

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



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Slides



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Version: 202406191309-c5b73fc

Agenda

1. Intro
2. Meet GOP
3. Exercises, Getting Started

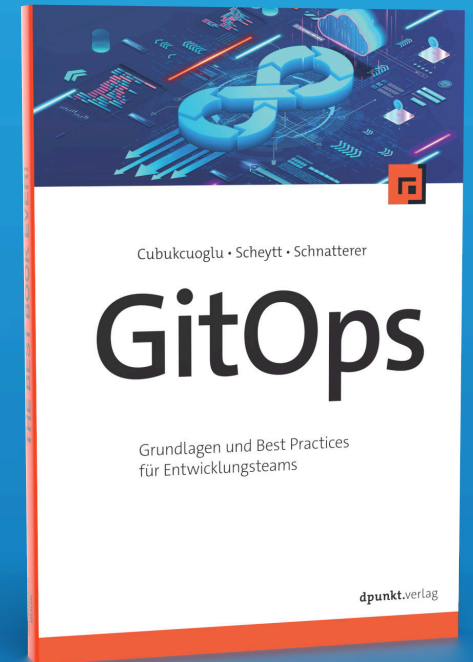
Yannick Christian Thomas

Cloud Engineer

Consulting + Infrastructure Team

Johannes Schnatterer

Technical Lead





What is your profession?



Software Engineer / Developer



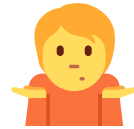
What is your profession?



Platform Engineer / Ops person



What is your profession?



None of the above



Who uses Kubernetes for local development?

k3d Minkube Microk8s k3s



Kelsey Hightower 

@kelseyhightower

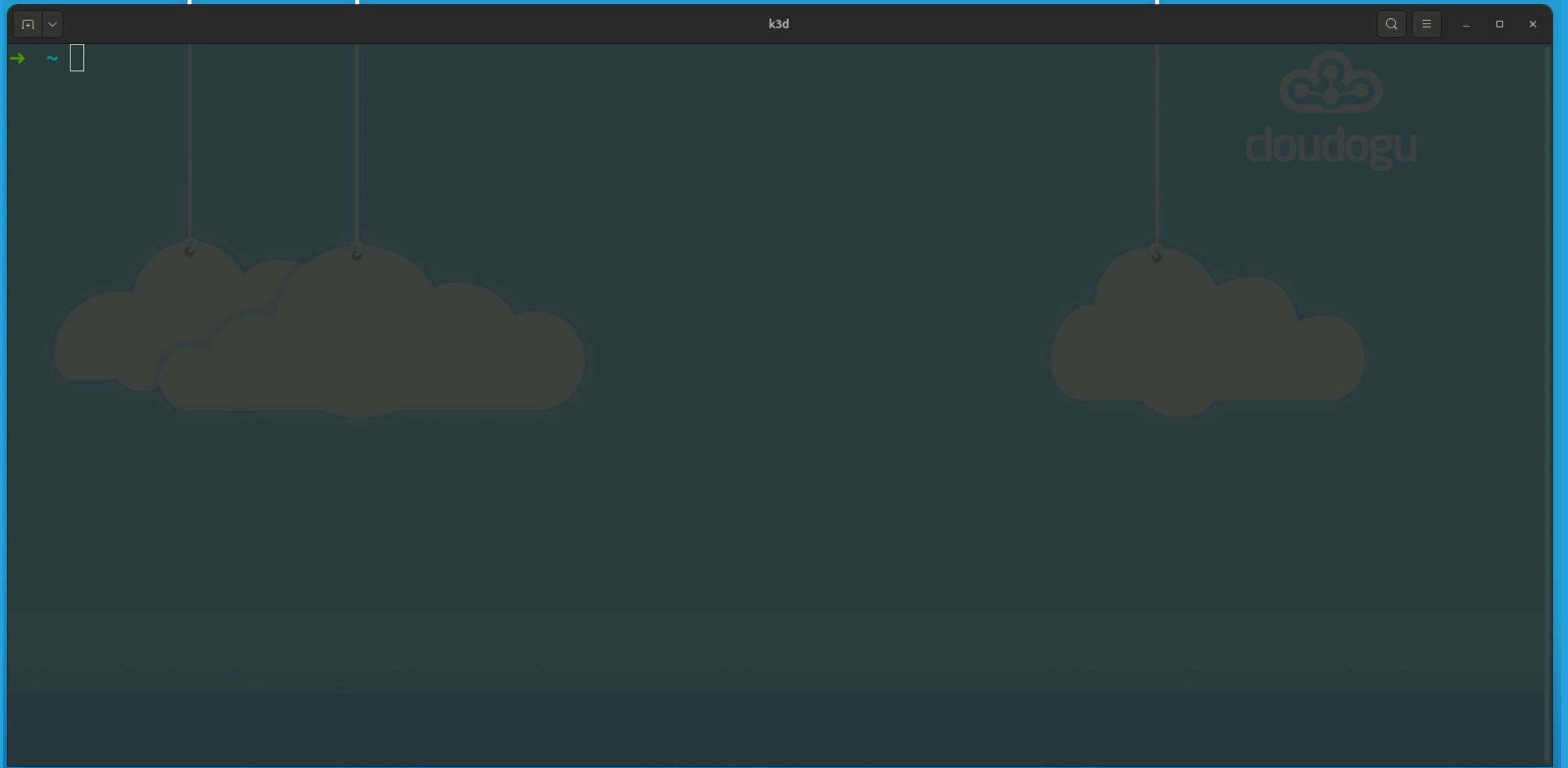
Kubernetes is a platform for building platforms. It's a better place to start; not the endgame.

