// CODE ➡ CLUSTER: BOOSTING DEVELOPMENT WITH A LOCAL KUBERNETES OPS PLATFORM

Johannes Schnatterer, Cloudogu GmbH

Slides

@schnatterer@floss.social in/jschnatterer

Version: 202406050933-a7d678d

🏋

🙋 What is your profession?

🤓 Software Engineer / Developer

🙋 What is your profession?

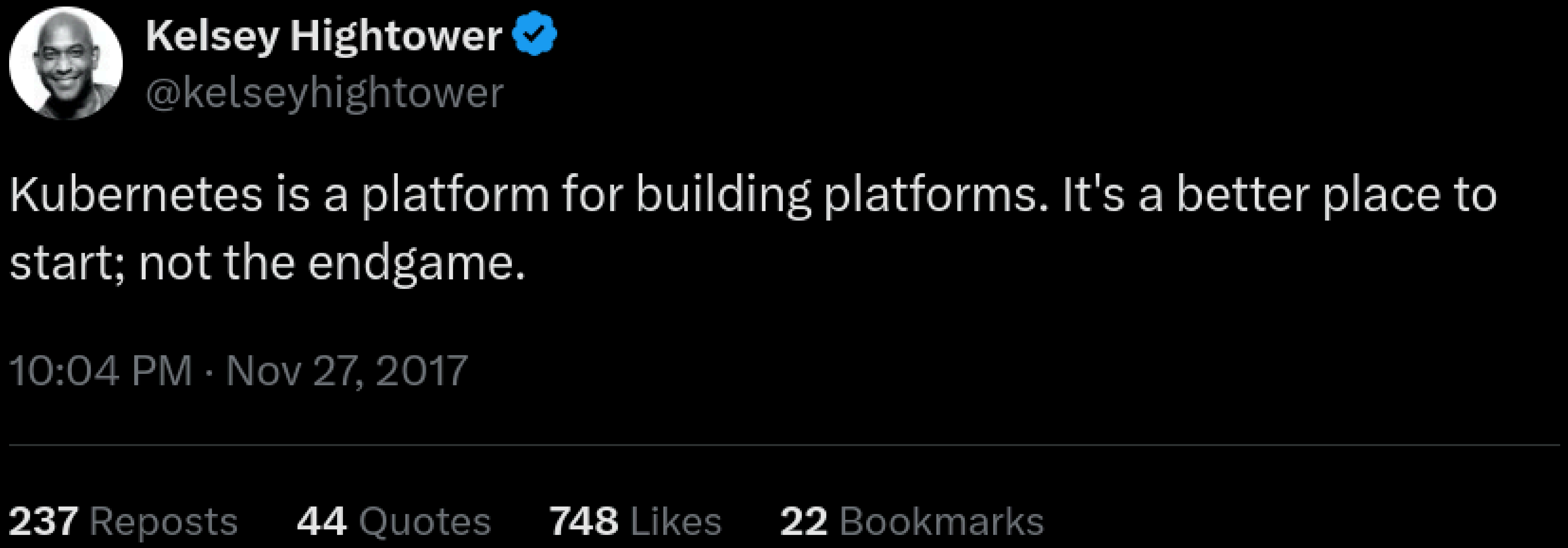
🛠️ Platform Engineer / Ops person

🙋 Who uses Kubernetes for local development?

k3d Minkube Microk8s k3s KIND

Docker Desktop k0s

Rancher Desktop



Kelsey Hightower
@kelseyhightower

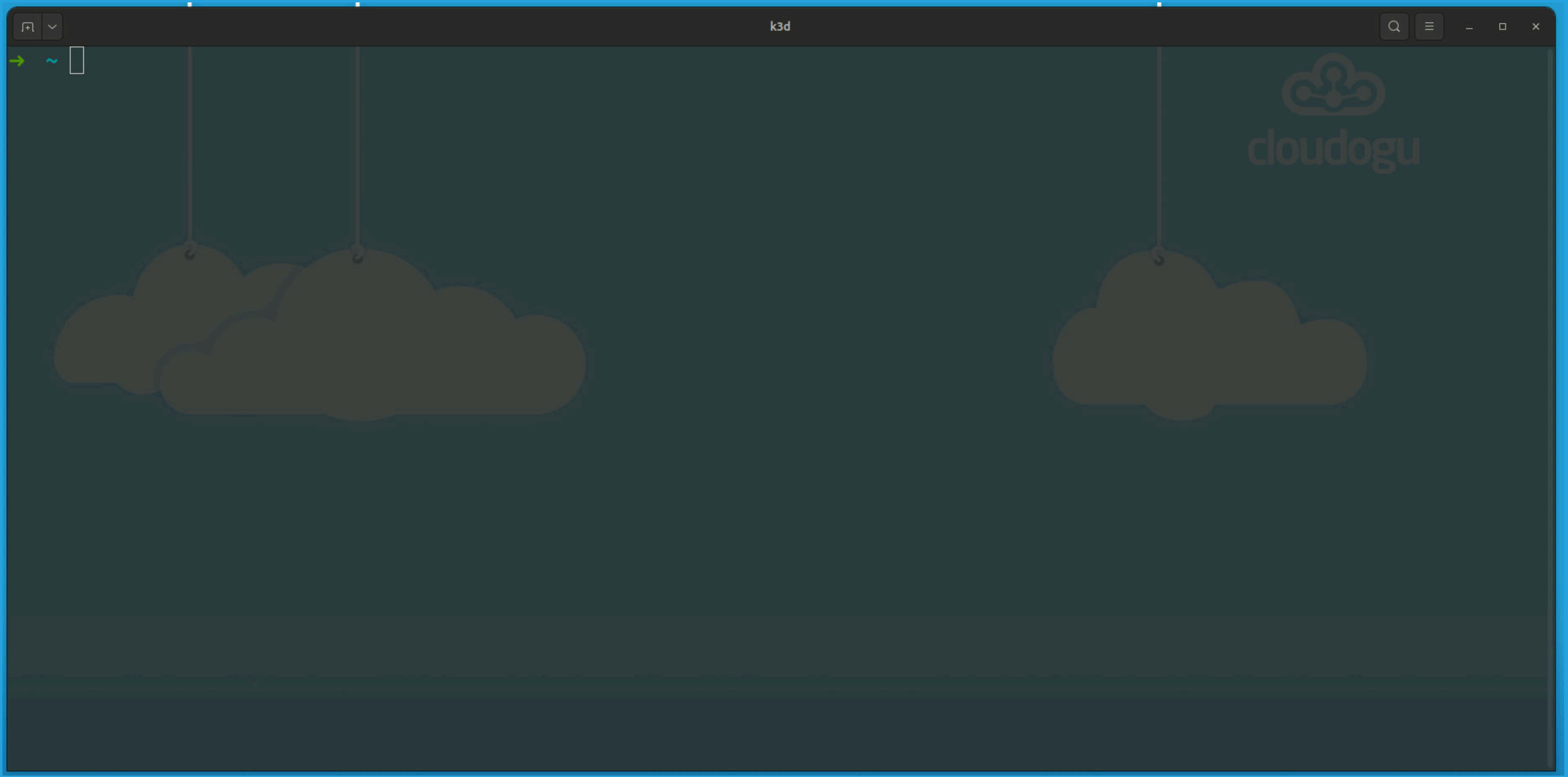
Kubernetes is a platform for building platforms. It's a better place to start; not the endgame.

