
CERN

Kubernetes Operators

as composable parts of the new Drupal SaaS

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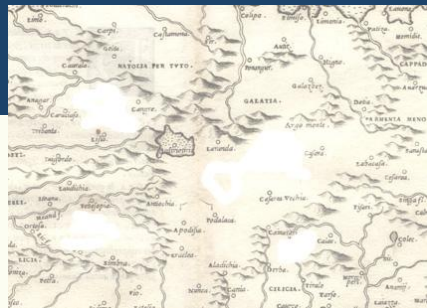
IT-CDA-WF

White Area talk



Coalescing Web Frameworks on K8s

Unique infrastructure per use case

PaaS	Openshift 3 (Kubernetes)
WebEOS	VMs with custom config
Drupal	Physical machines with custom config

Low reuse of components

Converging on a cloud native platform

PaaS	Openshift **4**
WebEOS	**Openshift 4**
Drupal	**Openshift 4**

Many shared components

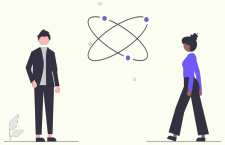
Platform components

```
argo-cd
authz-operator
cephfs-csi
cern-accounts-integration
cern-okd-admin-service-account
cert-manager
cluster-logging
cluster-state-backup
custom-ingress-deployment
cvmfs-csi
dbod
dns-manager
drupal
eosxd
force-clusterversion
landb-operator
logviewer
monitoring
okd-console--configuration
okd-registry-configuration
paas
reserved-hostnames
selinux-configuration
shared-image-streams
tektoncd
webeos
worker-nodes
```

Common pattern: Operator

Drupal @ CERN

Drupal @ CERN



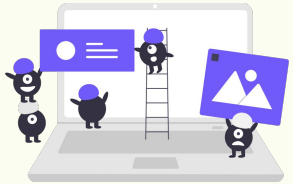
Physicists

Administration

Drupal expert

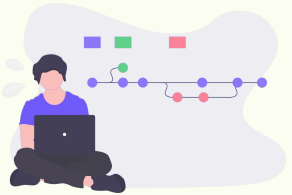
Comms expert

CERN
Drupal Distribution



Reliable hosting

Upgrades
Failure recovery

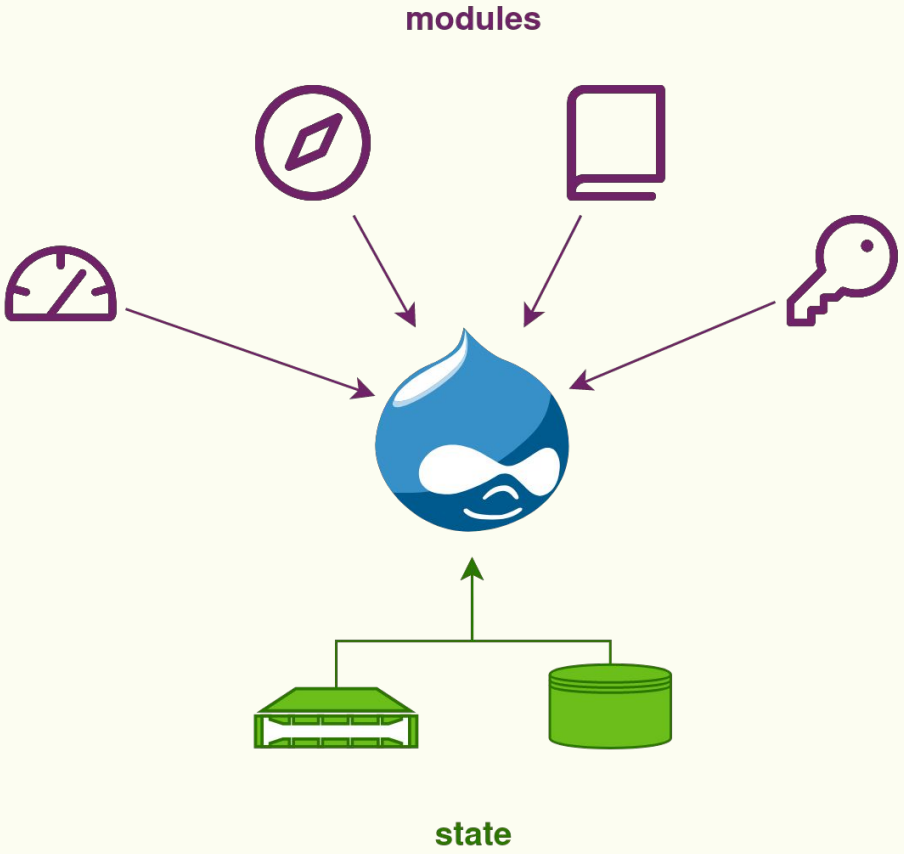


Custom modules & themes

Not just hosting, but fully managed

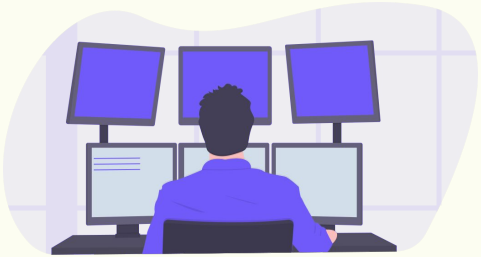
Software as a Service

Parts of a Drupal site



Drupal SaaS is tough

- Take 1500 instances of a complicated thing
- Automate business/operational logic
- Let users self-provision websites
- All this with a very small team!



