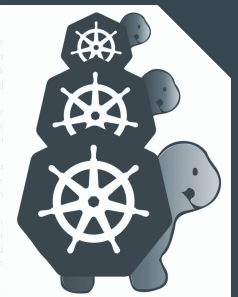
k8gb meets Cluster API

...

Jirka Kremser



Jirka Kremser

jkremser

@JirkaKremser

jiri.kremser@gmail.com

web: kremser.dev

previously:

- Red Hat
- Oracle
- GiantSwarm.io

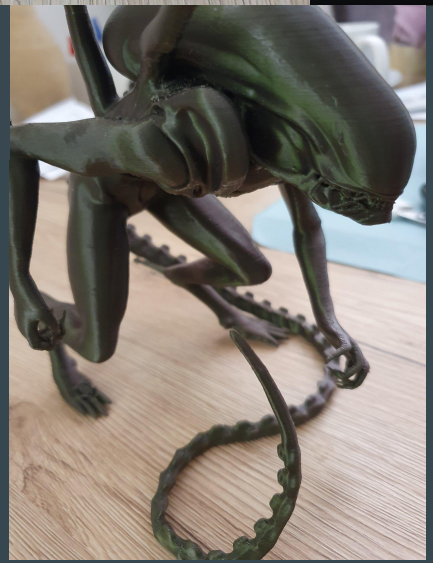
kedify.io (now)

pronounced as */yeerka/*

This slide deck: bit.ly/k8gb-capi

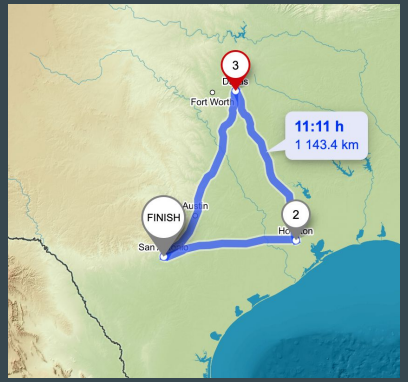
jkremser & life, slide #1

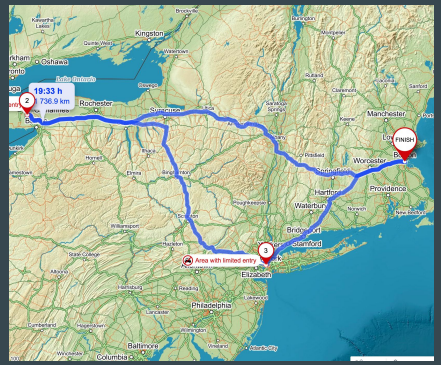
3D Printing

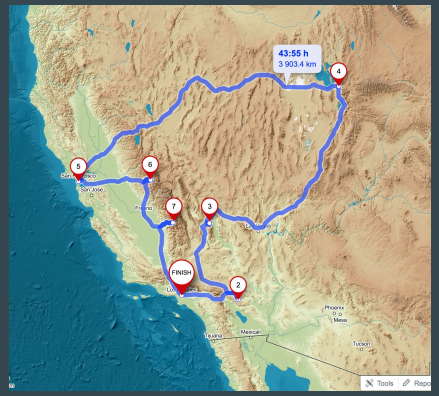


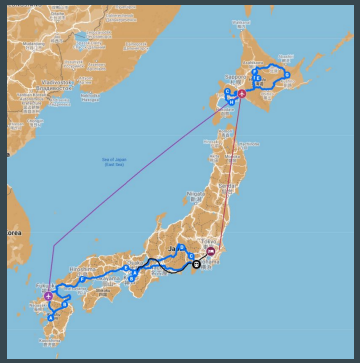
jkremser & life, slide #2

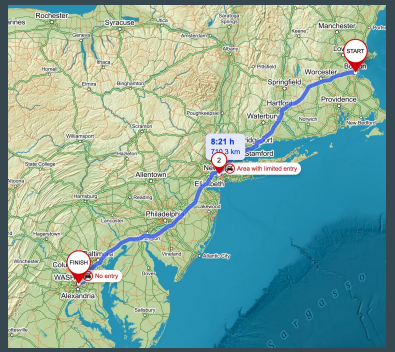
road trippin'