10:04 PM · Nov 27, 2017

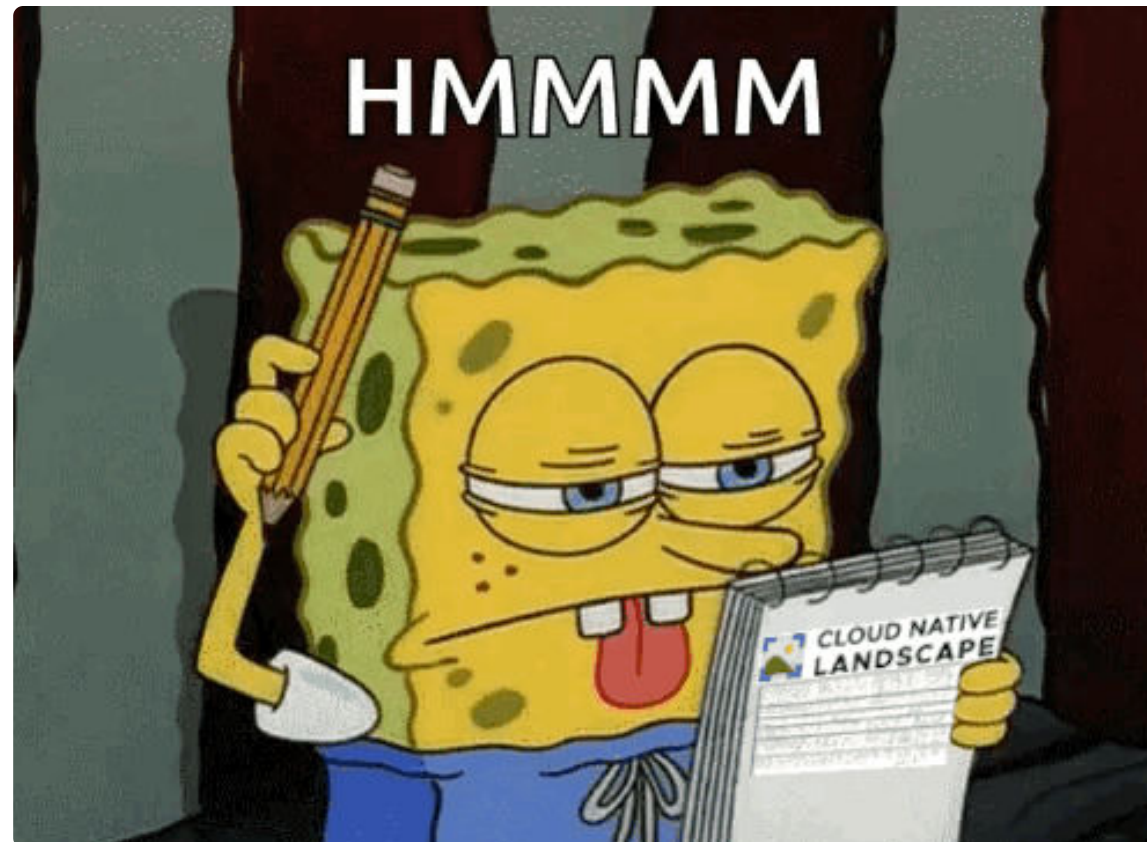
237 Reposts **44** Quotes **748** Likes **22** Bookmarks

 twitter.com/kelseyhightower/status/935252923721793536

Start a local k8s cluster with one command



Next, start the platform



So, let's write a *little* script...



a98089f



/ scripts / apply.sh

↑ Top

Code

Blame

Raw



```
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 only
673 --nginx-base-domain     ) shift 2;; # Ignore, used in groovy only
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)



Slides