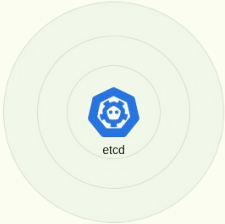
Drupal sites on K8s

Kubernetes

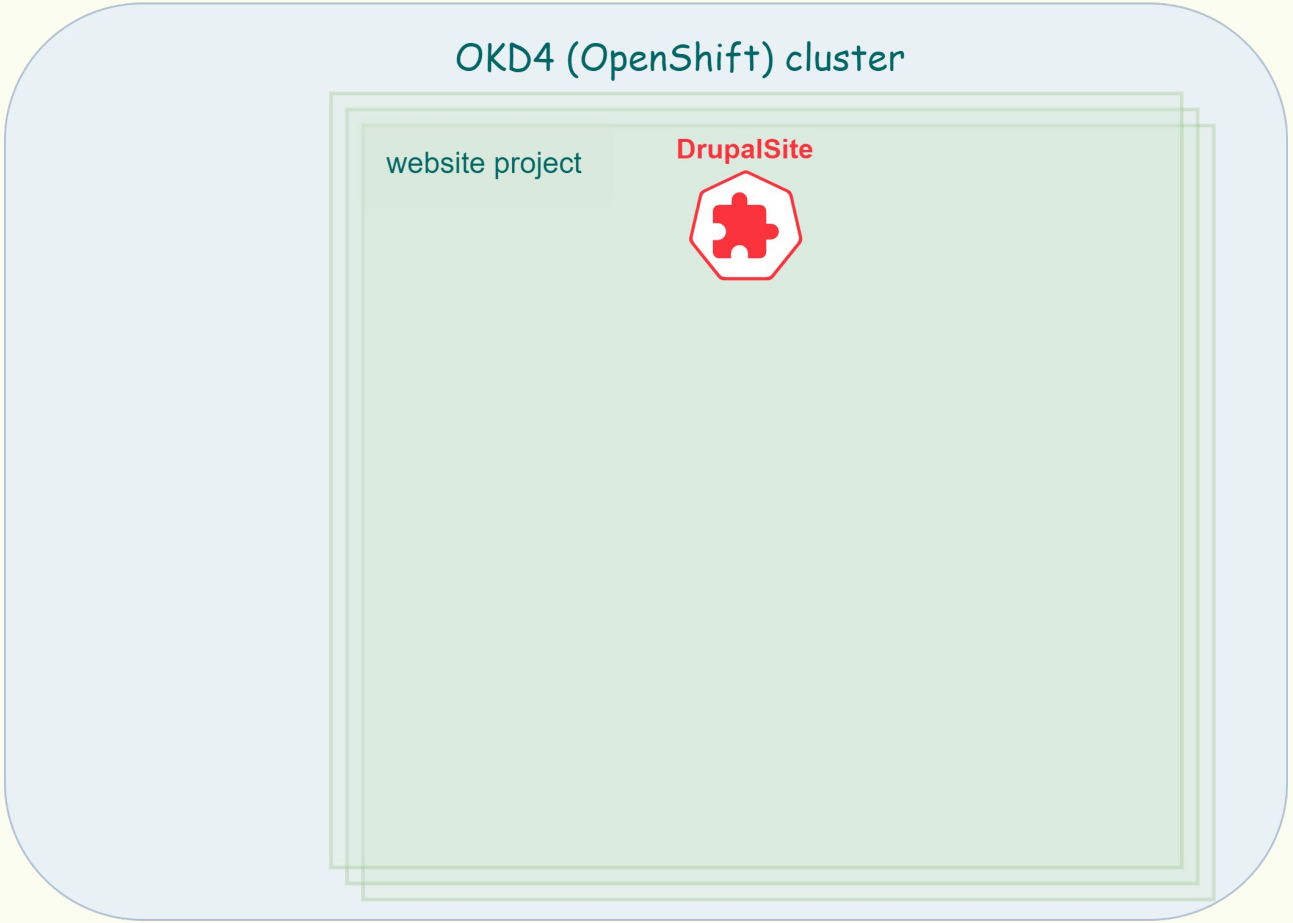
"*Container orchestrator*"

