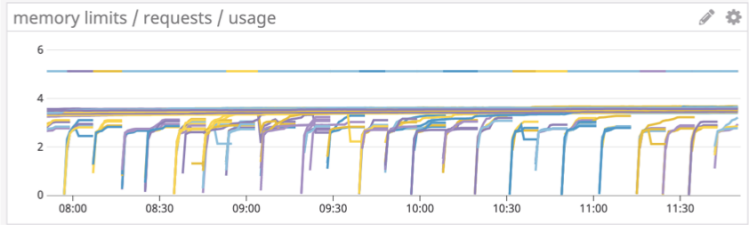
```
metrics:
 - type: External
   external:
     metricName: trace.rack.request.hits
     metricSelector:
       matchLabels:
         env : production
         service : some-service
     targetAverageValue: 10
```

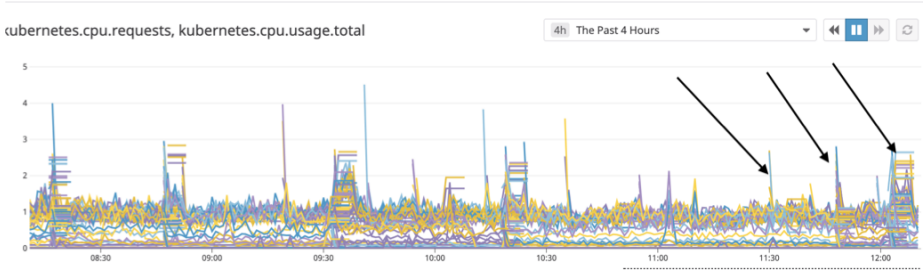


HPA lessons learned









offender pods:
request 1 core
use 3+ cores on start

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HPA lessons learned

add warmup script

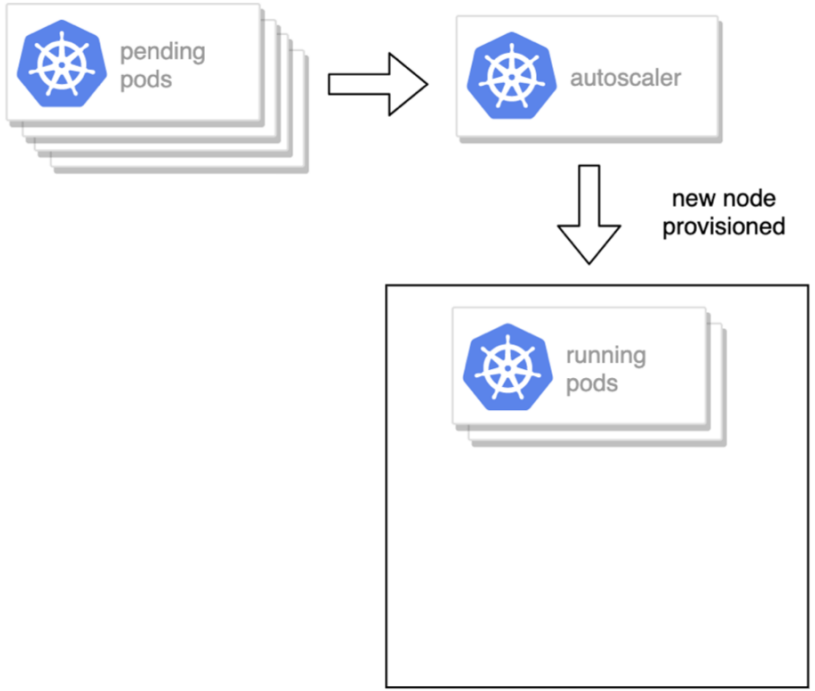
```
lifecycle:
  postStart:
    exec:
      command:
      - /bin/sh
      - -c
      - cd /app/script/warmup && ./warmup.sh
```

update deployment strategy

```
strategy:
  rollingUpdate:
    maxSurge: 25%
    maxUnavailable: 10%
  type: RollingUpdate
```

Cluster autoscaler

- overflow capacity in production
- utilize spot instances



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Spot instances and AZRebalance

