



// INTRODUCTION TO GITOPS – A NEW AGE OF AUTOMATION?

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Agenda

- What is GitOps?
- Where can it be used?
- How can it be used?
- What challenges arise?

What is GitOps?

- operating model
- Term (August 2017):

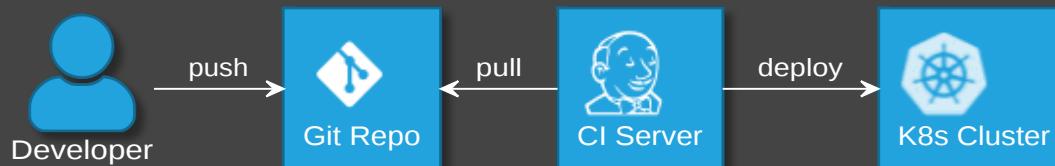
Use developer tooling to drive operations

 weave.works/blog/gitops-operations-by-pull-request

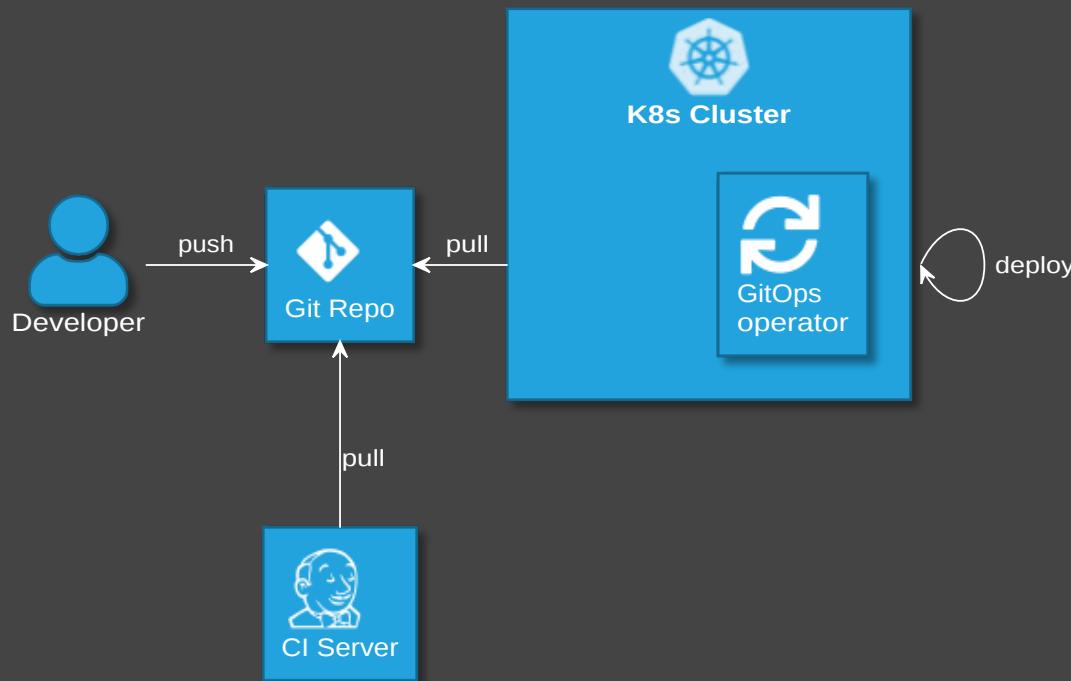
"The right way to do DevOps" (Alexis Richardson)

 youtu.be/lvLqJWOixDI

"Classic" Continuous Delivery ("CIOps")



GitOps



GitOps Principles

- 1 The principle of declarative desired state
- 2 The principle of immutable desired state versions
- 3 The principle of state reconciliation
- 4 The principle of operations through declaration

沩 WIP!

GH github.com/gitops-working-group/gitops-working-group/pull/48

MD hackmd.io/arwvV8NUQX683uBM3HzyNQem



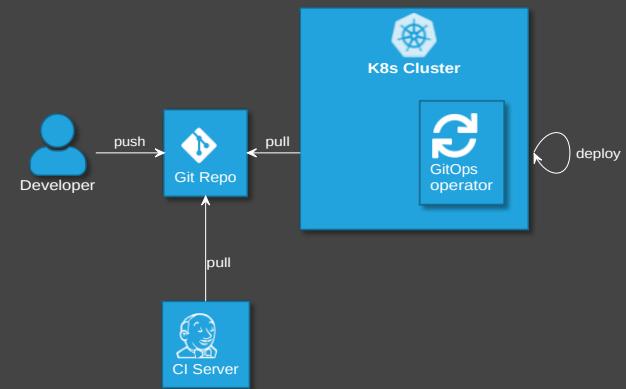
GitOps vs DevOps

TODO

 <https://www.heise.de/select/ix/2021/4/2032116550453239806> 

Advantages of GitOps

- (Almost) no access to cluster from outside
- No credentials on CI server
- Forces 100% declarative description
 - auditable
 - automatic sync of cluster and git
- Enterprise: Accessing git is simpler
(no new firewall rules)



A photograph of a blue claw hammer resting on a light-colored wooden surface. Several metal nails are scattered around the hammer, some partially driven into the wood. The lighting creates strong shadows, emphasizing the texture of the wood and the metallic surfaces.