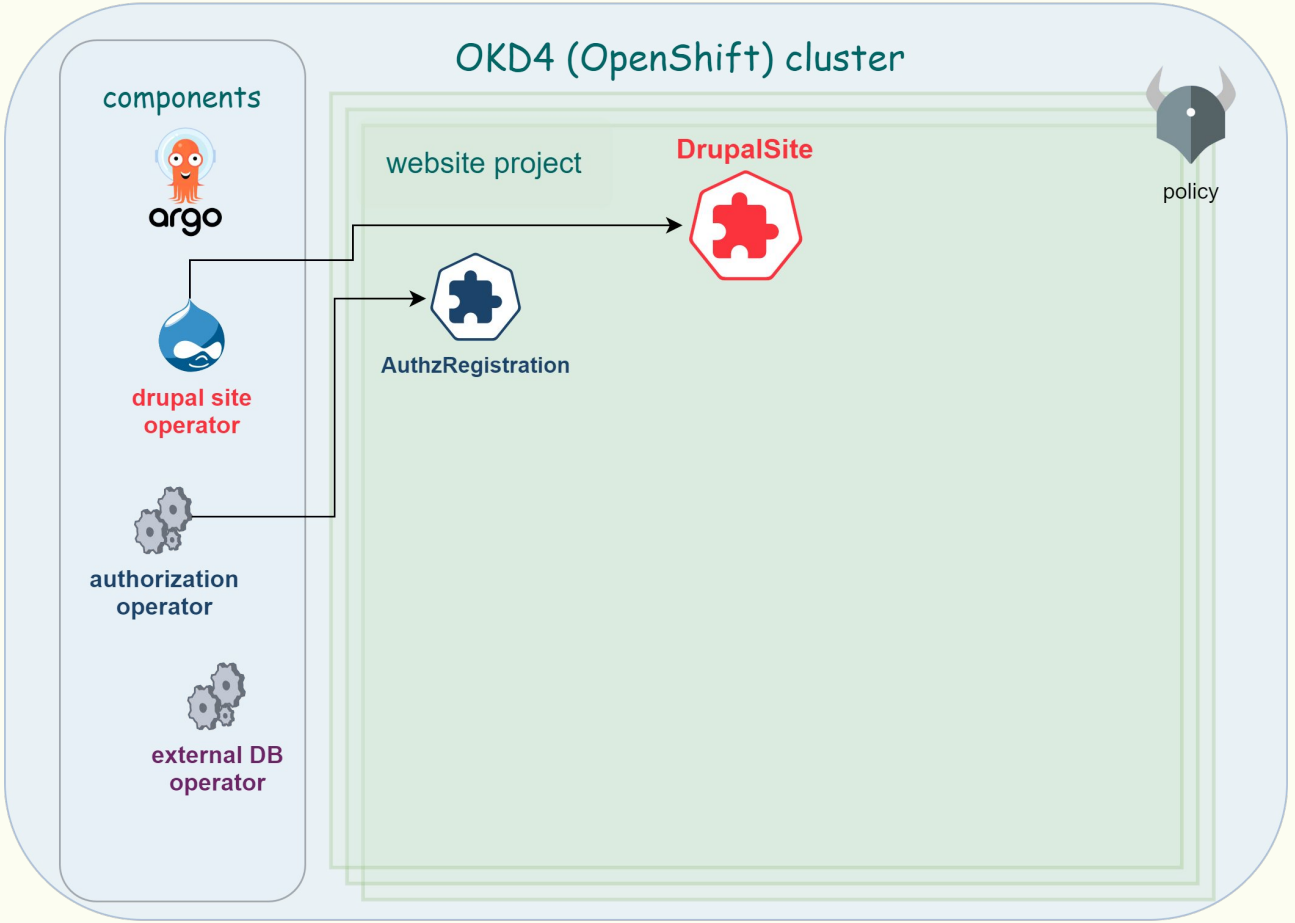
API resources

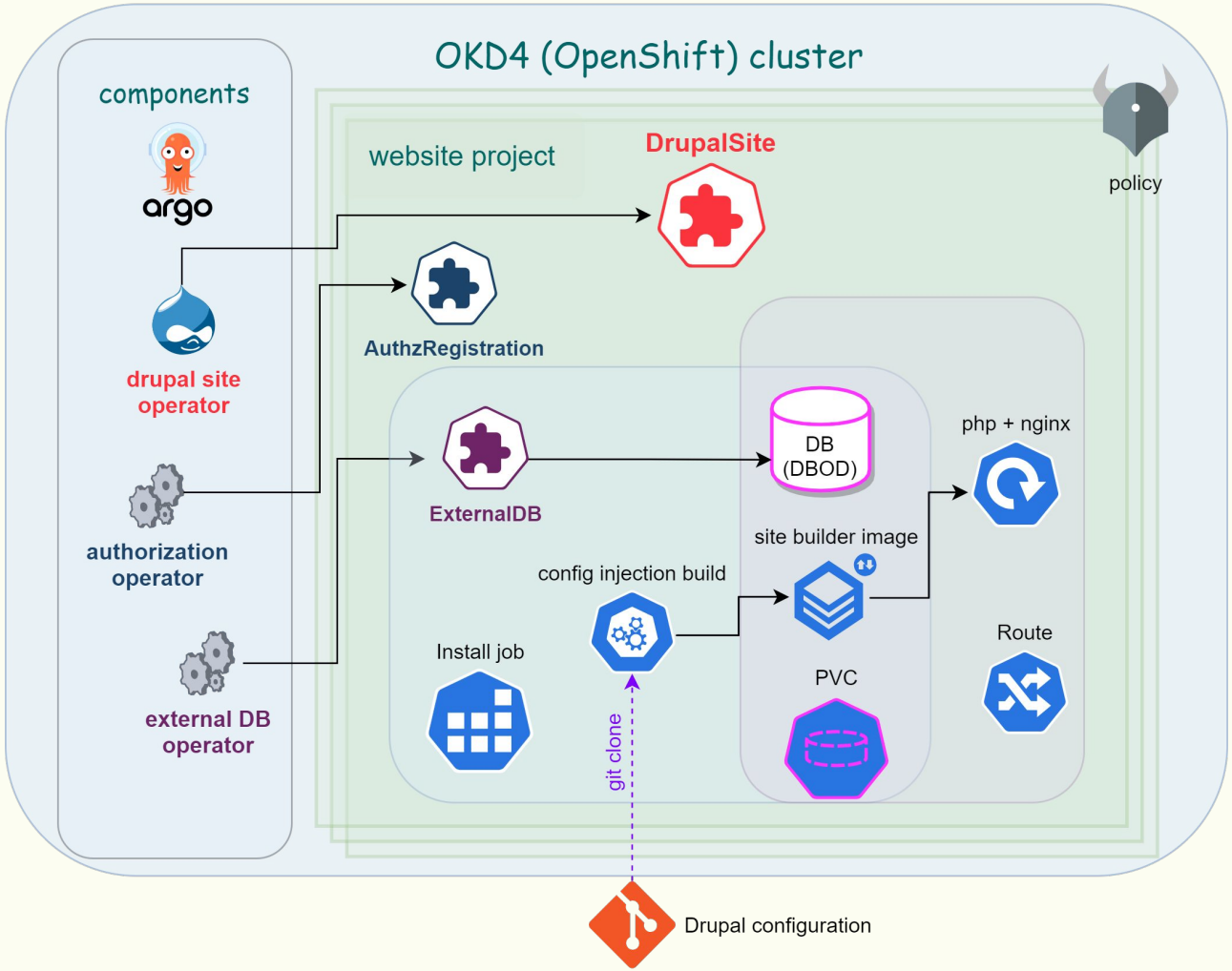
- not a workflow engine
- set of independent, **composable** control processes
- continuously drive the current state towards the provided desired state



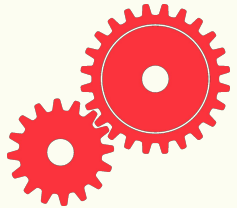