10:04 PM · Nov 27, 2017

237 Reposts 44 Quotes 748 Likes 22 Bookmarks

twitter.com/kelseyhightower/status/935252923721793536

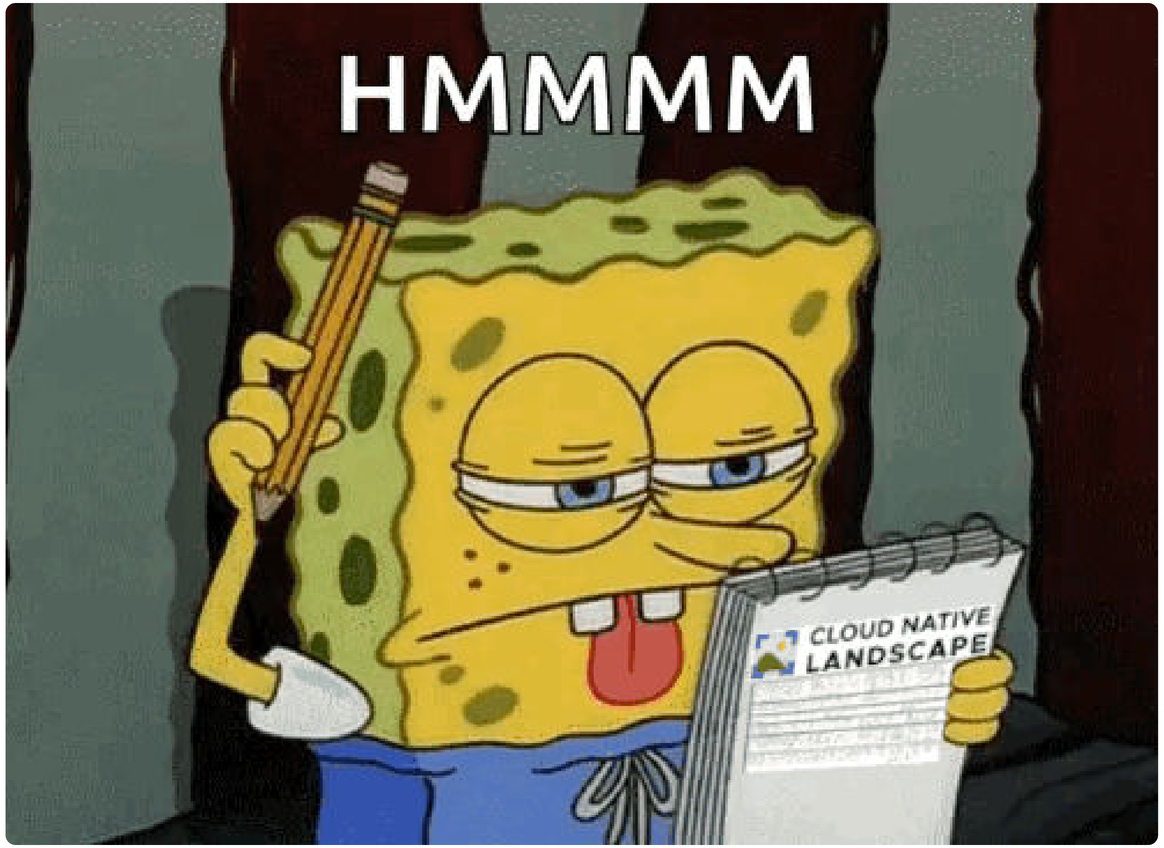
Start a local k8s cluster with one command



```
➜  ~ 
```

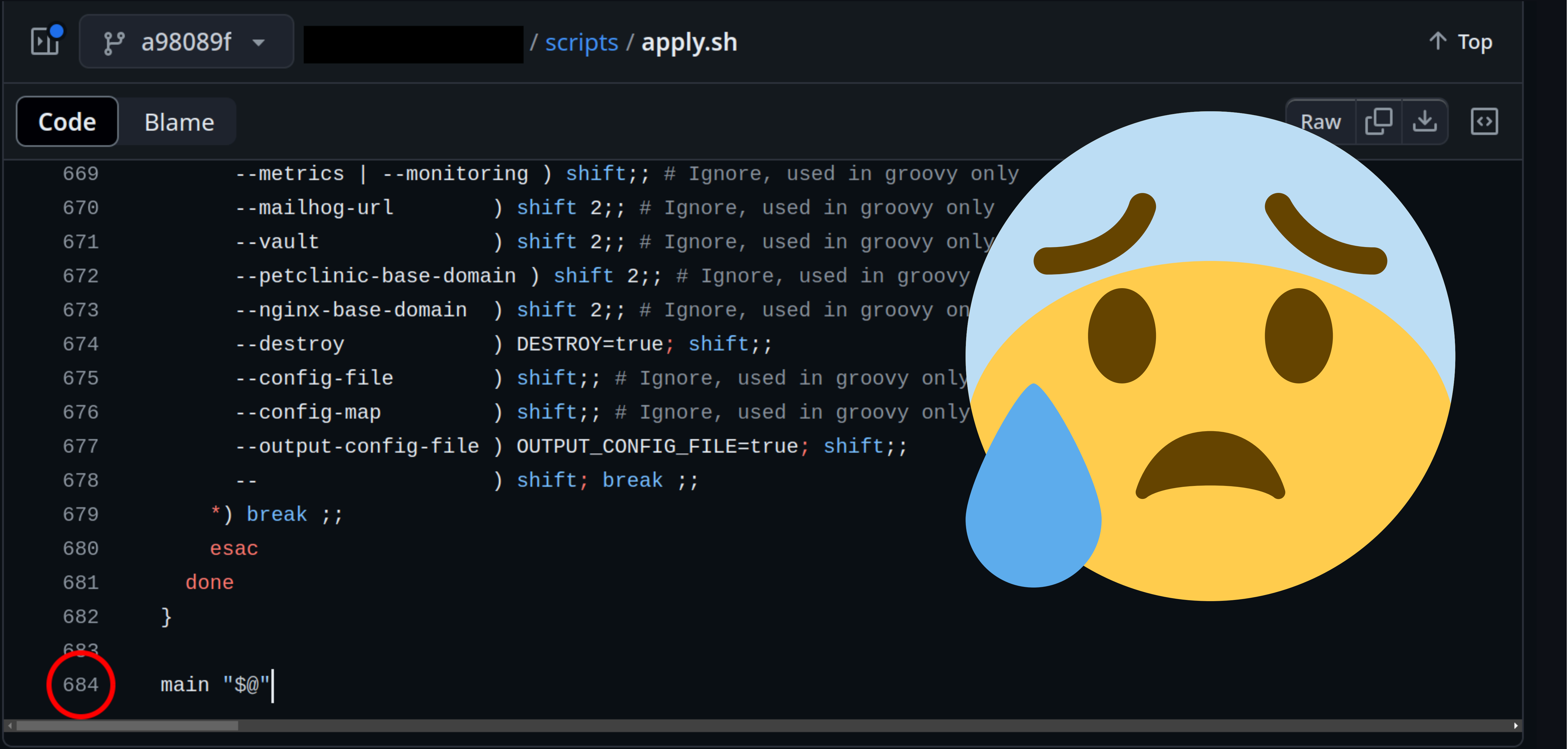
Next, start the platform

...