What can GitOps be used for?



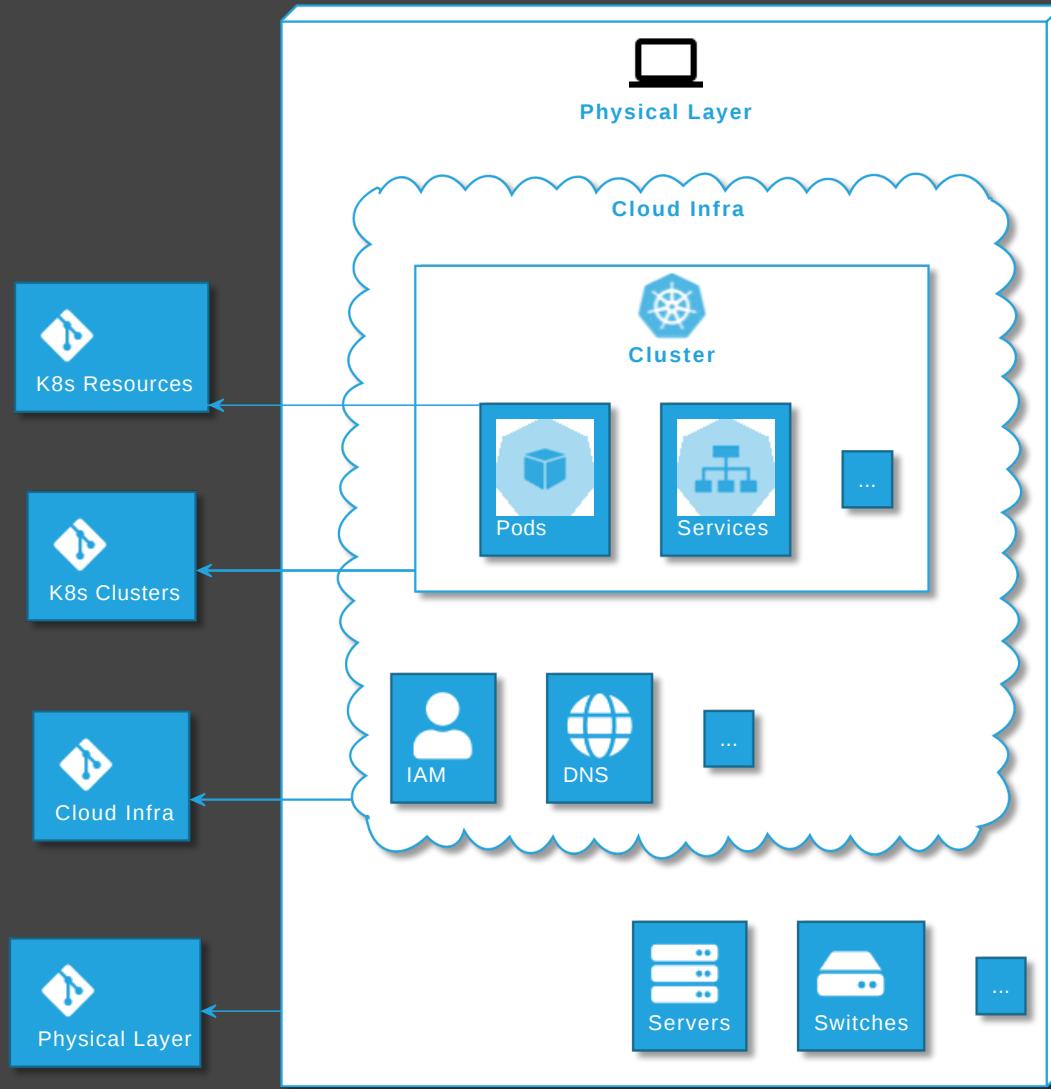
GitOps History in a nutshell

- grew up operating applications on Kubernetes,
- is now rising above it, operating clusters and other (cloud) infrastructure