```
VERSION='0.3.0'
bash <(curl -s \
  "https://raw.githubusercontent.com/cloudogu/gitops-playground/$VERSION/scripts/init-cluster.sh") \
  && docker run --rm -t -u $(id -u) \
    -v ~/.config/k3d/kubeconfig-gitops-playground.yaml:/home/.kube/config \
    --net=host \
    ghcr.io/cloudogu/gitops-playground:$VERSION --yes --base-url=http://localhost --ingress-nginx \
    --argocd --monitoring --vault=dev --mailhog
```

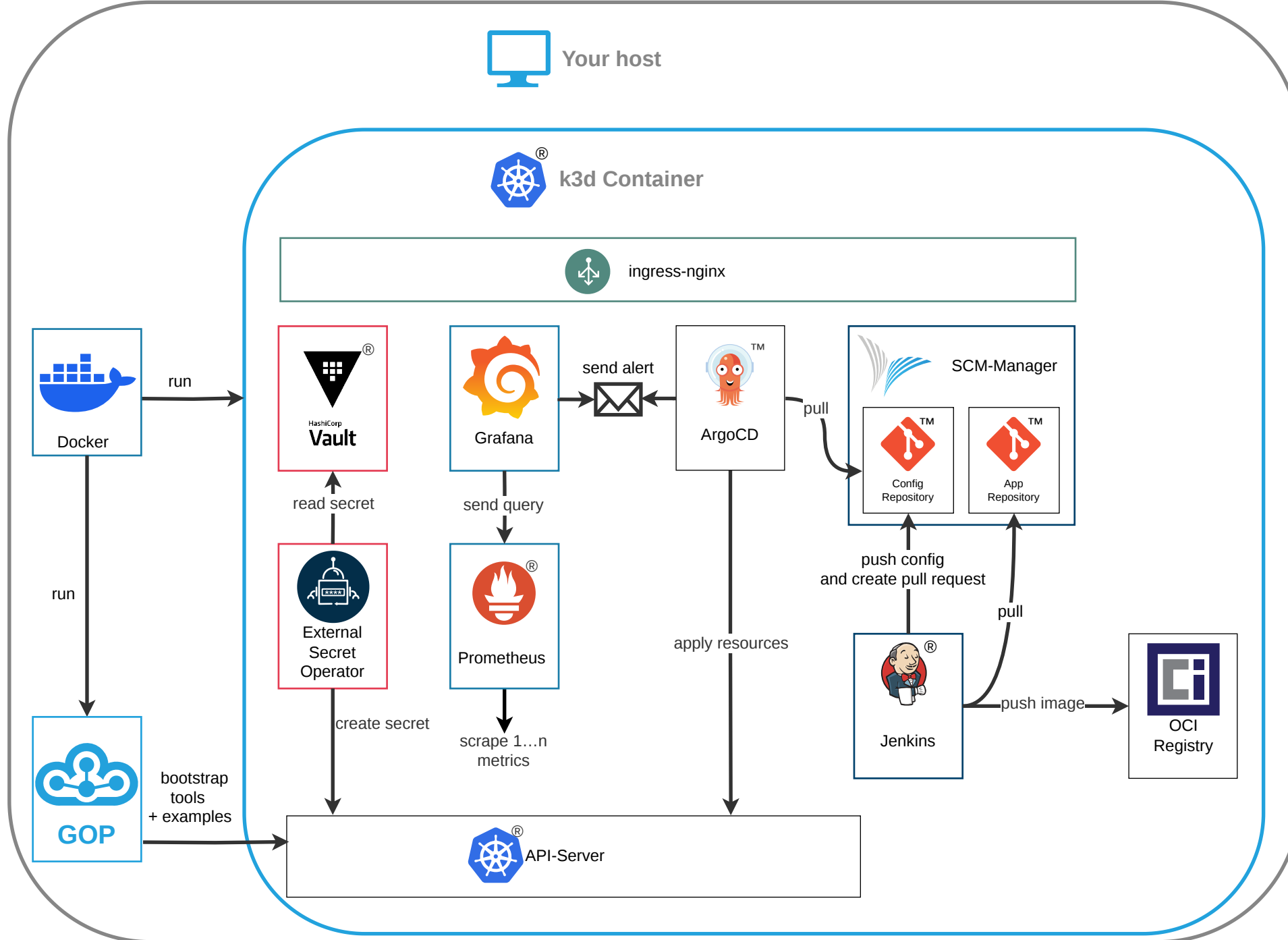
 [cloudogu/gitops-playground](https://github.com/cloudogu/gitops-playground)



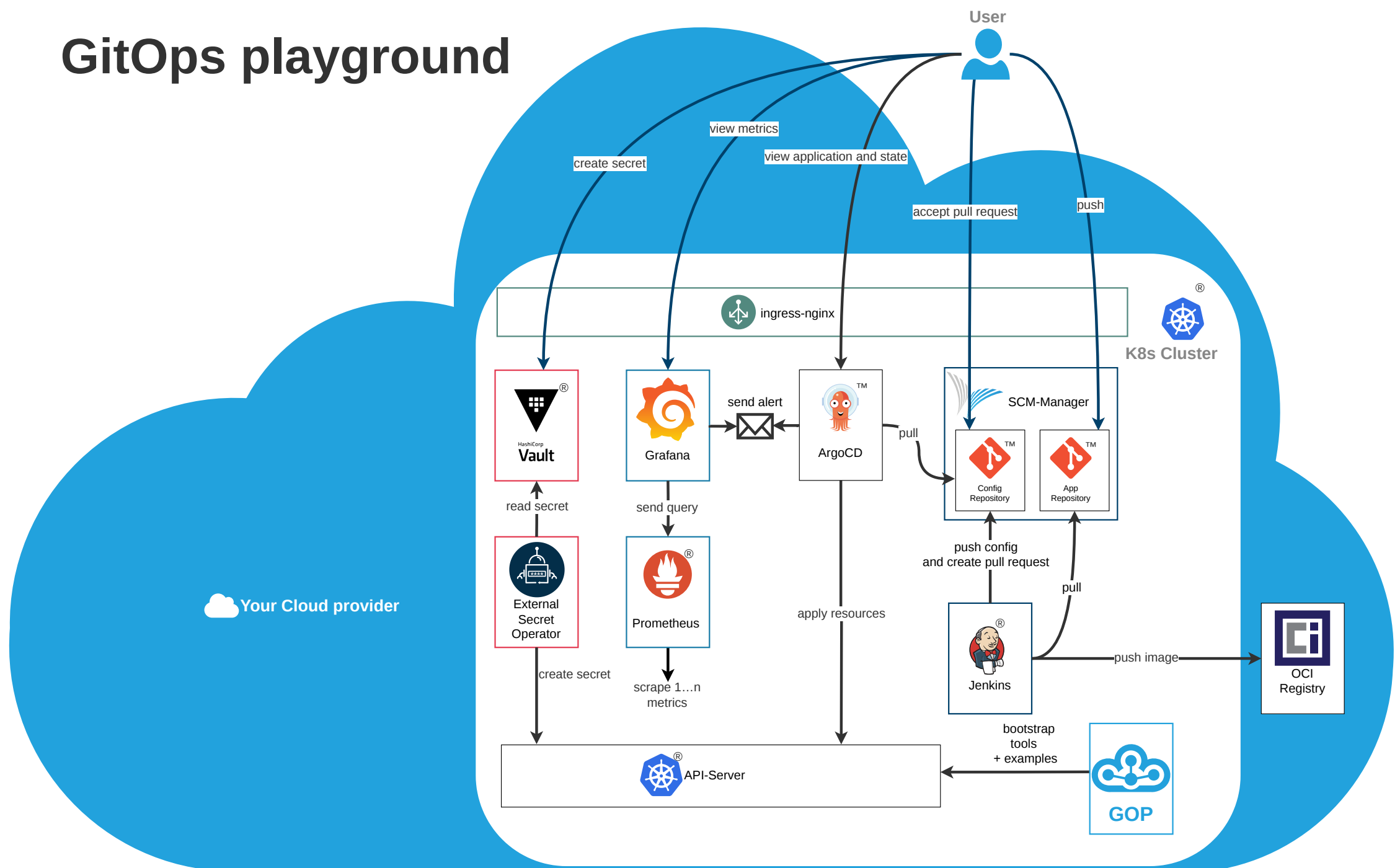
k3d hints

```
# Cleanup
k3d cluster rm gitops-playground
# Or
docker rm $(docker ps -a -q --filter "name=k3d-gitops-playground")
```

```
# Pause to save resources
k3d cluster stop gitops-playground
# Continue
k3d cluster start gitops-playground
```

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
# Mount kubeconfig for k3d
-v ~/.config/k3d/kubeconfig-gitops-playground.yaml:/home/.kube/config \
# Run as current user to avoid permission issues with kubeconfig
-u $(id -u) \
# Make k3d cluster available on 0.0.0.0 as described in kubeconfig
--net=host \
# Image, pin for reproducibility
ghcr.io/cloudogu/gitops-playground:$VERSION \
#Params for gop:
--yes --base-url=http://localhost --ingress-nginx --argocd --monitoring --vault=dev --mailhog
```