🌐 tenor.com/view/spongebob-squarepants-spongebob-think-thinking-gif-4280214517394111861

So, let’s write a *little* script…



[redacted] / scripts / apply.sh

```
669             --metrics | --monitoring ) shift;; # Ignore, used in groovy only
670             --mailhog-url        ) shift 2;; # Ignore, used in groovy only
671             --vault              ) shift 2;; # Ignore, used in groovy only
672             --petclinic-base-domain ) shift 2;; # Ignore, used in groovy
673             --nginx-base-domain  ) shift 2;; # Ignore, used in groovy on
674             --destroy            ) DESTROY=true; shift;;
675             --config-file        ) shift;; # Ignore, used in groovy only
676             --config-map         ) shift;; # Ignore, used in groovy only
677             --output-config-file ) OUTPUT_CONFIG_FILE=true; shift;;
678             --                   ) shift; break ;;
679           *) break ;;
680           esac
681         done
682     }
683
684     main "$@"
```

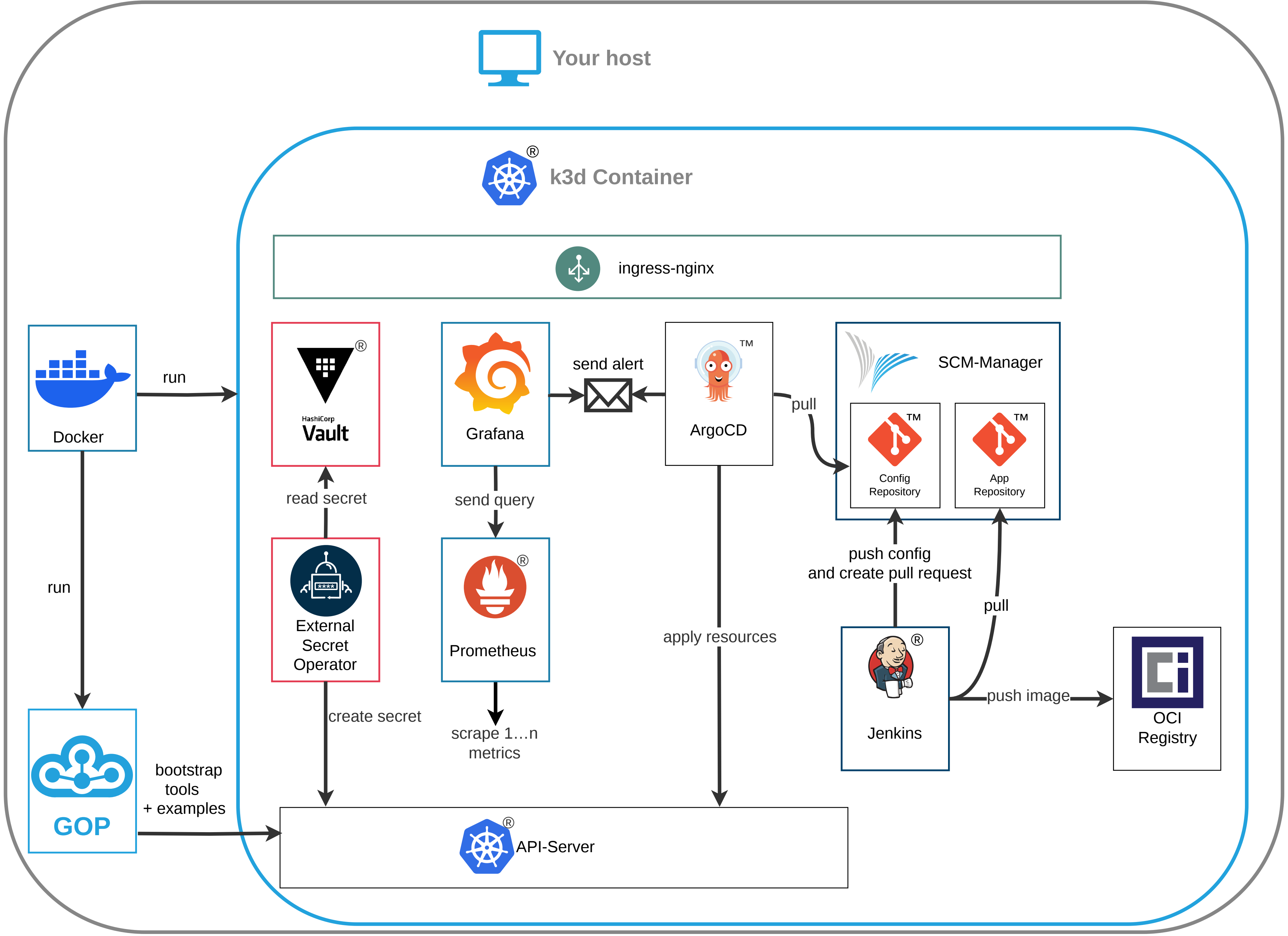
Why not start the platform with one command?