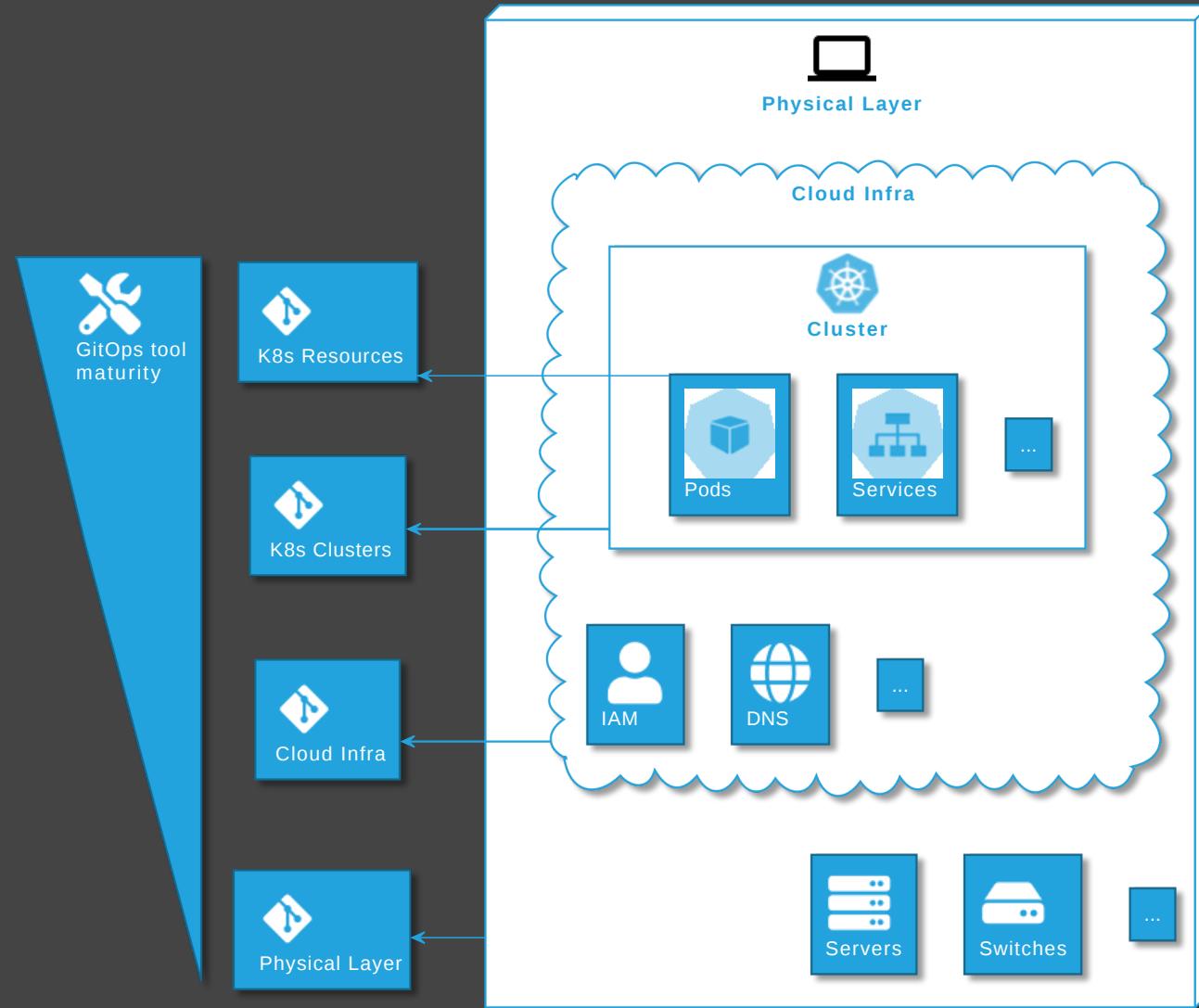
More on the history of GitOps:

🎥 <https://youtu.be/lvLqJWOixDI>

A GitOps Dream



GitOps reality





How can GitOps be used? Tools

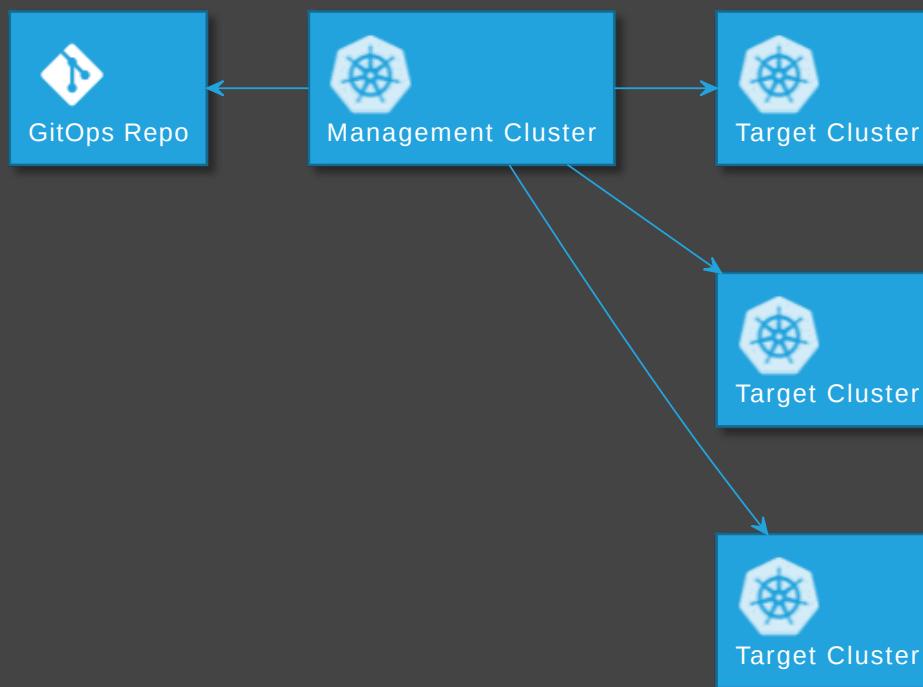
Categories

- Tools for Kubernetes AppOps
- Tools for Kubernetes ClusterOps
- Tools Close to Infrastructure
 - with or
 - without Kubernetes
- Supplementary GitOps tools

GitOps Tools for Kubernetes AppOps



Operate Kubernetes with Kubernetes



GitOps Tools for Kubernetes ClusterOps



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-  [hashicorp/terraform-k8s](#)
-  [rancher/terraform-controller](#)

Tools Close to Infrastructure

- with Kubernetes



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+ Operators

- without Kubernetes



Supplementary GitOps tools

Secrets

-  [bitnami-labs/sealed-secrets](#)
-  [mozilla/sops](#) + K8s integration
 -  [isindir/sops-secrets-operator](#)
 -  [jkroepke/helm-secrets](#) (plugin)
 - flux v2 (native support)
-  [Soluto/kamus](#)
- Operators for Key Management Systems
 -  [external-secrets/kubernetes-external-secrets](#)
 -  [ContainerSolutions/externalsecret-operator](#)
 -  [ricoberger/vault-secrets-operator](#)

Others

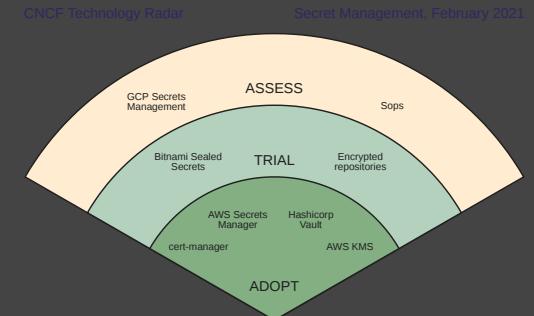
- Deployment Strategies - Progressive Delivery



- Backups
- Horizontal Pod Autoscaler
- ...