Ref: kubernetes.io/docs/concepts/overview/what-is-kubernetes/

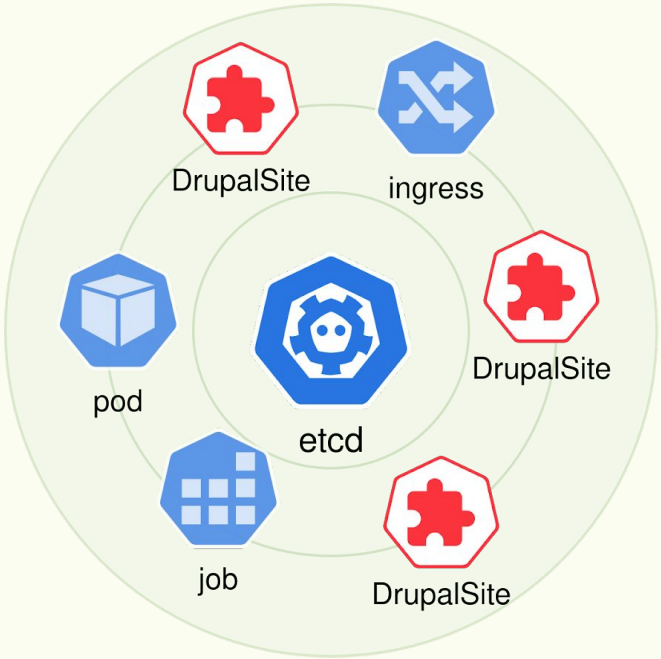

OKD4 (OpenShift) cluster
website project
DrupalSite


OKD4 (OpenShift) cluster
components
argo
drupal site operator
authorization operator
external DB operator
website project
DrupalSite
AuthzRegistration
policy