Meet GOP

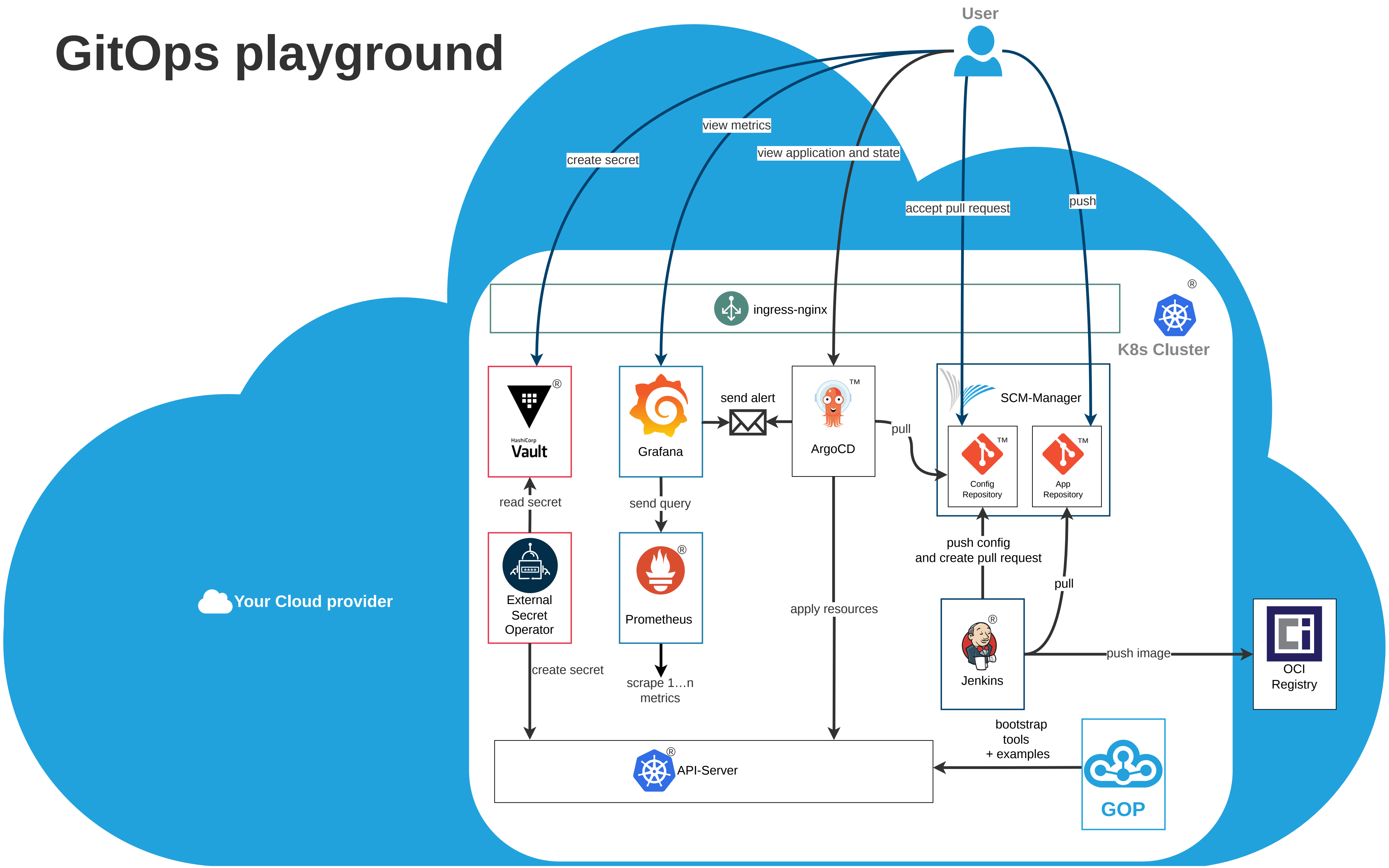
a GitOps-based operational stack (platform)

```
COMMIT='42e5f80'
bash <(curl -s \
  "https://raw.githubusercontent.com/cloudogu/gitops-playground/$COMMIT/scripts/init-cluster.sh") \
  --bind-ingress-port=80 \
   && docker run --rm -t -u $(id -u) \
    -v ~/.config/k3d/kubeconfig-gitops-playground.yaml:/home/.kube/config \
    --net=host \
    ghcr.io/cloudogu/gitops-playground:$COMMIT --yes --base-url=http://localhost --ingress-nginx \
      --argocd --monitoring --vault=dev --mailhog
```

cloudogu/gitops-playground


Your host
k3d Container
ingress-nginx
Docker
run
run
GOP
bootstrap
tools
+ examples
HashiCorp
Vault
read secret
External
Secret
Operator
create secret
Grafana
send alert
send query
Prometheus
scrape 1…n
metrics
ArgoCD
pull
apply resources
SCM-Manager
Config
Repository
App
Repository
push config
and create pull request
pull
Jenkins
push image
OCI
Registry
API-Server

GitOps playground



scripts/init-cluster.sh

```
k3d cluster create gitops-playground \
  # Mount port for ingress
  -p 80:80@server:0:direct \
  # Pin image for reproducibility
  --image=rancher/k3s:v1.29.1-k3s2 \
  # Disable built-in ingress controller, because we want to use the same one locally and in prod
  --k3s-arg=--disable=traefik@server:0 \
  # Allow node ports < 30000
  --k3s-arg=--kube-apiserver-arg=service-node-port-range=8010-65535@server:0 \
  # Hacks to make Docker available in Jenkins
  -v /var/run/docker.sock:/var/run/docker.sock@server:0 \
  -v /etc/group:/etc/group@server:0 -v /tmp:/tmp@server:0 \
  -p 30000:30000@server:0:direct

# Write kubeconfig to ~/.config/k3d/kubeconfig-gitops-playground.yaml
k3d kubeconfig write gitops-playground
```

docker run

```
docker run
  # Remove container after running, keeping your device clean
  # (remove in case of error to preserve logs)
  --rm
  # Colorful output, please
  -t
  # Run as current user, so files written to /tmp are accessible for you
  -u $(id -u) \
  # Mount kubeconfig for k3d
  -v ~/.config/k3d/kubeconfig-gitops-playground.yaml:/home/.kube/config \
  # Make k3d cluster available
  --net=host \
ghcr.io/cloudogu/gitops-playground:$COMMIT #Params for image go here
```

`ghcr.io/cloudogu/gitops-playground`

- OCI image
- Contains logic to install and configure the tools
- App written in Groovy (and bash 😰)
- Additional resources to run e.g. in air-gapped envs

Your turn

🌐 giphy.com/gifs/JIX9t2j0ZTN9S

Exercises 🏋️

- **GitOps+Alerting**

  Deploy broken app via GitOps, get alerted and fix problem
- **GitOps process**

  Promote a change in code all the way to production using GitOps
- **Monitoring**

  Deploy a Grafana dashboard for an app using GitOps
- **Secrets Management**

  Integrate secrets into app, propagate updates automatically
- ~~Progressive Delivery~~

  ~~Watch a canary release live with argo rollouts~~

Getting started

- Login: 👤 `admin` / 🔓 `admin`
- scmm.localhost
- argocd.localhost
- grafana.localhost
- vault.localhost
- mailhog.localhost
- jenkins.localhost

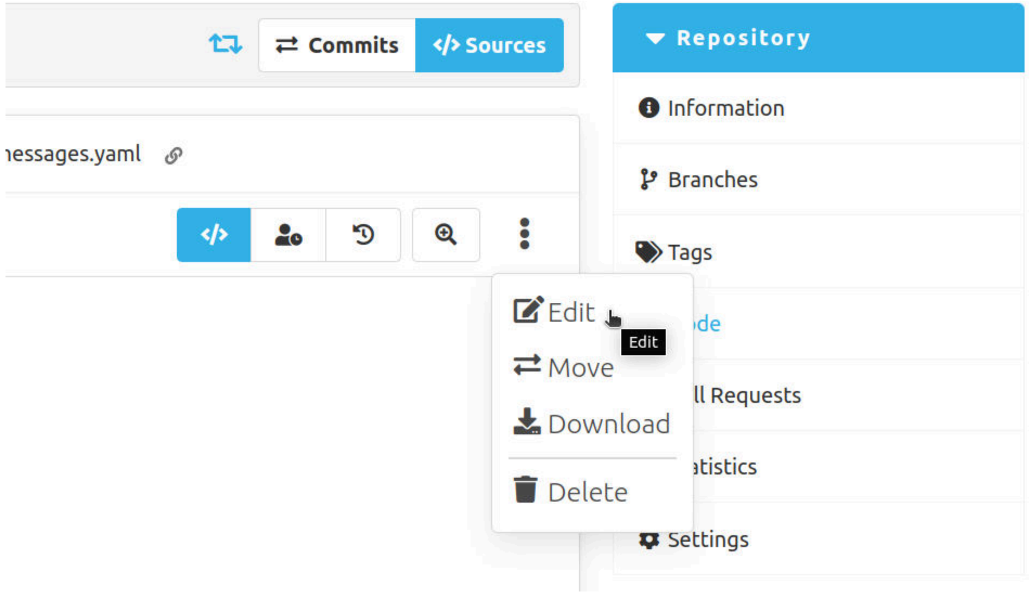
🏋️ Exercise: GitOps+Alerting 🐖

Deploy broken app via GitOps, get alerted and fix problem

Exercise: Alerting

1. Add repo to Argo CD
2. Create Argo CD `Application` YAML
3. Deploy, receive alert and fix app

💡 Hint: Edit file in SCM-Manager



1. Add repo to Argo CD

Add this repo to Argo CD (via GitOps):