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/JX9t2j0ZTN95



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**  

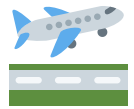
Deploy a Grafana dashboard for an app using GitOps

- **Secrets Management**  










Integrate secrets into app, propagate updates automatically

- ~~Progressive Delivery~~   Reach out if interested 

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



Getting started

- Login:  `admin` /  `admin`
-  `scmm.localhost`
-  `argocd.localhost`
-  `grafana.localhost`  skip changing password on first login
-  `vault.localhost`
-  `mailhog.localhost`
-  `jenkins.localhost`

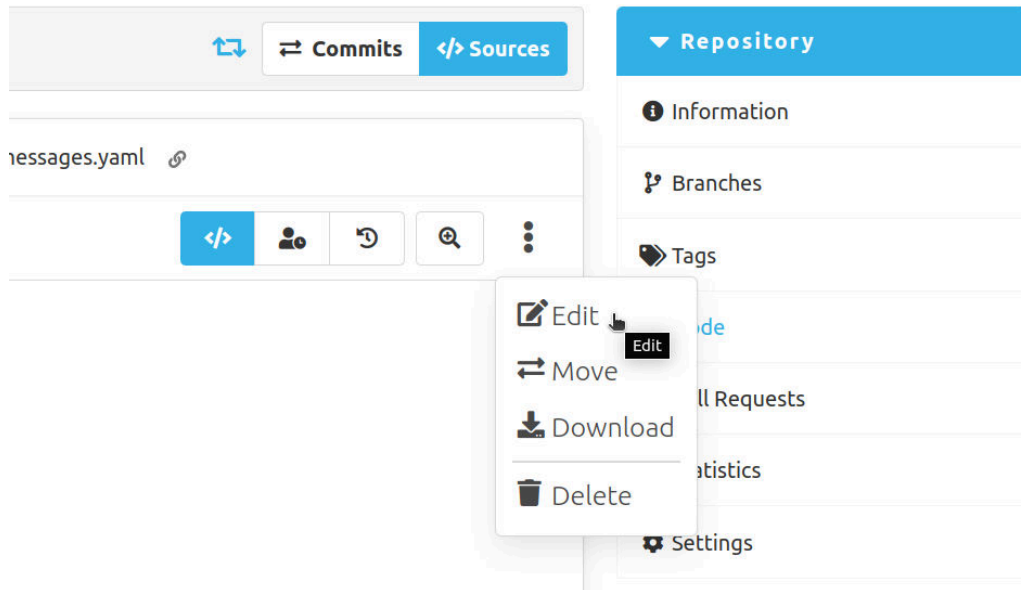
Exercise: GitOps+Alerting

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 
- 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  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 

- Go to  <argocd.localhost/applications/argocd/broken>, click 

- Check email in  <mailhog.localhost>

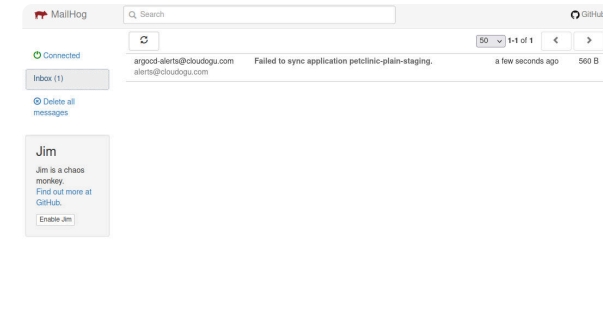
- Follow link to ArgoCD-UI, analyse error

- Fix error in repo:

 <scmm.localhost/scm/repo/argocd/example-apps/code/sources/main/argocd/broken.yaml>

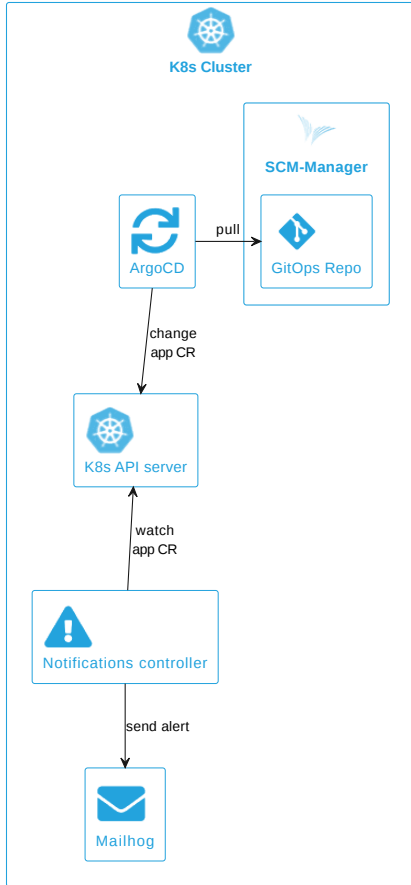
- Go to  <argocd.localhost/applications/argocd/broken>, click 

- Follow  `ingress`  link to open application in browser 



Then have a closer look at the concepts behind this 

Alerting in GOP



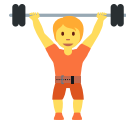
 Argo CD config:

 github.com/cloudogu/gitops-playground/blob/0.3.0/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