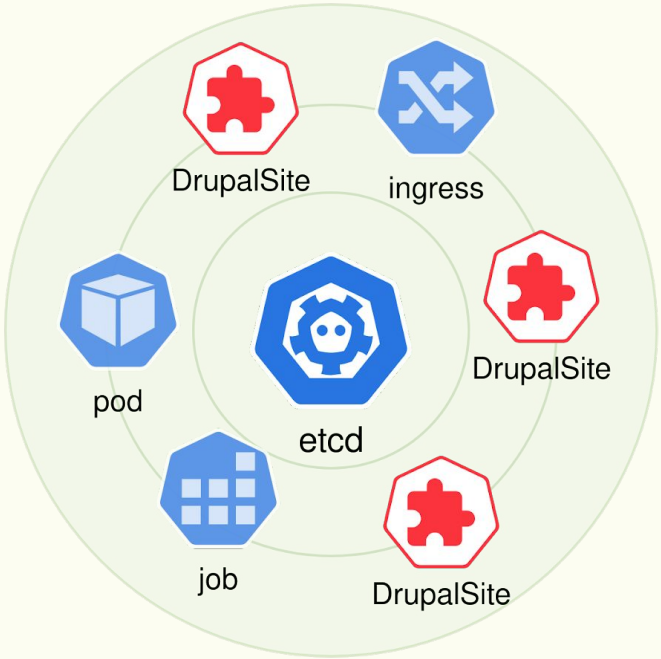

OKD4 (OpenShift) cluster
components
argo
drupal site operator
authorization operator
external DB operator
website project
DrupalSite
AuthzRegistration
ExternalDB
DB (DBOD)
php + nginx
site builder image
config injection build
Install job
PVC
Route
policy
git clone
Drupal configuration

Operator Pattern





What *should* be in the cluster



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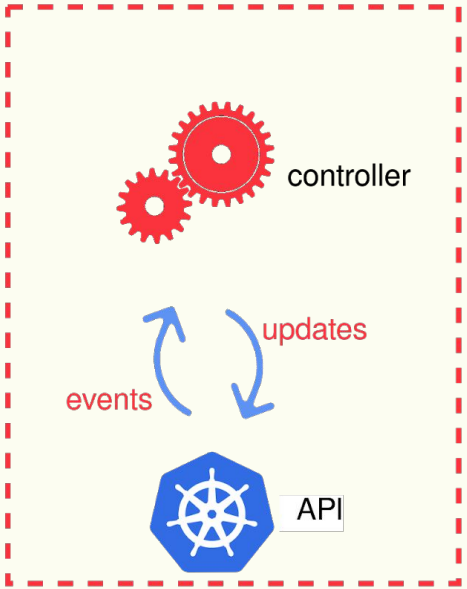
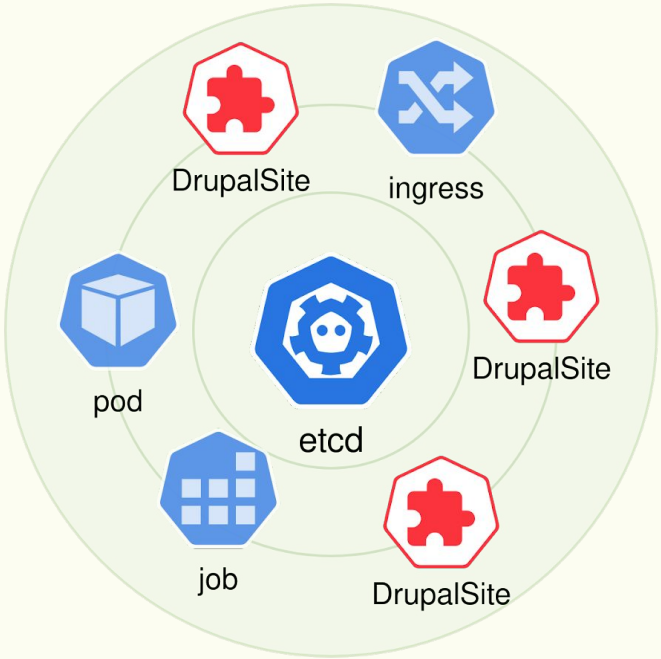