- spot termination works https://github.com/mumoshu/kube-spot-termination-notice-handler
- except when instance is terminated by Availability Zone

```
Terminating EC2 instance: i-0e685dc2a84b65f63
Cause:CauseAt 2019-07-18T06:09:59Z instances were launched to balance instances in
zones us-east-1a us-east-1e with other zones resulting in more than desired number of
instances in the group. At 2019-07-18T06:11:30Z an instance was taken out of service
in response to a difference between desired and actual capacity, shrinking the
capacity from 4 to 3. At 2019-07-18T06:11:30Z instance i-0e685dc2a84b65f63 was
selected for termination.
```

Spot instances and AZRebalance

```
metadata:
 creationTimestamp: 2017-10-12T16:28:23Z
 generation: 2
 name: m4xlarge
spec:
 image: 405610825889/harden-k8s-x.14-debian-stretch-amd64-hvm-ebs-2019-08-16
 machineType: m4.2xlarge
 maxPrice: "0.20"
 maxSize: 30
 minSize: 5
 role: Node
 rootVolumeSize: 100
 subnets:
 - us-east-1a
 - us-east-1c
 - us-east-1e
 suspendProcesses:
 - AZRebalanceapiVersion: kops/v1alpha2
kind: InstanceGroup
```

Container vulnerability scan

https://github.com/arminc/clair-scanner

jenkins APP 4:22 PM

Vulnerability scan completed:

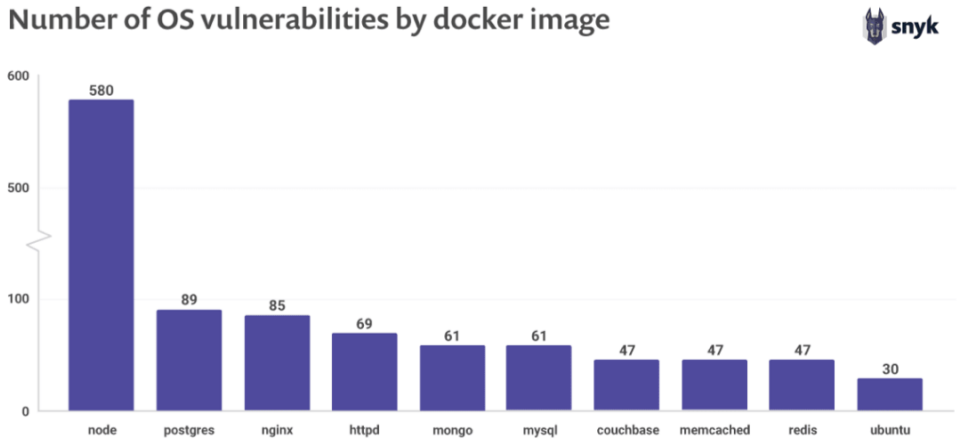
Medium: 7681

High: 2257

Critical:

DefCon1:

```
  16 alpine:v3.3
   9 alpine:v3.4
   4 alpine:v3.7
   2 alpine:v3.8
1015 debian:8
1199 debian:9
   4 ubuntu:14.04
  11 ubuntu:16.04
```



https://snyk.io/blog/top-ten-most-popular-docker-images-each-contain-at-least-30-vulnerabilities/

Container runtime security

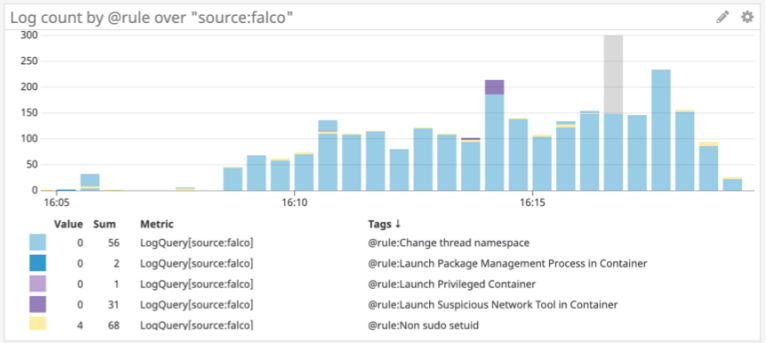
https://falco.org

Sysdig

Falco

Log count by @rule over "source:falco"