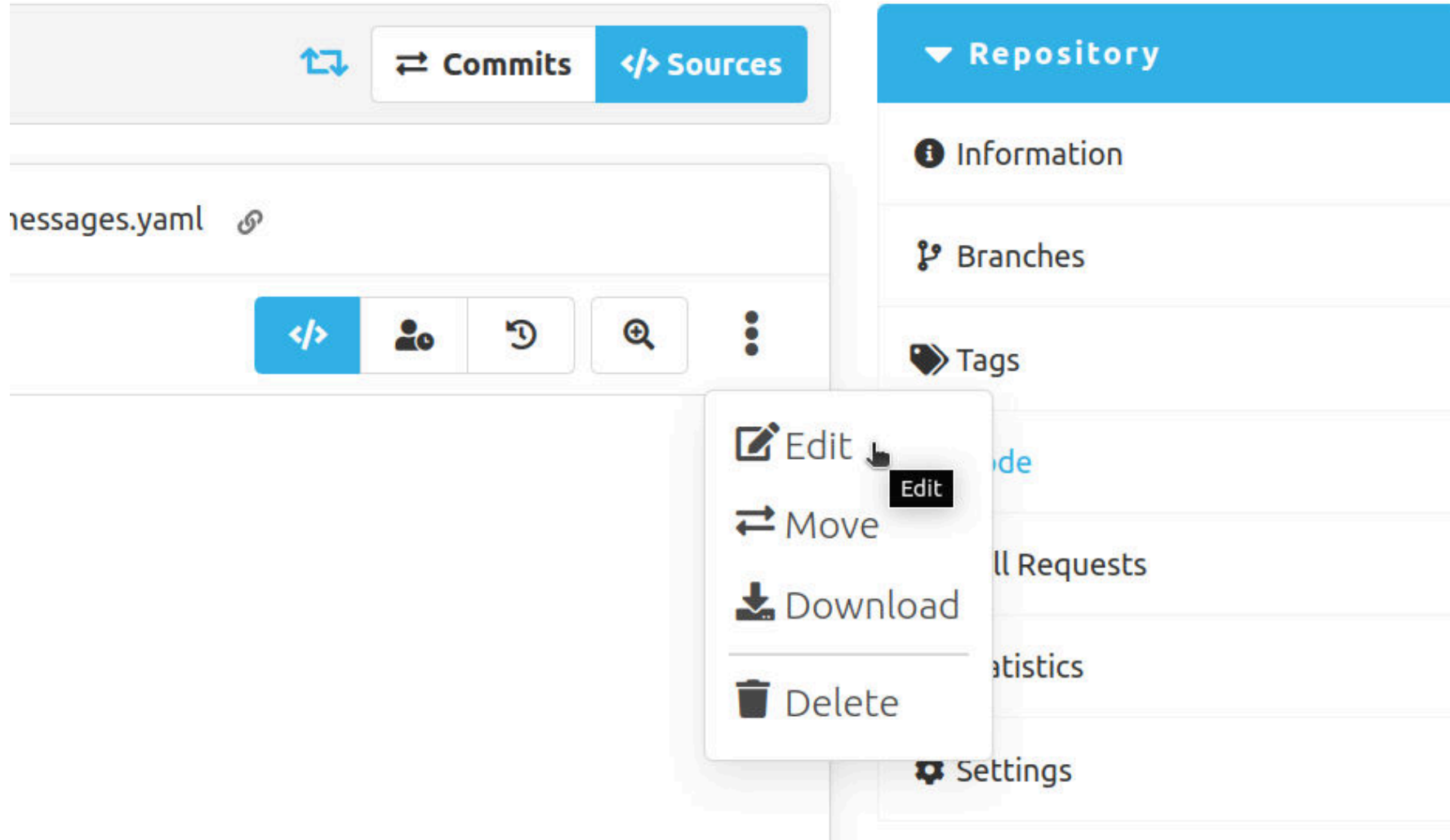
4. Press  REFRESH in ArgoCD UI

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 pull request, deploy production

1. Change app, build image, deploy staging

1. Open Argo CD Application for staging:

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

2. Follow  ingress  link to open application in browser

3. Change welcome message in app repo

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

4. Wait for Build

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

5. Press  in ArgoCD UI  Watch GitOps deployment

6.  Reload app in Browser  Shows message in staging 

2. Accept pull request, deploy production

1. Open Argo CD Application for production:

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

2. Follow  ingress  link to open application in browser

3. Accept pull request for petclinic-plain

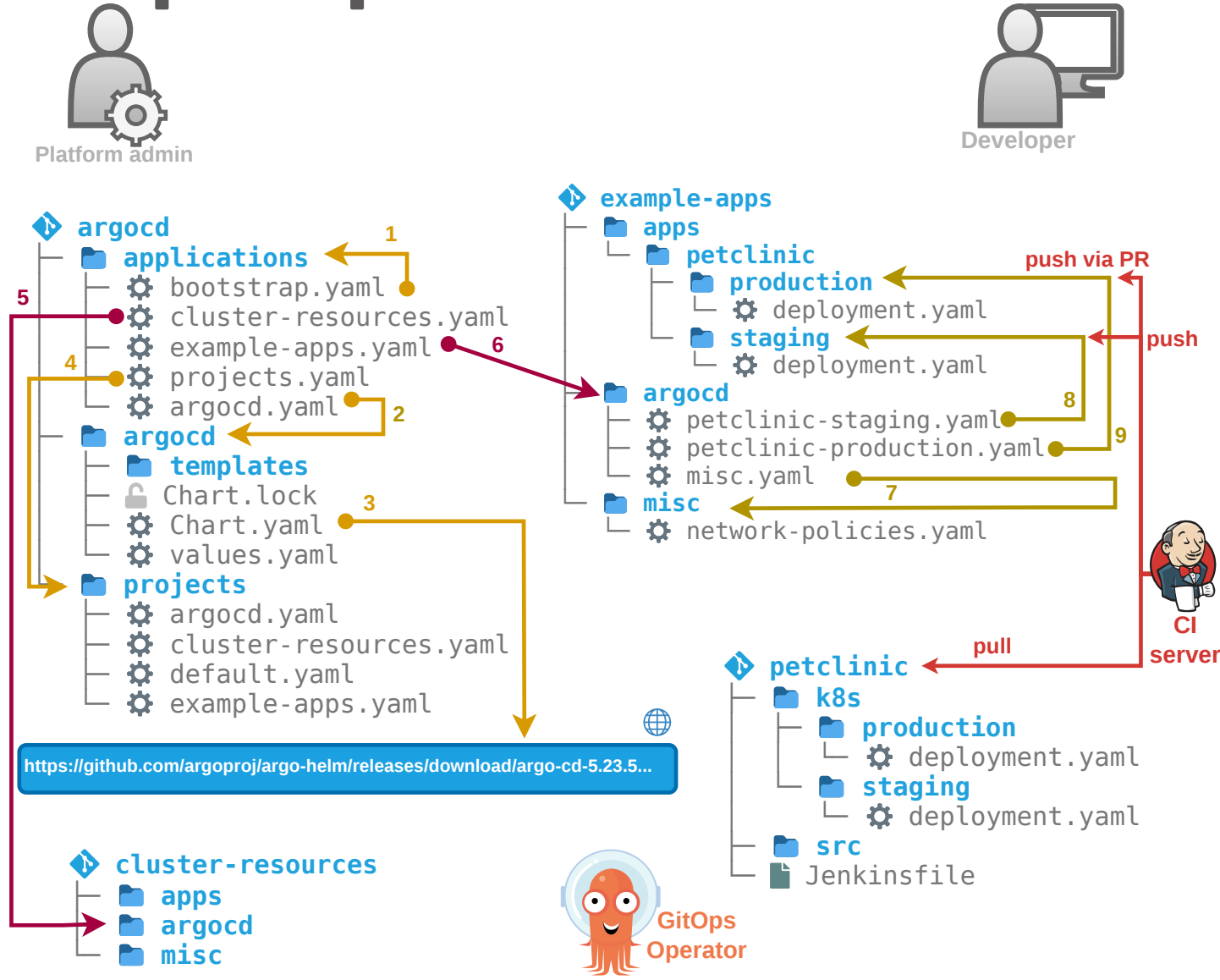
 scmm.localhost/scm/repo/argocd/example-apps/pull-requests