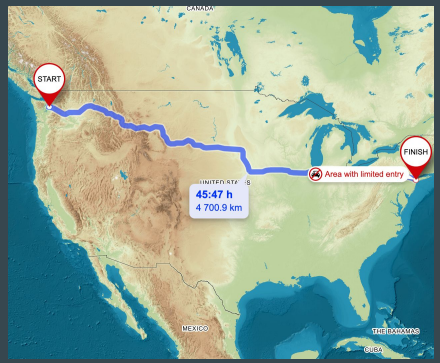


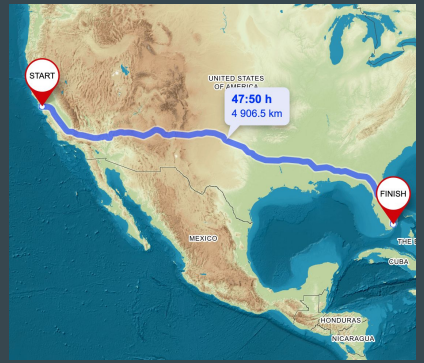


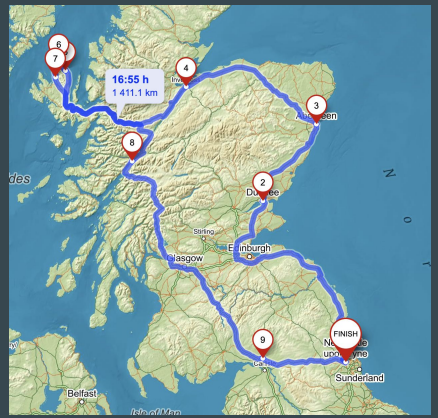


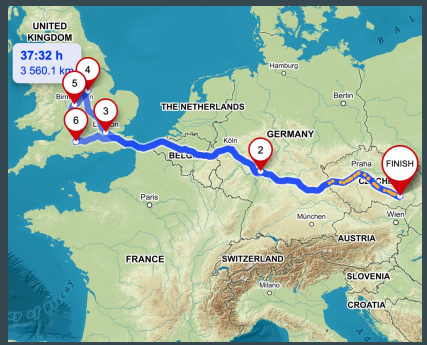












jkremser & life, slide #3

- 2 kids (boys, 8 and 10)
- drone “pilot” - youtu.be/1c0VaR70rDk

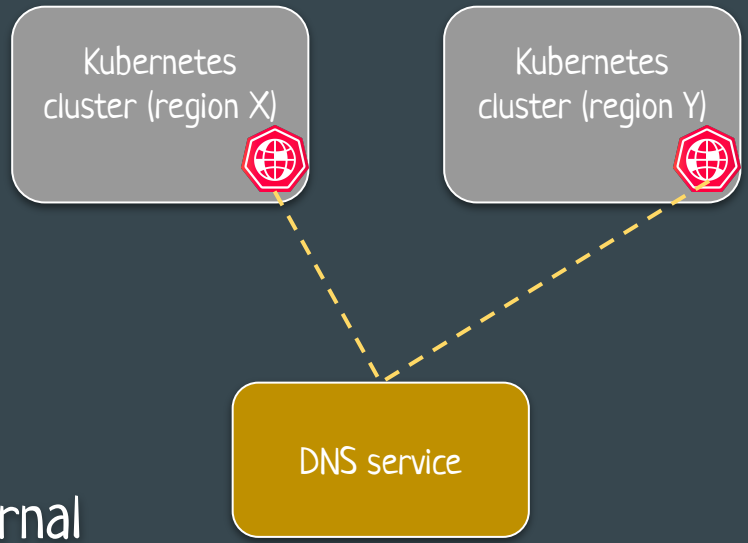
Motivation

"High availability of services as code"

- no vendor lock-in
- no external health checks
- no webui clicking / cloud provider cli tweaks