@RULE	COUNT
System procs network activity	2.47K
Non sudo setuid	69
Change thread namespace	56
Launch Suspicious Network Tool in Container	31
Launch Package Management Process in Container	2
Launch Privileged Container	1
Run shell untrusted	1



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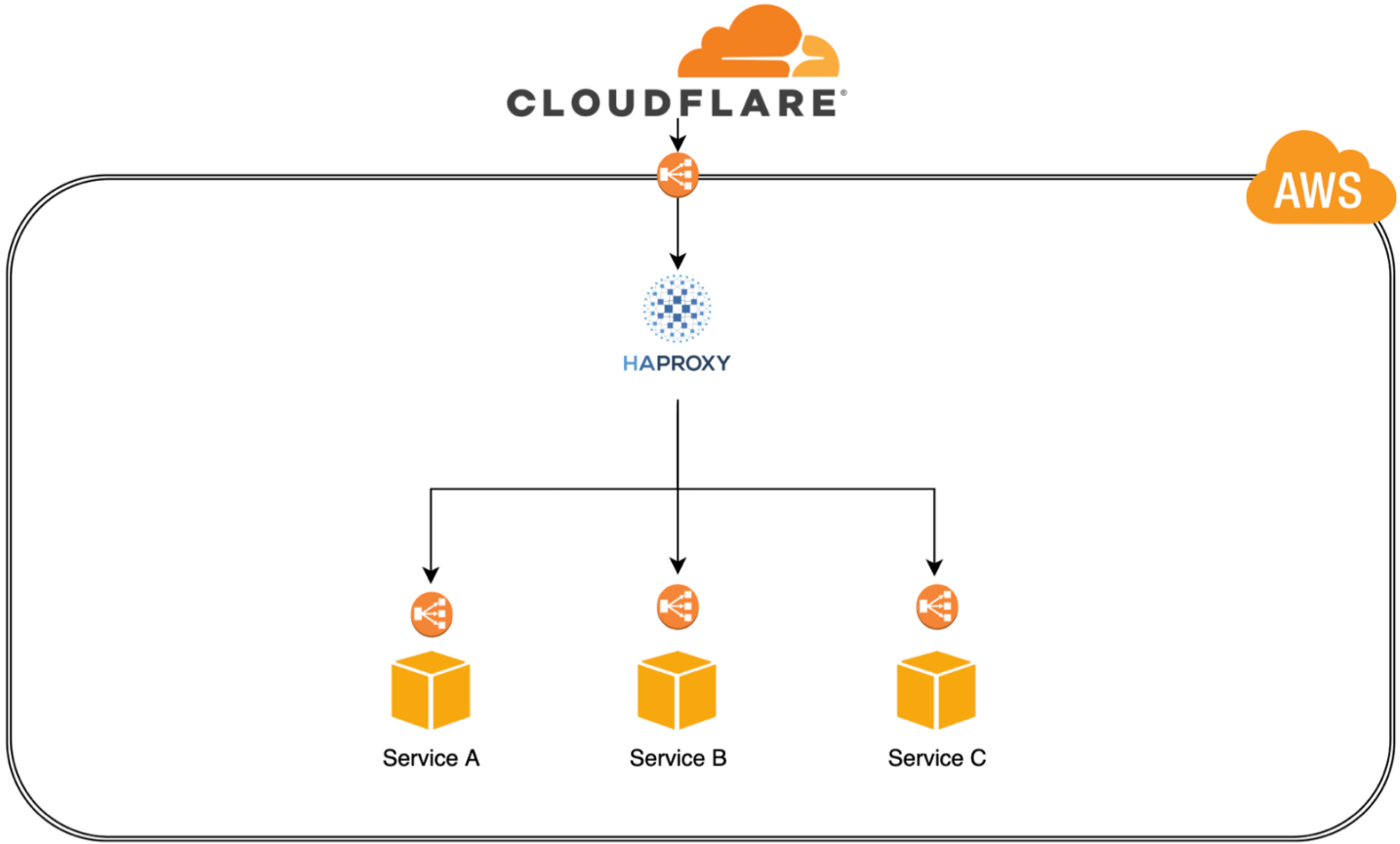
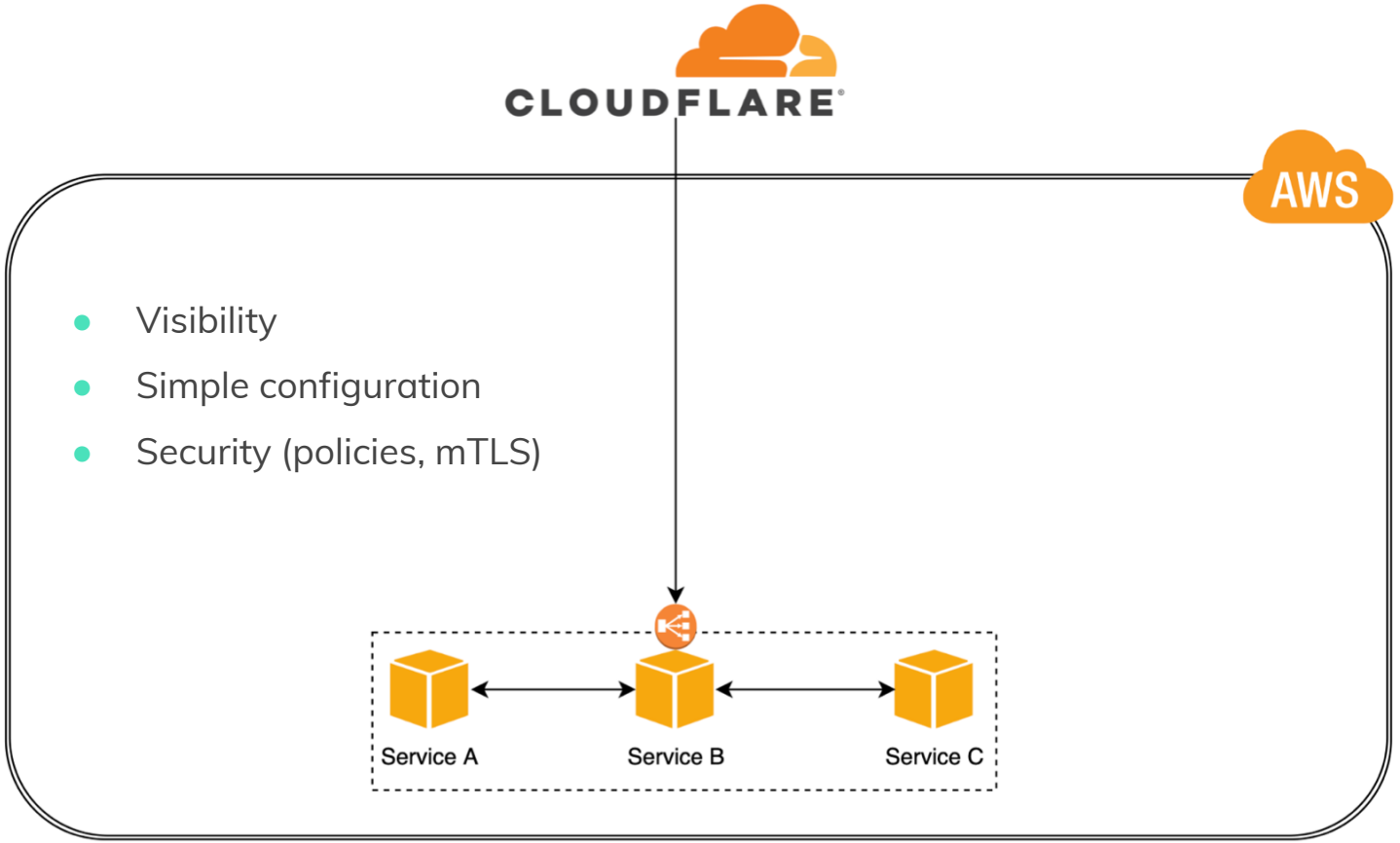
Service Mesh



Service Mesh



What's next

- Finish Istio rollout
- More security
- Knative builds
- Have fun!

THANK YOU

https://www.thredup.com/devopsstage-2019