4. Press  in ArgoCD UI  Watch GitOps deployment

5.  Reload app in Browser  Shows message in production 🎉🎉

Have a closer look at the concepts behind this 👉

GitOps repo structure in GOP



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: Monitoring

- Deploy a Grafana dashboard for an app using GitOps 
- (Expose and visualize metrics of Spring Boot app )

Deploy a Grafana dashboard for an app using GitOps

1. Expose metrics
2. Create specific Grafana dashboard JSON
3. Deploy dashboard via GitOps
4. Watch metrics

1. Expose metrics





- Enable metrics export on nginx via GitOps

 scmm.localhost/scm/repo/argocd/example-apps/code/sourceext/edit/main/apps/nginx-helm-umbrella/values.yaml

```
nginx:
  metrics:
    enabled: true
  serviceMonitor:
    enabled: true
```

- Go to  argocd.localhost/applications/example-apps-production/nginx-helm-umbrella, click 
- Check if `servicemonitor` was created



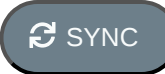

2. Create specific Grafana dashboard JSON

-  grafana.localhost/dashboard/import
- Paste content from here  and click 
-  github.com/nginxinc/nginx-prometheus-exporter/blob/v1.2.0/grafana/dashboard.json
- Name: `nginx-helm-umbrella`
- Click `Select a Prometheus data source: Prometheus`
- Click 




3. Deploy dashboard via GitOps

- Copy JSON from  grafana.localhost/d/MsjffzSZz?editview=dashboard_json
- to  scmm.localhost/scm/repo/argocd/example-apps/code/sourceext/create/main/apps/nginx-helm-umbrella
 - Path: **Add** /files
 - Enter Filename: `dashboard.json` + commit message, click 
- Add another file

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: nginx-helm-umbrella-dashboard
  labels:
    grafana_dashboard: "1"
data:
  dashboard.json: |-
    {{ .Files.Get "files/dashboard.json" | indent 4 }}
```

- Path: **Add** /templates
- Enter Filename: `dashboard.yaml` + commit message, click 
- Go to  argocd.localhost/applications/example-apps-production/nginx-helm-umbrella, click 
- Check if  `configmap` was created

4. Watch metrics

- Follow  `ingress`  link to open app in browser
- Generate traffic by  reloading
- Enjoy your dashboard

 grafana.localhost/d/MsjffzSZz 

Expose and visualize metrics of Spring Boot app 🏆

- Expose container port by name:

🔗 scmm.localhost/scm/repo/argocd/petclinic-plain/code/sources/main/k8s/staging/deployment.yaml

```
ports:
  # ..
  - containerPort: 9080
    name: actuator
```

- Expose prometheus metrics from app:

🔗 scmm.localhost/scm/repo/argocd/petclinic-plain/code/sources/main/pom.xml

```
<dependency>
  <groupId>io.micrometer</groupId>
  <artifactId>micrometer-registry-prometheus</artifactId>
</dependency>
```

- Wait for build and deployment to staging

Create service for metrics port

```
apiVersion: v1
kind: Service
metadata:
  name: spring-petclinic-plain-monitor
  namespace: example-apps-staging
  labels:
    app: spring-petclinic-plain
    type: metrics
spec:
  ports:
    - name: metrics
      port: 9080
      protocol: TCP
      targetPort: actuator
  selector:
    app: spring-petclinic-plain
```



Use `kubectl` for faster iteration. GitOps can come later.

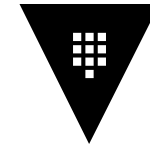
Create service monitor