`http://scmm-scm-manager.default.svc.cluster.local/scm/repo/exercises/broken-application`

1. Add to `repositories` in Argo CD’s config:
   - scmm.localhost/scm/repo/argocd/argocd/code/sources/main/argocd/values.yaml
2. Authorize `Project` to use the repo by adding it to `sourceRepos` here:
   - scmm.localhost/scm/repo/argocd/argocd/code/sources/main/projects/example-apps.yaml

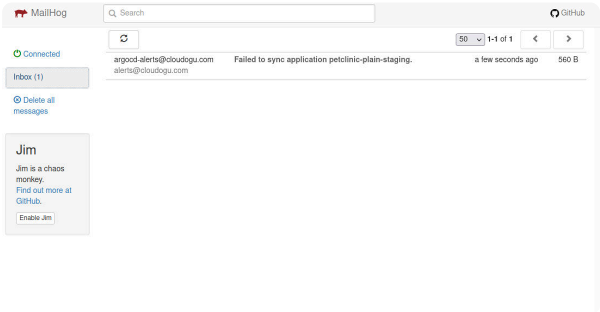
2. Create Argo CD `Application` YAML

- Go to argocd.localhost, click + NEW APP
- Enter `Name`: `broken`
- Click on `Project Name`, choose `example apps`
- Click on `Repository URL`, choose the `broken-application` repo
- Enter `Path`: `.`
- Click on `Cluster URL`, choose `https://kubernetes.default.svc`
- Enter `Namespace`: `example-apps-staging`
- At the top, click EDIT AS YAML and copy content

3. Deploy, receive alert and fix app

- Paste content here:

  scmm.localhost/scm/repo/argocd/example-apps/code/sourceext/create/main/argocd
- Enter `Filename`: `broken.yaml`, and Commit Message, then click Commit
- Go to argocd.localhost/applications/argocd/broken, click SYNC
- Check email in mailhog.localhost



argocd-alerts@cloudogu.com alerts@cloudogu.com **Failed to sync application petclinic-plain-staging.** a few seconds ago 560 B

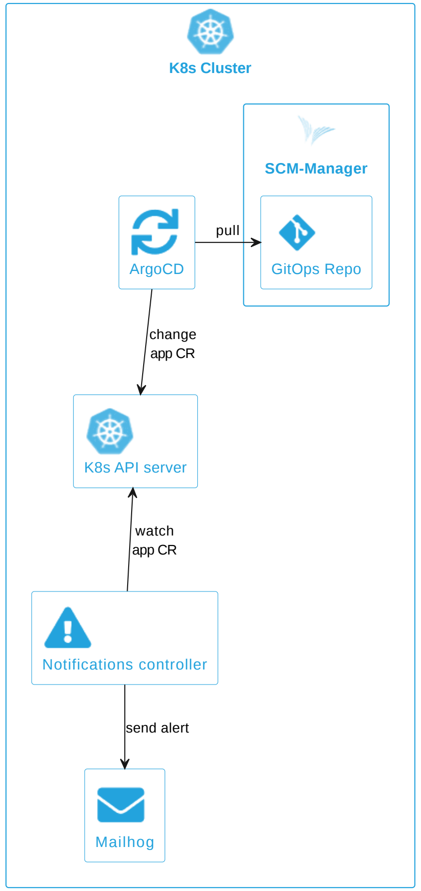
Jim

Jim is a chaos monkey. Find out more at GitHub.

- Follow link to ArgoCD-UI, analyse error
- Fix error in repo:

  scmm.localhost/scm/repo/argocd/example-apps/code/sources/main/argocd/broken.yaml
- Go to argocd.localhost/applications/argocd/broken, click SYNC
- Open application in Browser 🥳
- Have a closer look at the concepts behind this 👇

Alerting in GOP



Argo CD config:

github.com/cloudogu/gitops-playground/blob/0.2.0/argocd/argocd/argocd/values.ftl.yaml

scmm.localhost/scm/repo/argocd/argocd/code/sources/main/argocd/values.yaml

See also

- GitOps repo structure in GOP
- 🏋 Exercise: GitOps process

🏋️ Exercise: GitOps process

Promote a change in code all the way to production using GitOps

- Warmup 🤓
- GitOps with CI server and promotion 🚀

Warmup 🤓

1. Open Argo CD `Application`:

   argocd.localhost/applications/example-apps-staging/petclinic-plain

2. Open app in Browser:

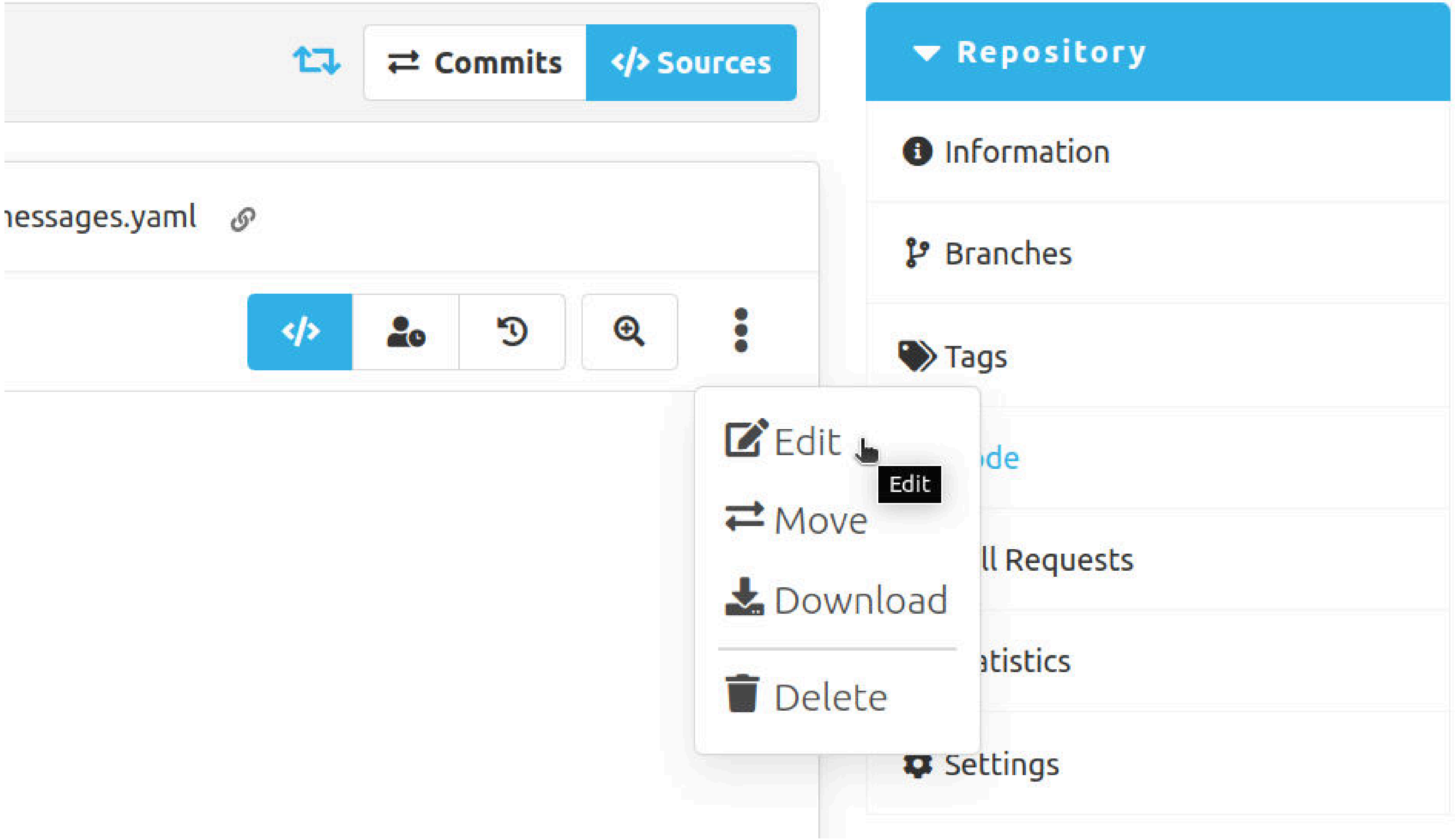
   🌐 staging.petclinic-plain.petclinic.localhost