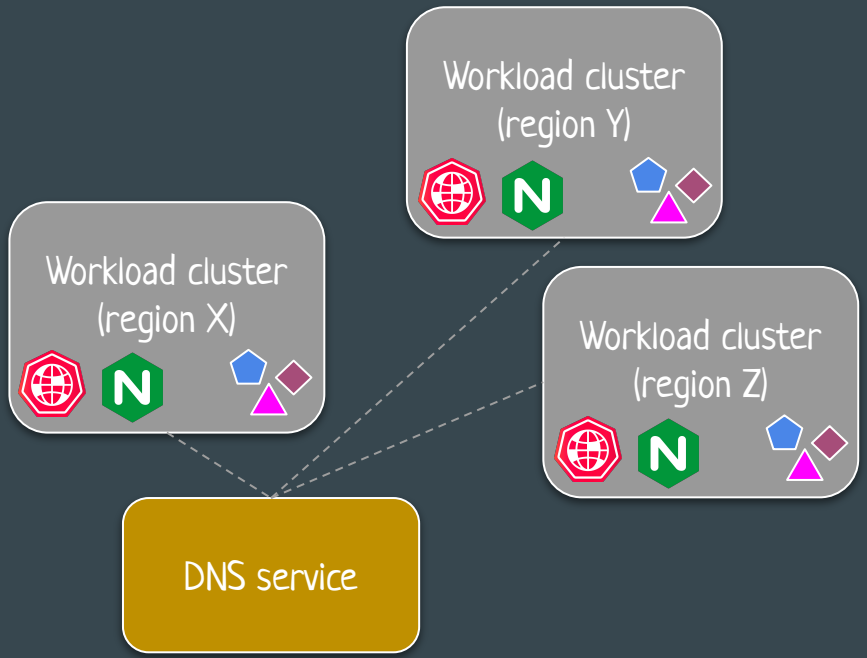
Part 1 - k8gb

- dns based global load balancer
- relies on k8s readiness probes
- decentralized - no SPoF
- CRD or annotation based
- ships internally own coredns and external dns components



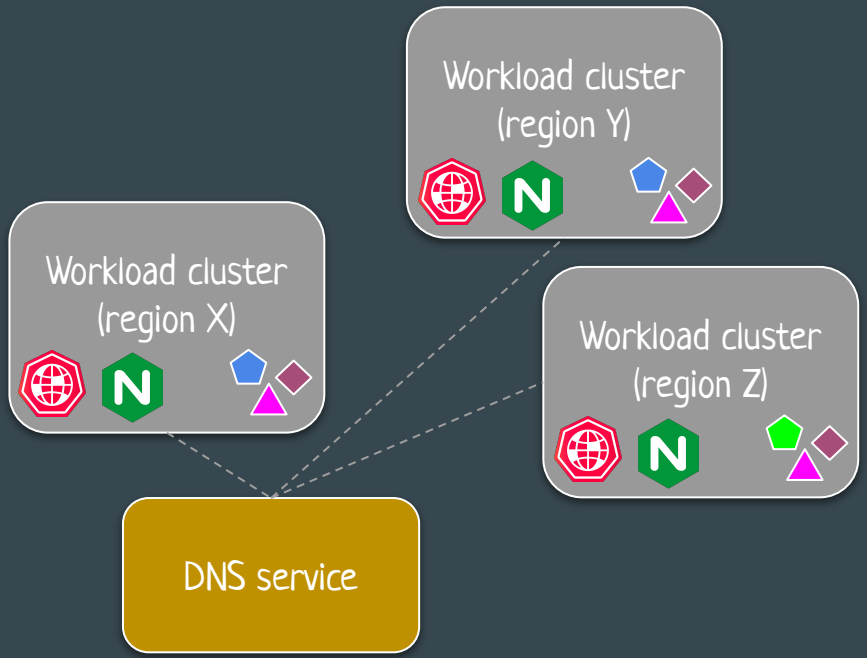
/k8gb-io/k8gb-manim/blob/master/example/k8gb.gif

Topology



Clusters share common configuration and same workload applications. K8gb is not opinionated on how the config is delivered to the cluster.