```
apiVersion: monitoring.coreos.com/v1
kind: ServiceMonitor
metadata:
  name: spring-petclinic-plain-monitor
  namespace: example-apps-staging
spec:
  endpoints:
    - interval: 15s
      path: /actuator/prometheus
      port: actuator
  namespaceSelector:
    matchNames:
      - example-apps-staging
  selector:
    matchLabels:
      app: spring-petclinic-plain
      type: metrics
```

Find a suitable JVM / spring / micrometer dashboard and import it to Grafana

 grafana.com/grafana/dashboards 🎉

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:

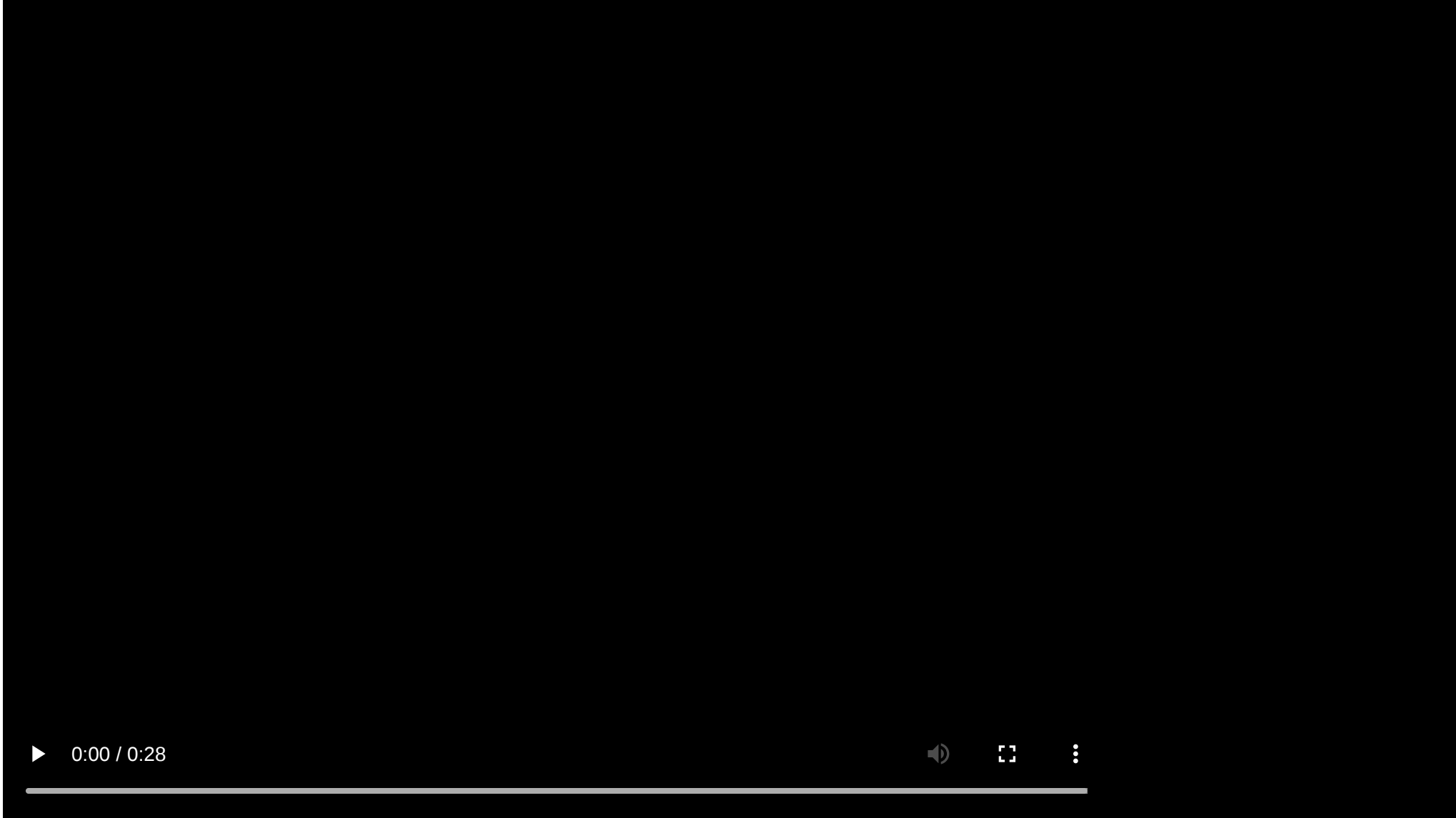
▼ vault.localhost/ui/vault/secrets/secret/edit/staging/nginx-helm-jenkins

- 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



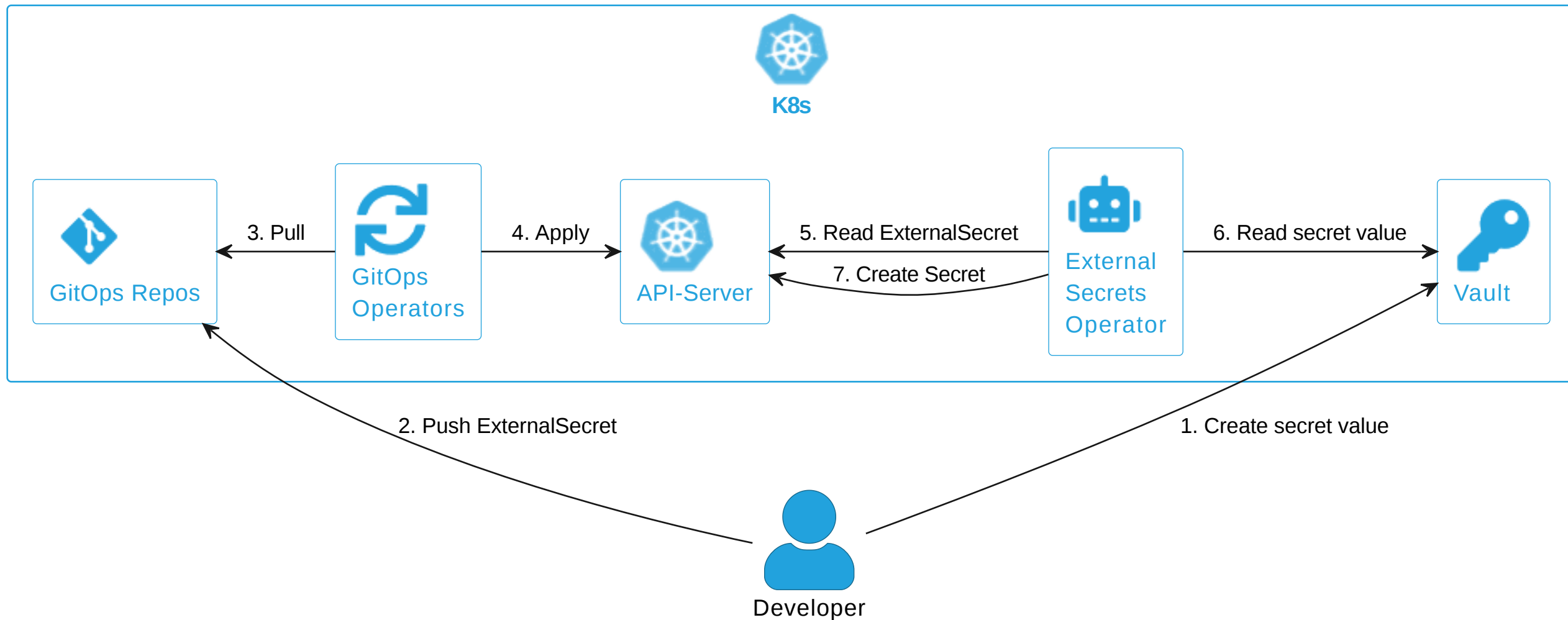
Mount secret into app 🚀

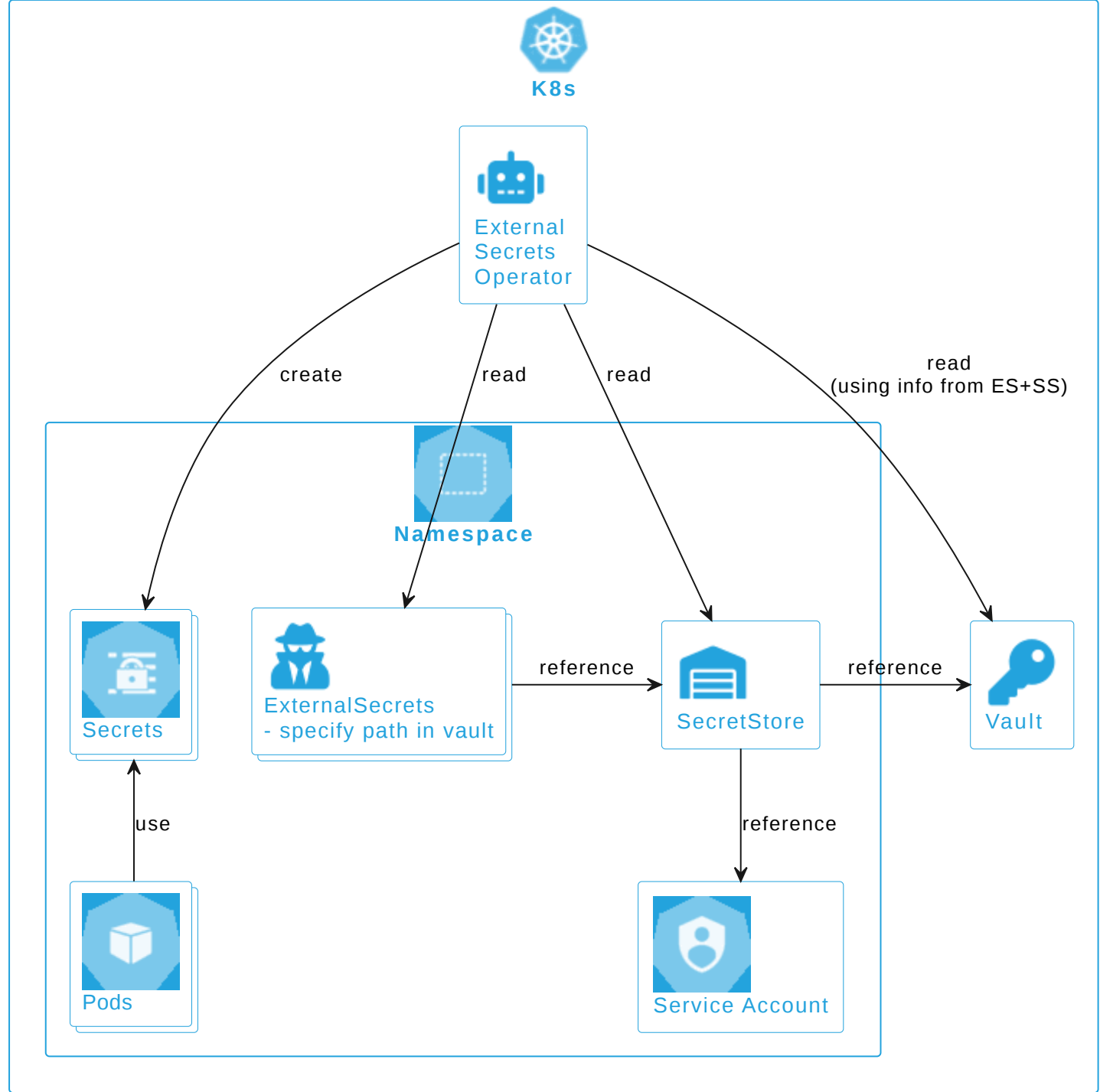
Create a new secret in Vault and mount it into an app

1. Create secret in Vault and sync into cluster via
`ExternalSecret`
2. Use secret in app

Let's start with some basics 📝

External Secrets Operator (ESO) with Vault





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 ExternalSecret:


📌 [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](#)


1. Create secret in Vault and sync into cluster via ExternalSecret

1. Create secret in Vault

-  vault.localhost/ui/vault/secrets/secret
- Click [Create secret +](#)