See also

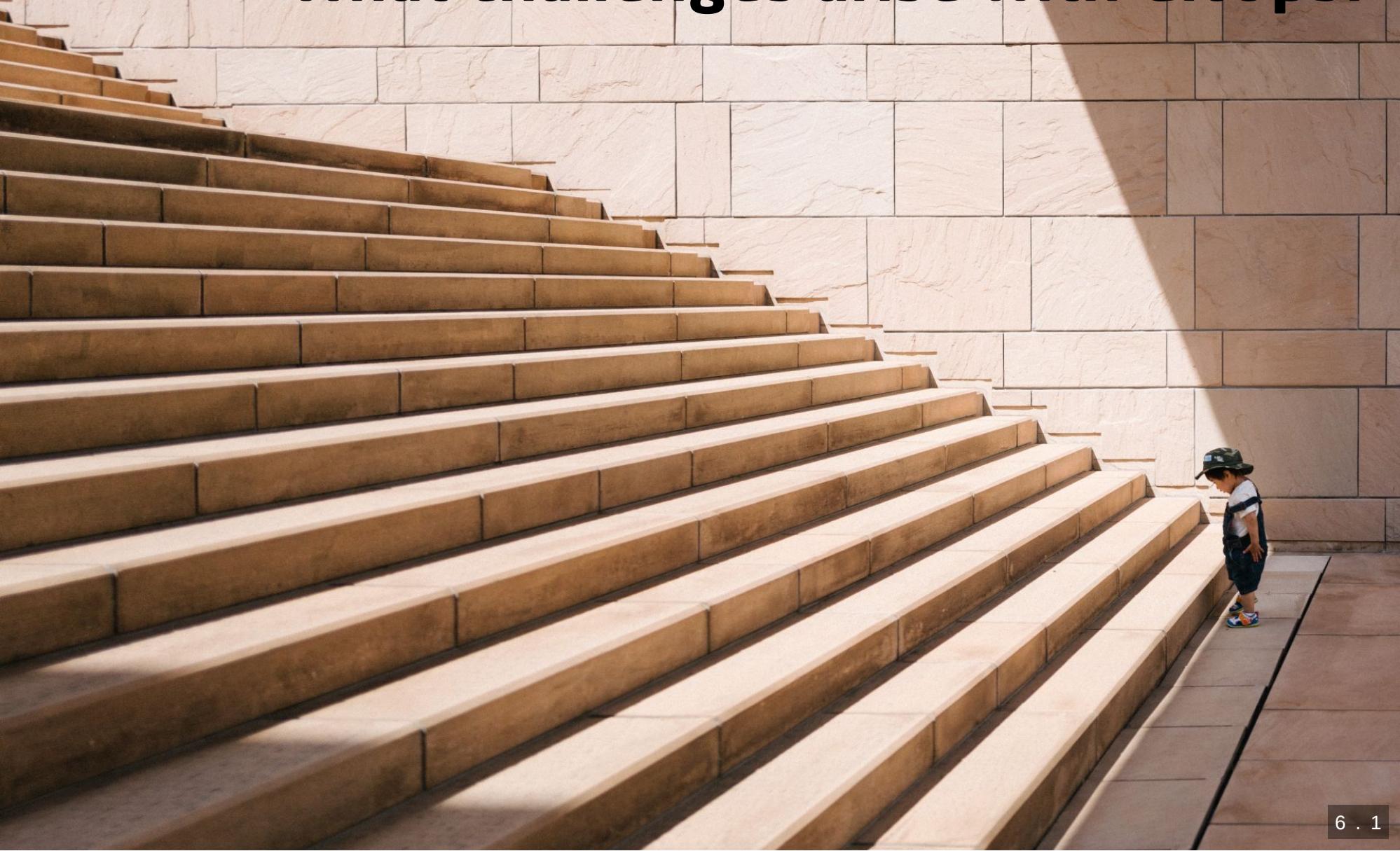
-  cloudogu.com/blog/gitops-tools (iX 4/2021)
 - General tool comparison,
 - tips on criteria for tool selection,
 - comparison of ArgoCD v1 and Flux v2
-  radar.cncf.io/2021-02-secrets-management
-  weaveworks/awesome-gitops
-  gitops.tech



Demo

 github.com/cloudogu/k8s-gitops-playground

What challenges arise with GitOps?



More Infra ...

- GitOps Operator: One or more custom controllers
- Helm, Kustomize Controllers
- Operators for Supplementary tools (secrets, etc.)
- Monitoring/Alerting systems
- ...

... higher cost

- Error handling
 - failing late and silently
 - monitoring/alerting required
 - reason might be difficult to pinpoint
 - operators cause alerts (OOM errors, on Git/API server down, etc.)
- Resource consumption
- Maintenance/patching
- Vendor support necessary

Day two questions

- POC is simple
- Operations in prod has its challenges
 - How to structure repos?
 - How to realize staging?
 - How to delete resources?
 - How to realize local dev env?
 - ...

How to delete resources?

- “garbage collection” (Flux) / “resource pruning” (ArgoCD)
disabled by default
-  Enable from the start → avoid manual interaction

Local development

- Option 1: Deploy GitOps operator and Git server on local cluster
 - ➡ complicated
- Option 2: Just carry on without GitOps. Possible when IaC remains in app repo

CONCLUSION



Personal Conclusion

After migrating to and operating with GitOps in production for > 1 year

- Smoother CI/CD,
 - *everything* declarative
 - faster deployment
 - force sync desired state  actual state
- But: security advantages only when finished migration
- A lot of potential ahead!

GitOps experience distilled

- + Has advantages, once established
- Mileage for getting there may vary

Adopt?

- Greenfield
 - Kubernetes AppOps: Definitely
 - Cloud Infra: Depends
- Brownfield: Depends

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 cloudogu.com/gitops

-  GitOps Resources (intro, tool comparison, etc.)
-  Links to GitOps Playground and Build Lib 
-  Discussions
-  Training



Slides