reconciliation



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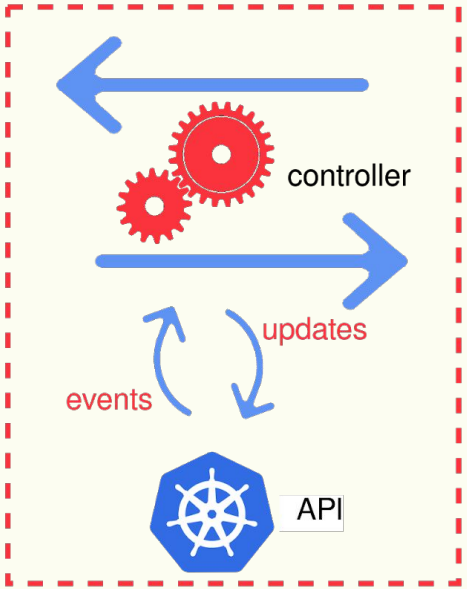
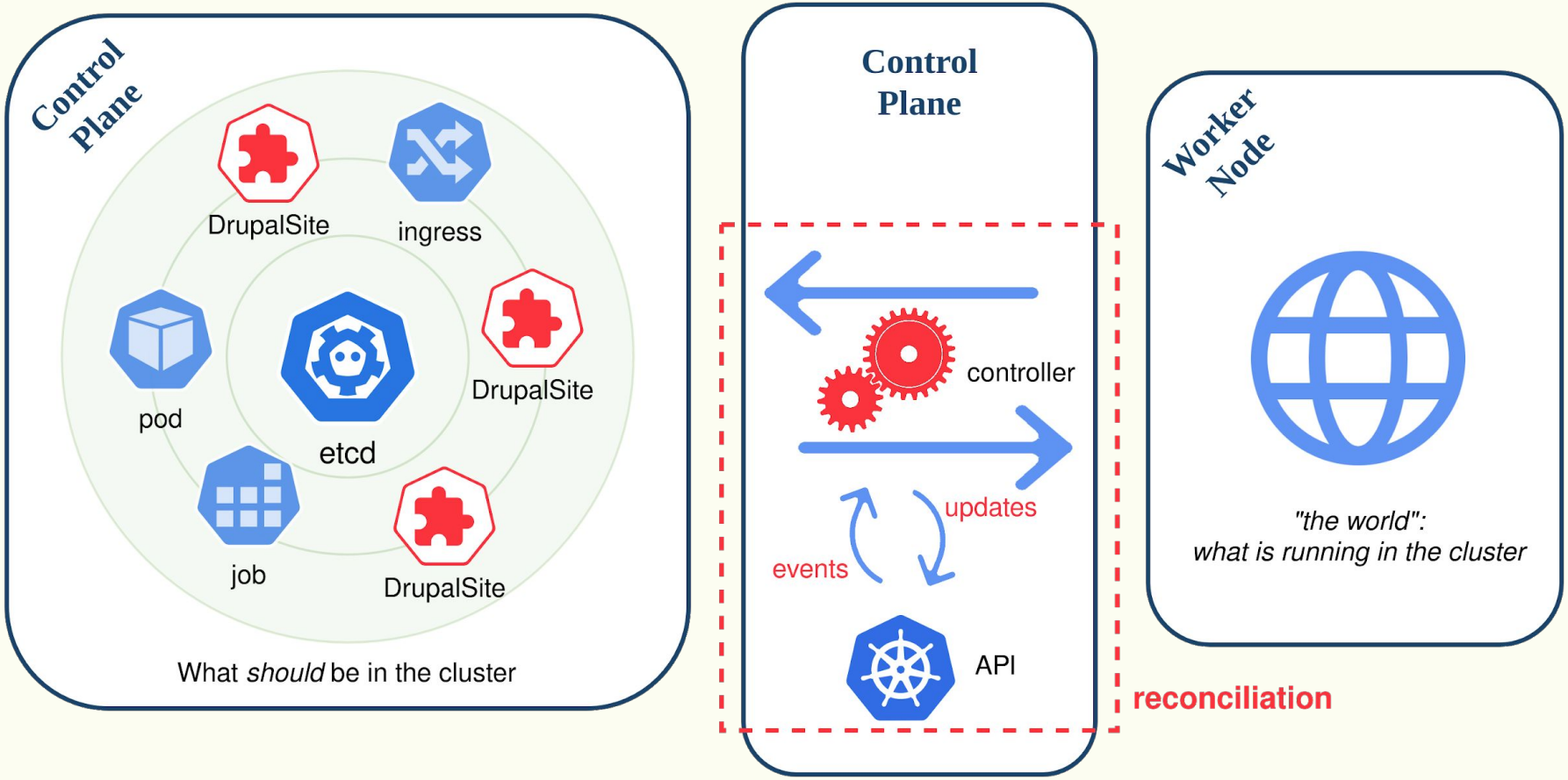
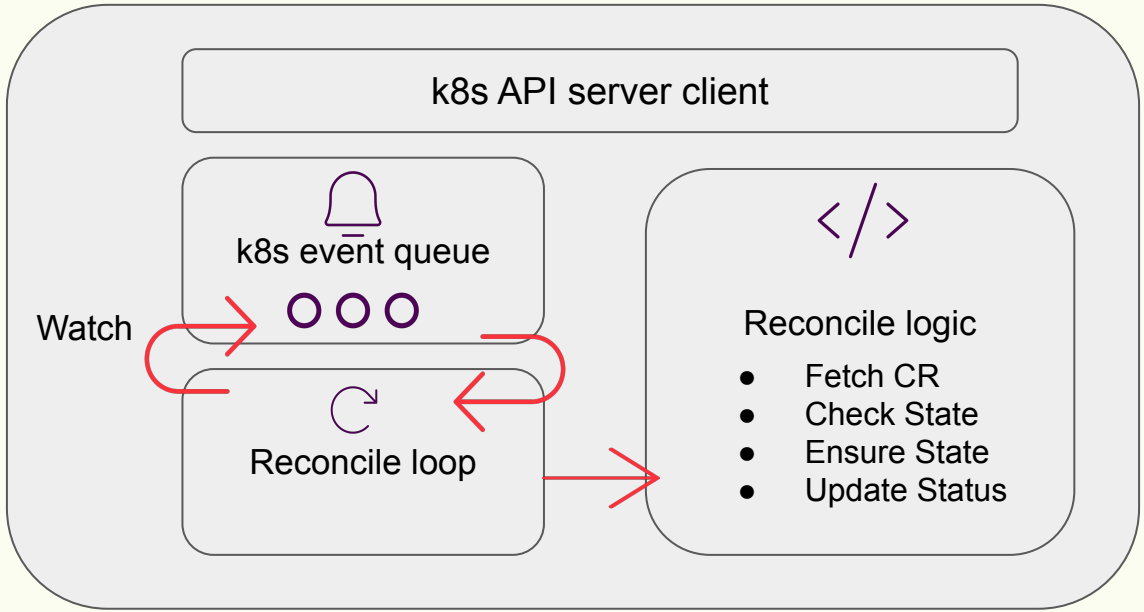