- Path for this secret: `production/nginx-helm-umbrella`
- key: `my-secret`, value: choose any

2. Deploy ExternalSecret via GitOps (💡 example on [previous slide](#))

 scmm.localhost/scm/repo/argocd/example-apps/code/sourceext/create/main/apps/nginx-helm-umbrella

- Path: **Add** /templates
- Enter Filename: `secret.yaml` + commit message, click 

3. Go to argocd.localhost/applications/example-apps-production/nginx-helm-umbrella, click

4. Check if secret was created

2. Use secret in app

4. Mount `secret` into NGINX (💡 example on [previous slide](#)):

- 🔗 scmm.localhost/scm/repo/argocd/example-apps/code/sourceext/edit/main/apps/nginx-helm-umbrella/values.yaml
- 💡 Hint: Add one `nginx.extraVolumes` and one `nginx.extraVolumeMounts`

5. Go to 🐙 argocd.localhost/applications/argocd/broken, click 

6. Follow  `ingress`  link to open application in browser

7. Add path `/secret` 🎉

8. Optional: Change the secret in Vault and wait for sync as in [Warmup](#) 😎

⚠️ Secret in vault is transient, i.e. gone after restart (dev mode)

Please take a few moments to answer 5 short questions about GOP



Thanks for helping us improve 🙏

Yannick Christian Thomas
Johannes Schnatterer
Cloudogu GmbH

Please reach out for all questions or feedback!

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in in/jschnatterer

@ @schnatterer@floss.social



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