3. Change `welcome` message in config repo:

   scmm.localhost/scm/repo/argocd/example-apps/code/sources/main/apps/spring-petclinic-plain/staging/generatedResources/messages.yaml

4. Press ⟳ REFRESH in ArgoCD UI
5. `Restart` `deploy` in ArgoCD UI ➡️ Watch GitOps deployment
6. 🔄 Reload app in Browser ➡️ Shows new message 🥳

💡 Hint: Edit file in SCM-Manager



GitOps with CI server and promotion 🚀

First:

Accept Pull Request for `petclinic-plain` to deploy prod

◆ scmm.localhost/scm/repo/argocd/example-apps/pull-requests

Then:

1. Change app, build image, deploy staging
2. Accept PR, deploy production

1. Change app, build image, deploy staging

1. Open staging app in Browser:

   🌐 staging.petclinic-plain.petclinic.localhost

2. Change `welcome` message in app repo

   scmm.localhost/scm/repo/argocd/petclinic-plain/code/sources/main/src/main/resources/messages/messages.properties

3. Wait for Build

   jenkins.localhost/job/example-apps/job/petclinic-plain/job/main

4. Open Argo CD `Application` for staging:

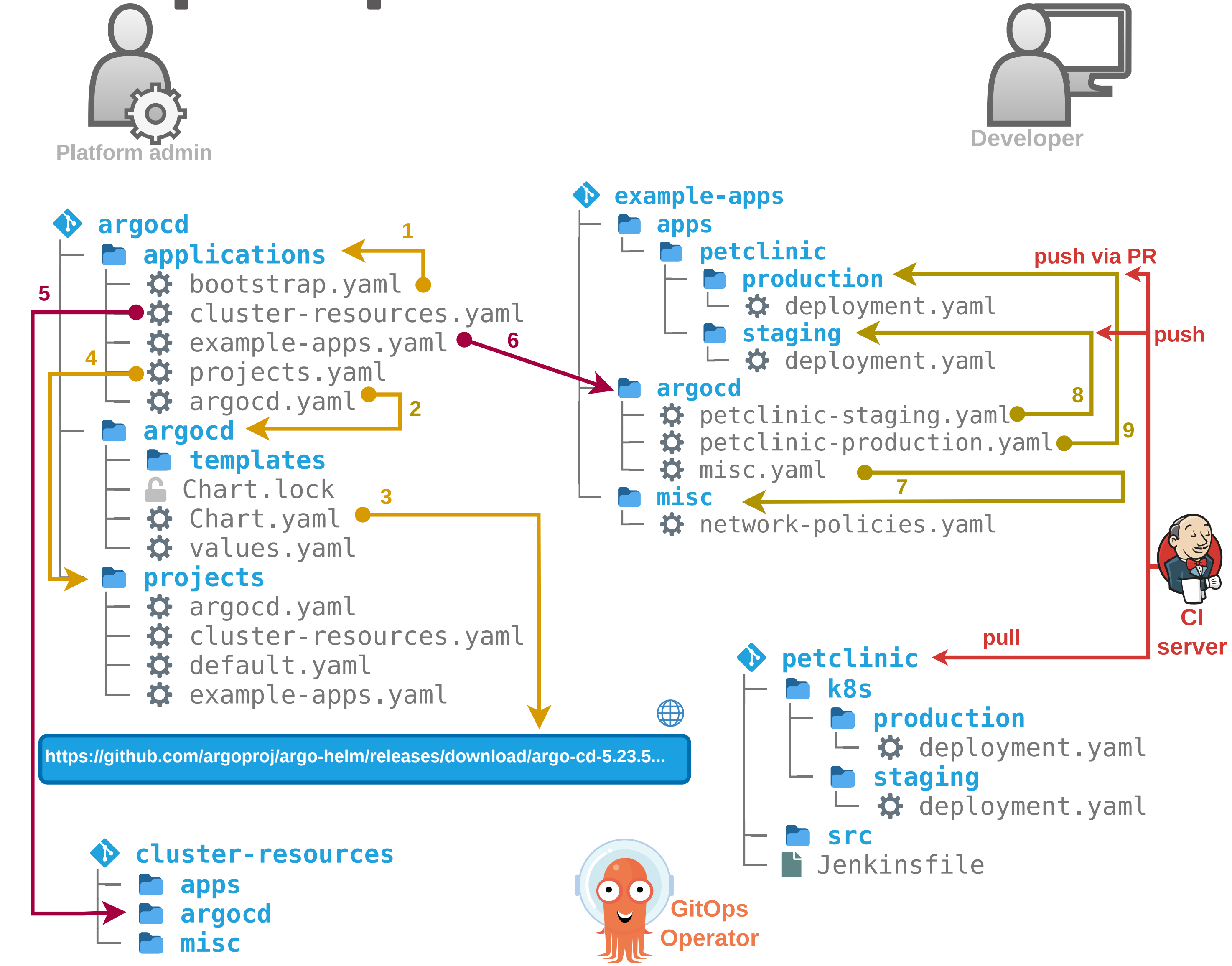
   argocd.localhost/applications/example-apps-staging/petclinic-plain

5. Press ↻ REFRESH in ArgoCD UI ➡️ Watch GitOps deployment
6. 🔄 Reload app in Browser ➡️ Shows message in staging 🥳

2. Accept PR, deploy production

1. Open production app in Browser:
   🌐 production.petclinic-plain.petclinic.localhost
2. Open Argo CD `Application` for production:
   argocd.localhost/applications/example-apps-production/petclinic-plain
3. Accept Pull Request for `petclinic-plain`
   scmm.localhost/scm/repo/argocd/example-apps/pull-requests
4. Press ⟳ REFRESH in ArgoCD UI ➡️ Watch GitOps deployment
5. 🔄 Reload app in Browser ➡️ Shows message in production 🥳🥳
6. Have a closer look at the concepts behind this 👇