Topology



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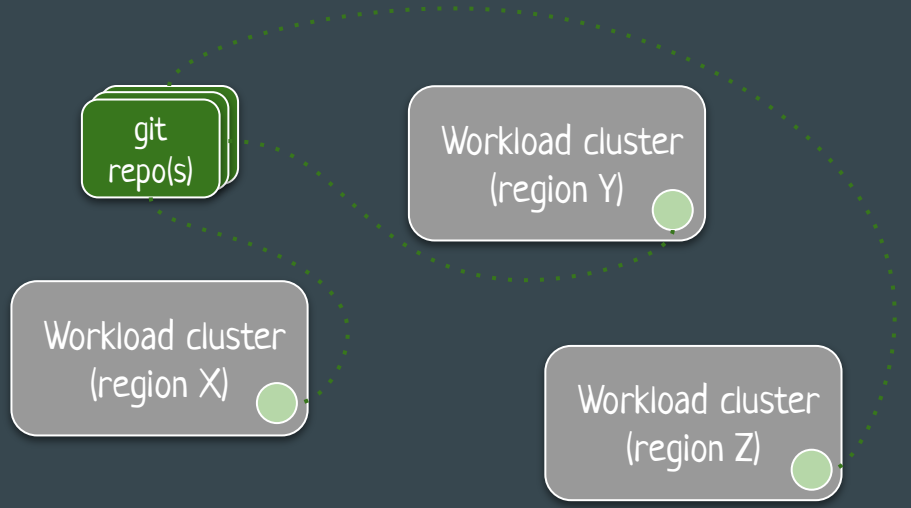
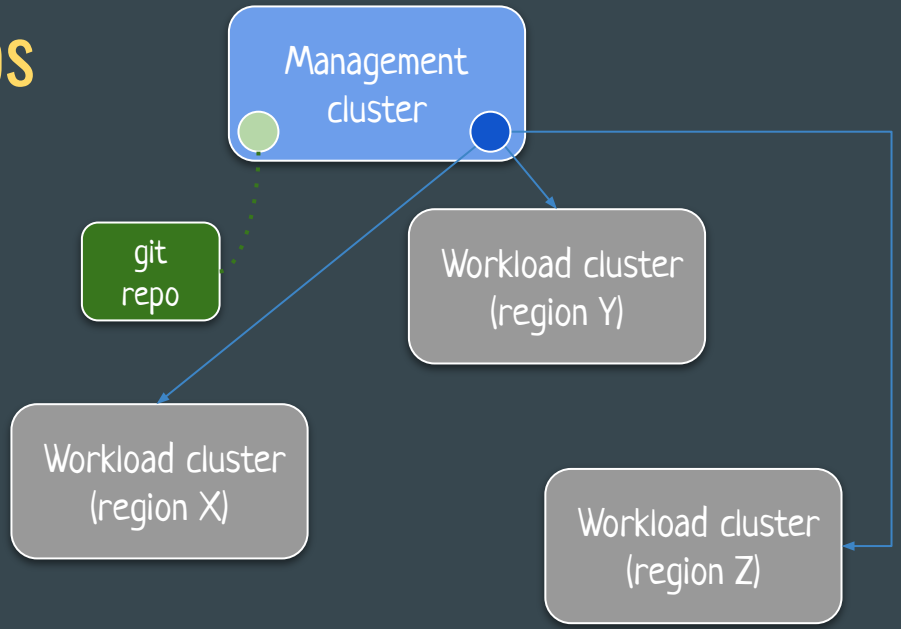
GitOps



How to address configuration drift?

GitOps



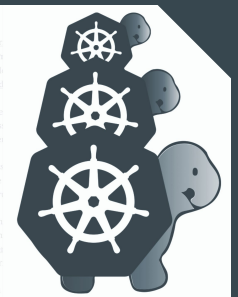
What if we want also k8s clusters as a code?

- flux/argocd
- something that can create and manage k8s clusters

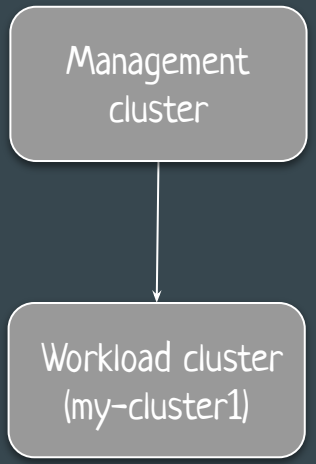
Part 2 - Cluster API “●“

```
clusterctl generate cluster my-cluster \
   --kubernetes-version v1.24.11 \
   --control-plane-machine-count=1 \
   --worker-machine-count=3 | kubectl apply -f -
```

```
~/w/example-capi-clusters master ?16 λ clusterctl describe cluster -n org-giantswarm gcapeverde
NAME                                                    READY  SEVERITY  REASON  SINCE  MESSAGE
Cluster/gcapeverde                                      True                     3d19h
├─ClusterInfrastructure - VSphereCluster/gcapeverde     True                     3d19h
├─ControlPlane - KubeadmControlPlane/gcapeverde         True                     3d19h
│ └─Machine/gcapeverde-4pl9j                            True                     3d19h
└─Workers
  └─MachineDeployment/gcapeverde-worker                 True                     3d18h
    └─3 Machines...                                     True                     3d19h  See gcapever
```