reconciliation

"the world":
what is running in the cluster


Control Plane
DrupalSite
ingress
pod
etcd
DrupalSite
job
DrupalSite
What *should* be in the cluster
Control Plane
controller
updates
events
API
reconciliation
Worker Node
"the world":
what is running in the cluster

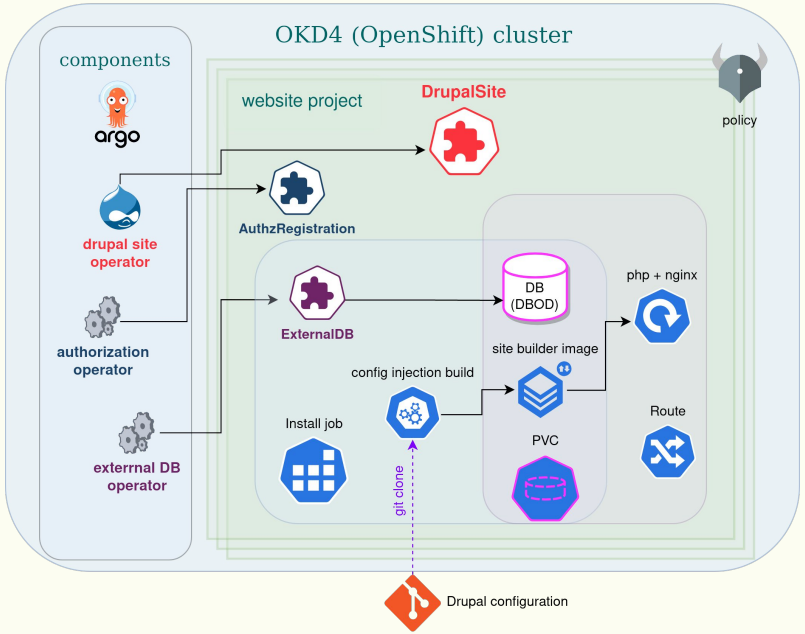
Making operators



Diving into our operators

The DrupalSite operator

```yaml
apiVersion: drupal.kubecon.cern.ch/eu2021
kind: DrupalSite
metadata:
  name: kubecon
spec:
  drupalVersion: "9.1.x"
  publish: true
  siteUrl: kubecon.webtest.cern.ch
  environment:
    name: "dev"
    qosClass: "standard"
    dbodClass: "test"
  diskSize: "1Gi"
```



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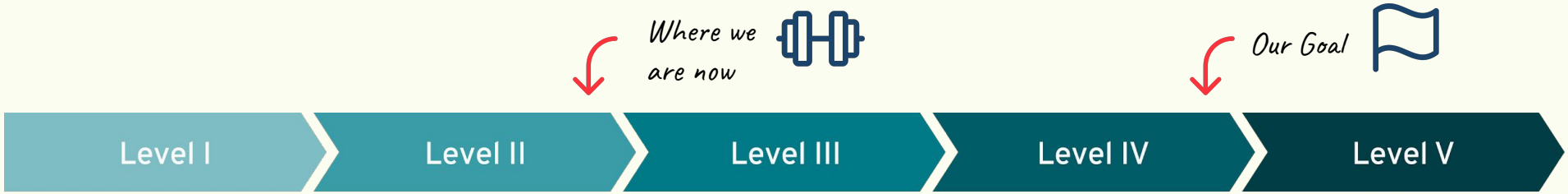
  publish: true
  siteUrl: kubecon.webtest.cern.ch
  environment:
    name: "dev"
    qosClass: "standard"
    dbodClass: "test"
  diskSize: "1Gi"
```