GitOps repo structure in GOP



```
argocd
├─ applications
│  ├─ bootstrap.yaml
│  ├─ cluster-resources.yaml
│  ├─ example-apps.yaml
│  ├─ projects.yaml
│  └─ argocd.yaml
├─ argocd
│  ├─ templates
│  ├─ Chart.lock
│  ├─ Chart.yaml
│  └─ values.yaml
└─ projects
   ├─ argocd.yaml
   ├─ cluster-resources.yaml
   ├─ default.yaml
   └─ example-apps.yaml
```

https://github.com/argoproj/argo-helm/releases/download/argo-cd-5.23.5...

```
cluster-resources
├─ apps
├─ argocd
└─ misc
```

```
example-apps
├─ apps
│  └─ petclinic
│     ├─ production
│     │  └─ deployment.yaml
│     └─ staging
│        └─ deployment.yaml
├─ argocd
│  ├─ petclinic-staging.yaml
│  ├─ petclinic-production.yaml
│  └─ misc.yaml
└─ misc
   └─ network-policies.yaml
```

```
petclinic
├─ k8s
│  ├─ production
│  │  └─ deployment.yaml
│  └─ staging
│     └─ deployment.yaml
├─ src
└─ Jenkinsfile
```

scmm.localhost/scm/repo/argocd/petclinic-plain/code/sources/main/Jenkinsfile

uses

github.com/cloudogu/gitops-build-lib

cloudogu.com/blog/gitops-repository-patterns-part-6-examples

🏋️ Exercise: Secrets Management

Integrate secrets into app, propagate updates automatically

- Warmup 🤓
- Mount secret into app 🚀

Warmup 🤓

- Secret exposed via HTTP 😅

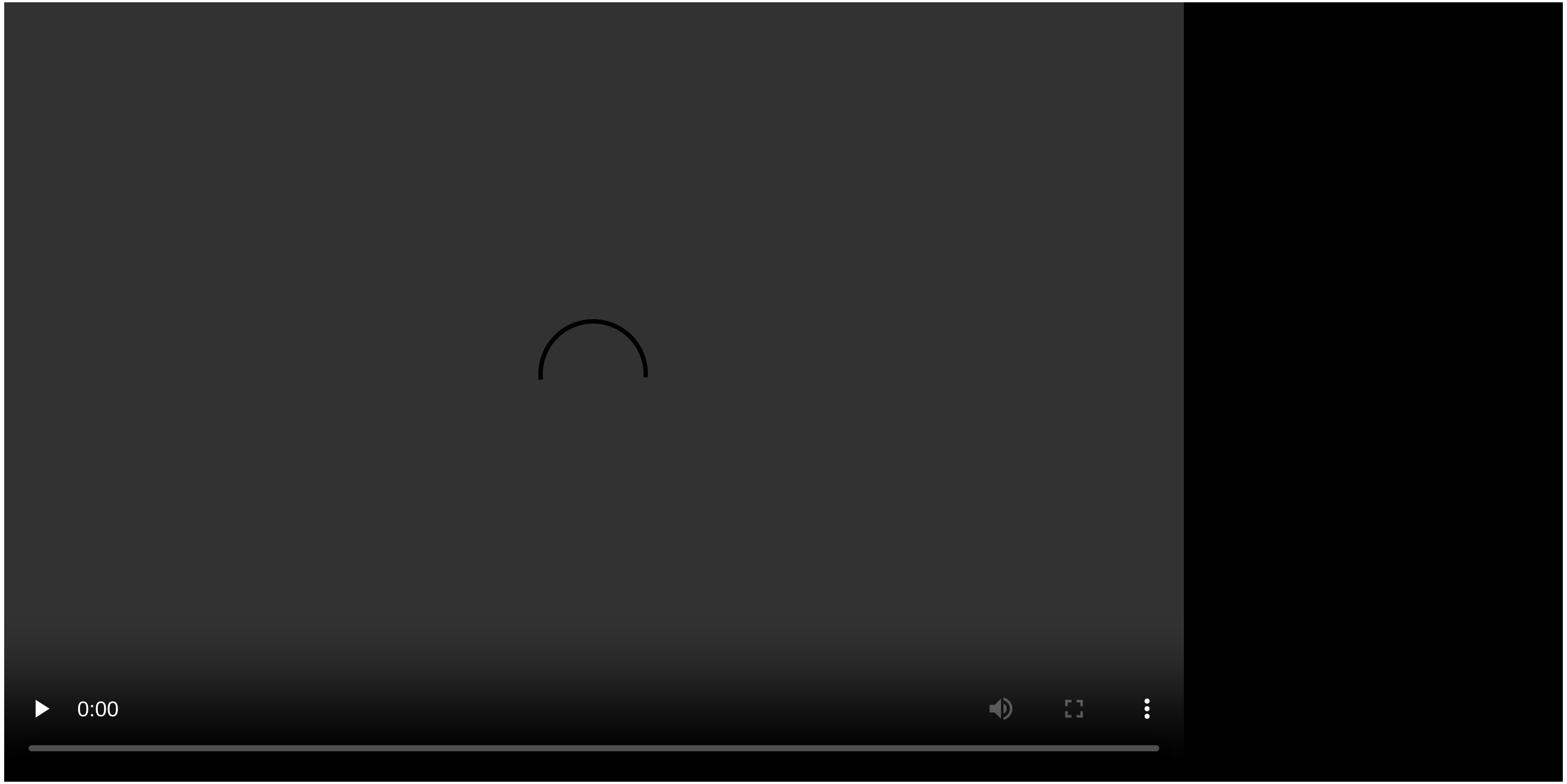
  🌐 staging.nginx-helm.nginx.localhost/secret
- Change in Vault:

  vault.localhost/ui/vault/secrets/secret/edit/staging/nginx-helm-jenkins
- Watch it propagate automatically (<2 min)

  Either reload Browser or:

```
while ; do  echo -n "$(date '+%Y-%m-%d %H:%M:%S'):  " ; \
   curl staging.nginx-helm.nginx.localhost/secret/  ; echo; sleep 1; done
```