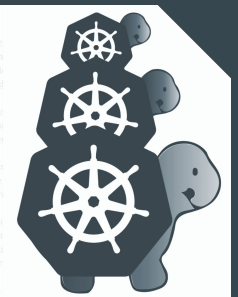


Topology

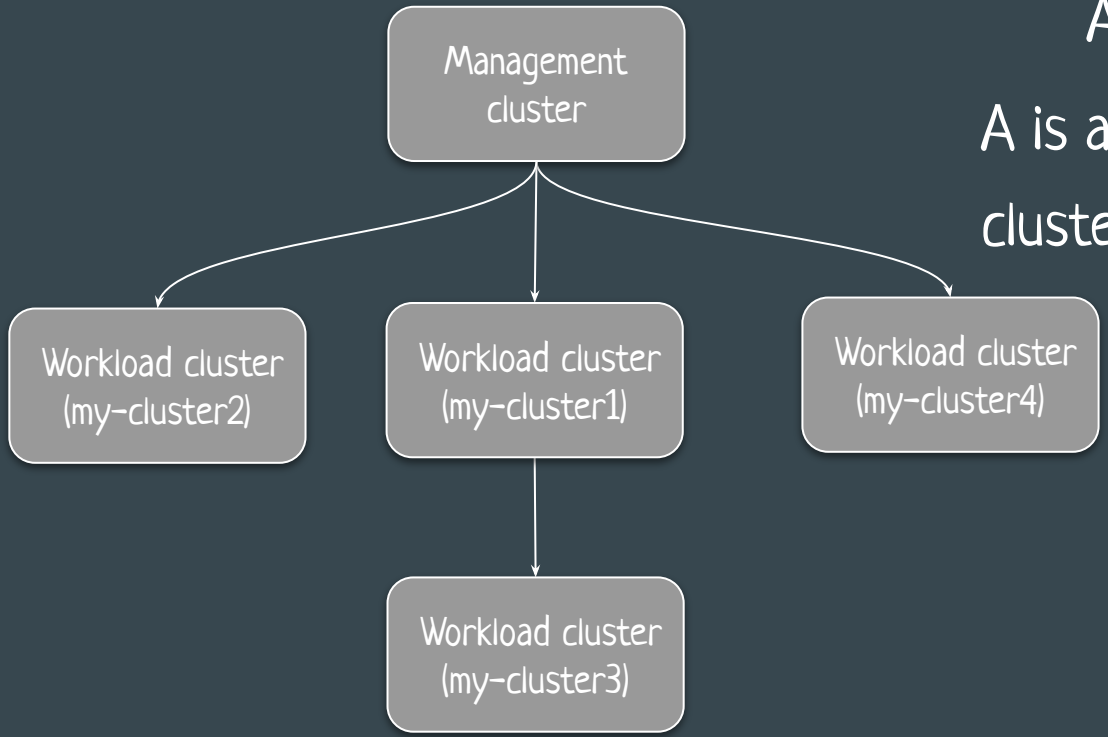


A ⟶ B

A is a management cluster for cluster B



Topology



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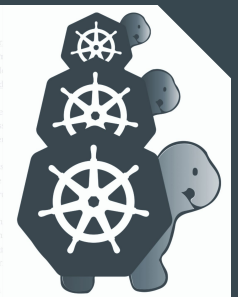
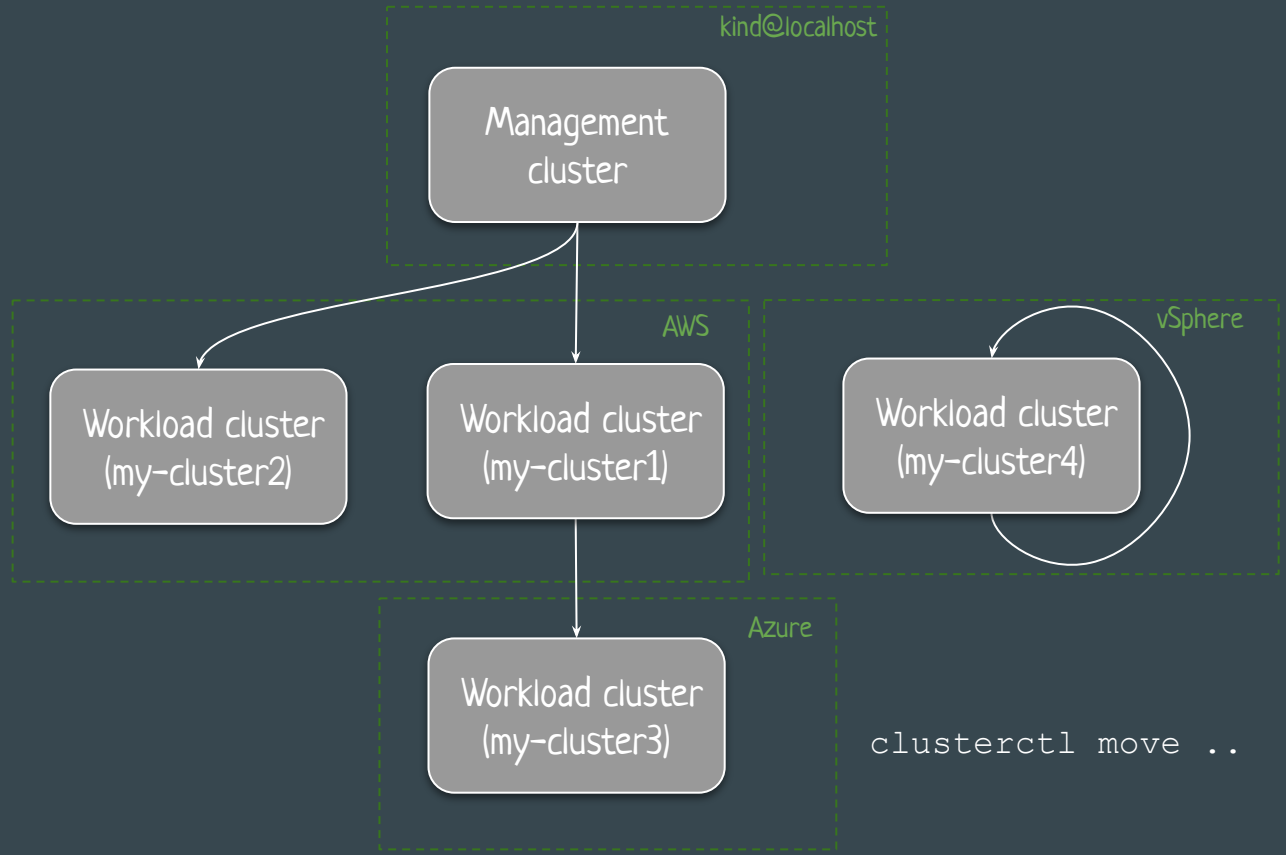
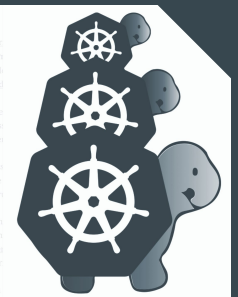


Topology


kind@localhost
Management cluster
AWS
Workload cluster (my-cluster2)
Workload cluster (my-cluster1)
vSphere
Workload cluster (my-cluster4)
Azure
Workload cluster (my-cluster3)
clusterctl move ..



Components

- Core
- Infrastructure
- Bootstrap
- Control Plane

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- Core
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controllers	CRDs
capi-controller-manager	Cluster MachineDeployment MachineHealthCheck MachinePool Machine MachineSet ClusterClass

Components

- Core
- Infrastructure
- Bootstrap
- Control Plane

VMs, Networking, security groups (aws)

let Foo ∈ {AWS, Azure, GCP, VSphere,..}

controllers	CRDs
cap{a, z, g, v, vcd, d, ..}-controller-manager	FooCluster FooMachineTemplate FooMachine FooClusterIdentity FooControlPlane FooMachinePool ...