```yaml
status:
  conditions:
    - type: Installed
      status: "False"
    - type: Ready
      status: "False"
      reason: DBODError
    - type: UpdateNeeded
      status: Unknown
      reason: k8sAPIClientError
      message: 'k8sAPIClientError:
Deployment.apps "kubecon" not found'
  lastRunningDrupalVersion: 8.9.13
```

Operator Capabilities



Basic Install

Automated application provisioning and configuration management

Seamless Upgrades

Patch and minor version upgrades supported

Full Lifecycle

App lifecycle, storage lifecycle (backup, failure recovery)

Deep Insights

Metrics, alerts, log processing and workload analysis

Auto Pilot

Horizontal/vertical scaling, auto config tuning, abnormal detection, scheduling tuning

Ref: https://sdk.operatorframework.io/docs/overview/

Composing Operators

components

drupal site operator

authorization operator

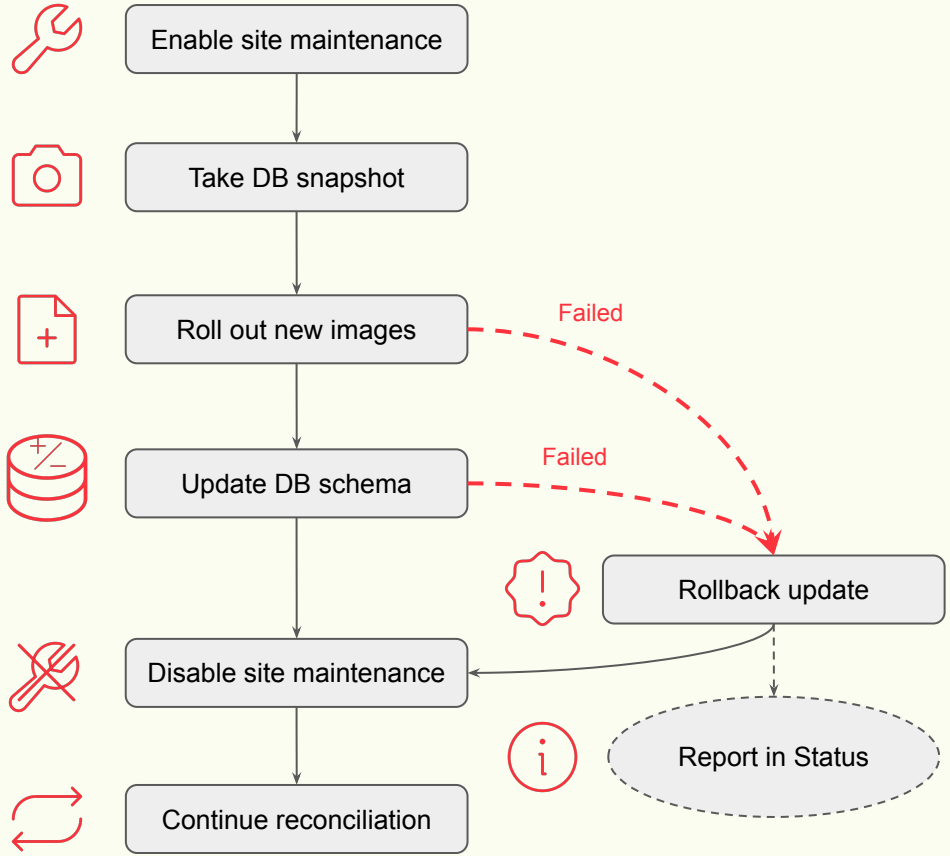
external DB operator

Not only DrupalSites need to integrate with external services

➢ CRDs make operators composable

Demo: Upgrading Drupal sites

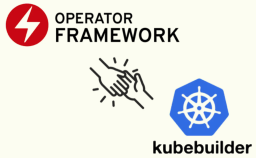
Update workflow



What have we discovered?

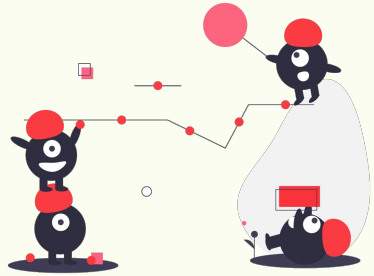
Development practices

- GitOps
  - Cluster configuration with Helm charts
  - Maintain with ArgoCD Applications
  - Validation with e2e tests
- Auto-provisioning development clusters
  - Almost same configuration as production clusters
- Operator Framework
  - Kubebuilder book



Conclusions

- We can provision a highly automated infrastructure to solve a complex problem with a very small team →



- We used the operator model as a critical part of our design.
- Kubernetes as a common API to control many kinds of resources.

➢ gitlab.cern.ch/drupal/paas/drupalsite-operator


That's all Folks!