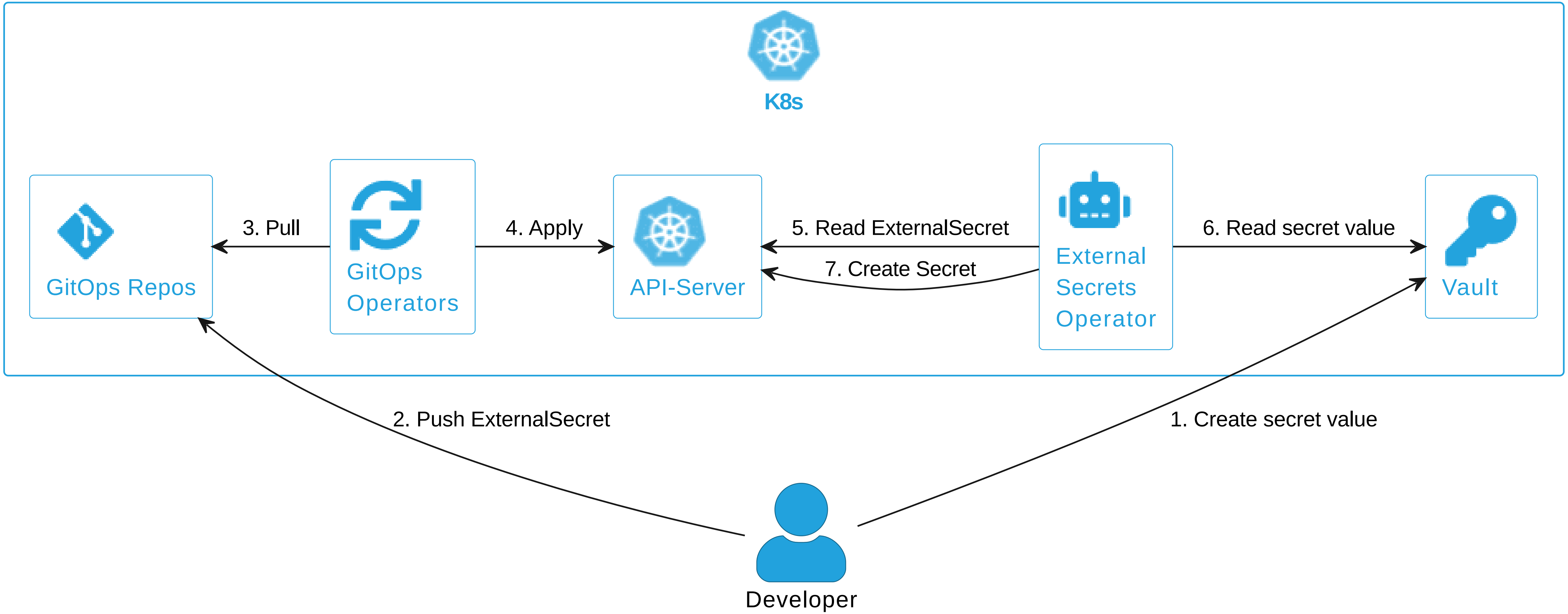
📽️ Warmup in time-lapse

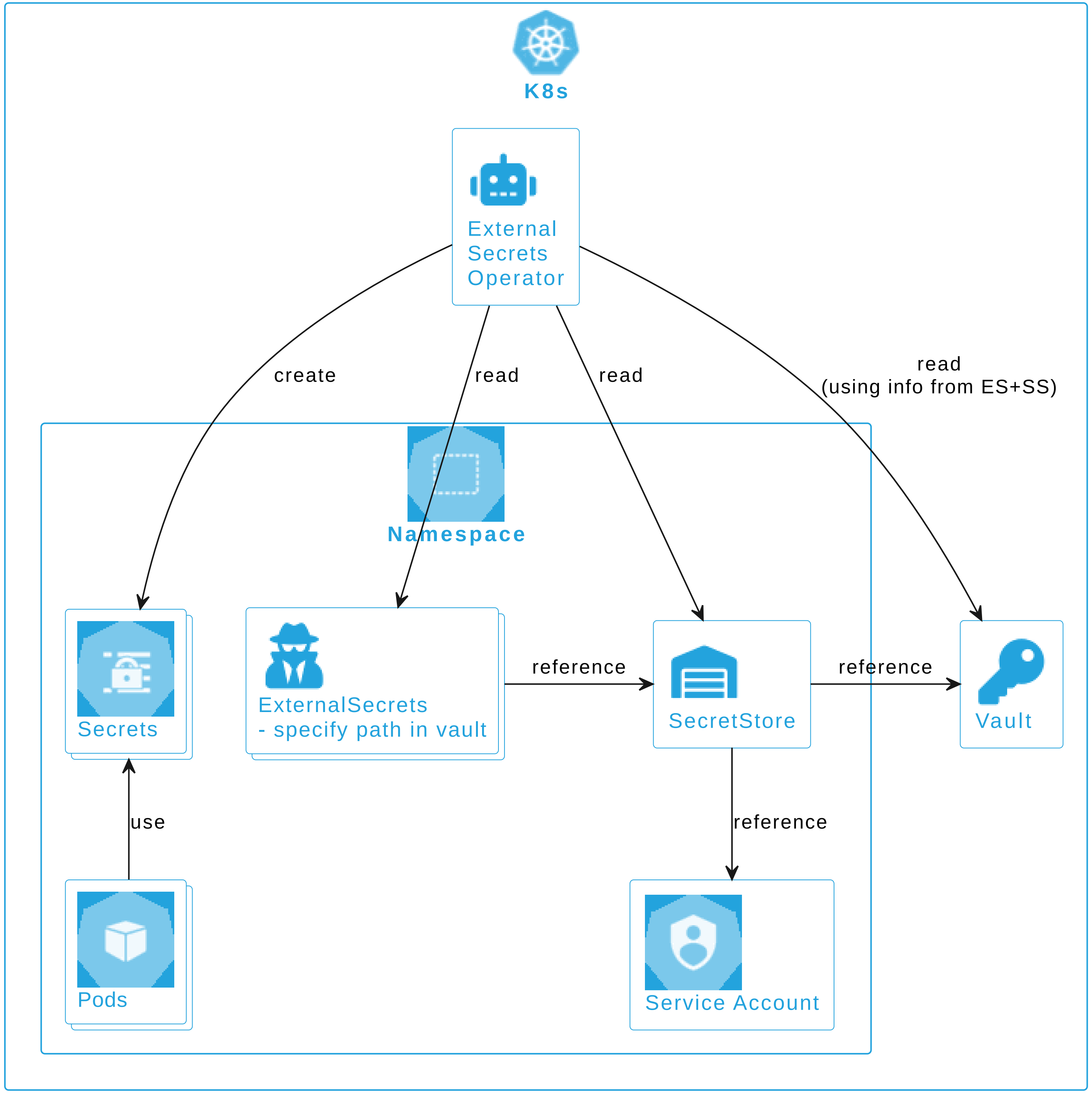


Mount secret into app 🚀

TODO summarize and link steps

External Secrets Operator with Vault




K8s
External Secrets Operator
create
read
read
read
(using info from ES+SS)
Namespace
Secrets
ExternalSecrets
- specify path in vault
reference
SecretStore
reference
Vault
use
reference
Pods
Service Account

ESO+Vault config in GOP

- SecretStore per Namespace:

  scmm.localhost/scm/repo/argocd/cluster-resources/code/sources/main/misc/secrets/secret-store-staging.yaml

- Example External Secret:

  scmm.localhost/scm/repo/argocd/nginx-helm-jenkins/code/sources/main/k8s/staging/external-secret.yaml

- Mounted into app:

  scmm.localhost/scm/repo/argocd/nginx-helm-jenkins/code/sources/main/k8s/values-shared.yaml

TODO

Johannes Schnatterer, Cloudogu GmbH

Slides

💪 Join my team: cloudogu.com/join/cloud-engineer

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