Components

- Core
- Infrastructure
- Bootstrap
- Control Plane

controllers	CRDs
capi-kubeadm-bootstrap-controller-manager	KubeadmConfigTemplate KubeadmConfigs

Controller converts KubeadmConfig bootstrap object into a cloud-init or ignition script that is going to turn a Machine into a Kubernetes Node using kubeadm
(also MicroK8s impl, EKS, Talos)

Components

- Core
- Infrastructure
- Bootstrap
- Control Plane

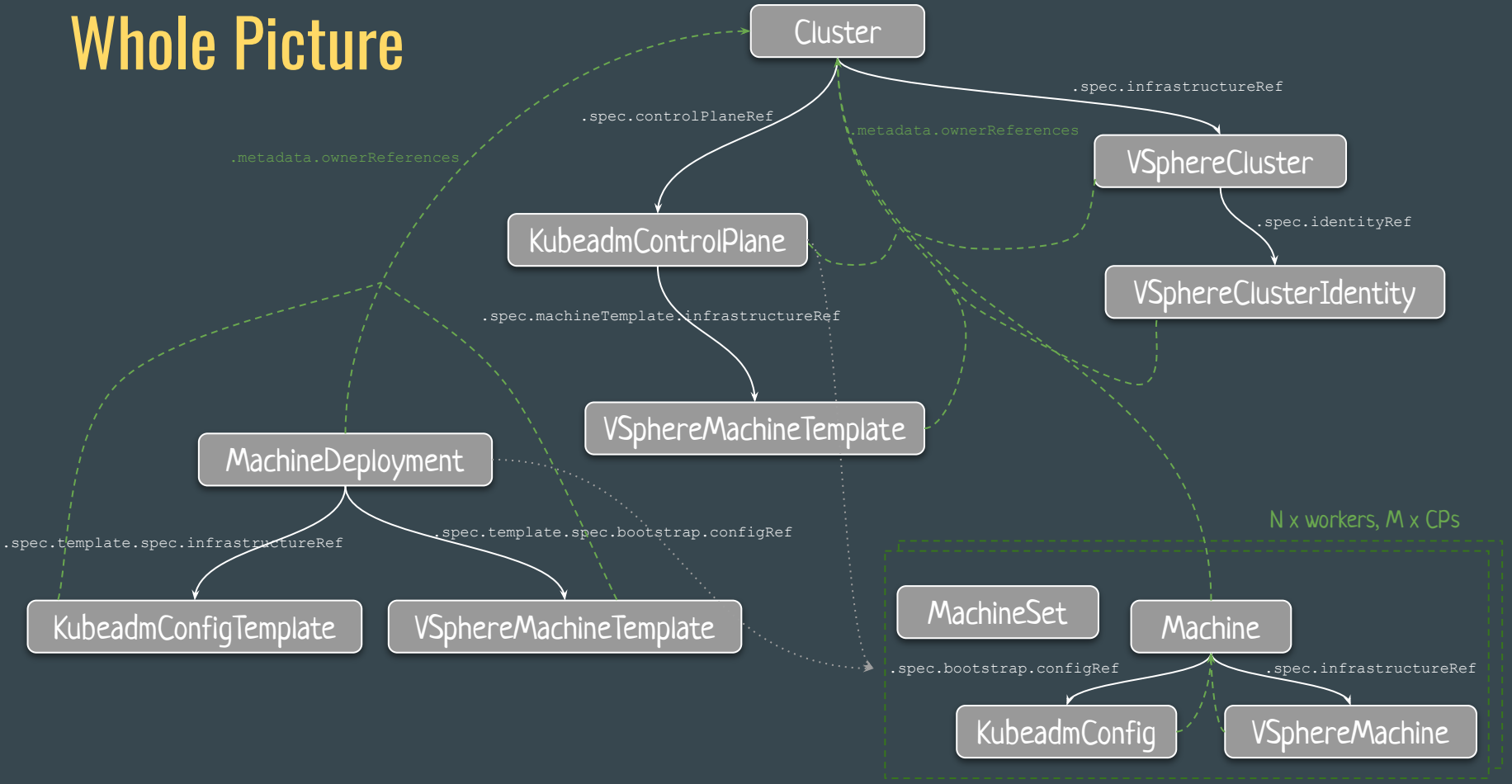
controllers	CRDs
capi-kubeadm-control-plane-controller-manager	KubeadmControlPlaneTemplate KubeadmControlPlane

etcd, coredns, image repo

KubeadmControlPlane CR has also KubeadmConfig included

(each CP is also a node)

Whole Picture



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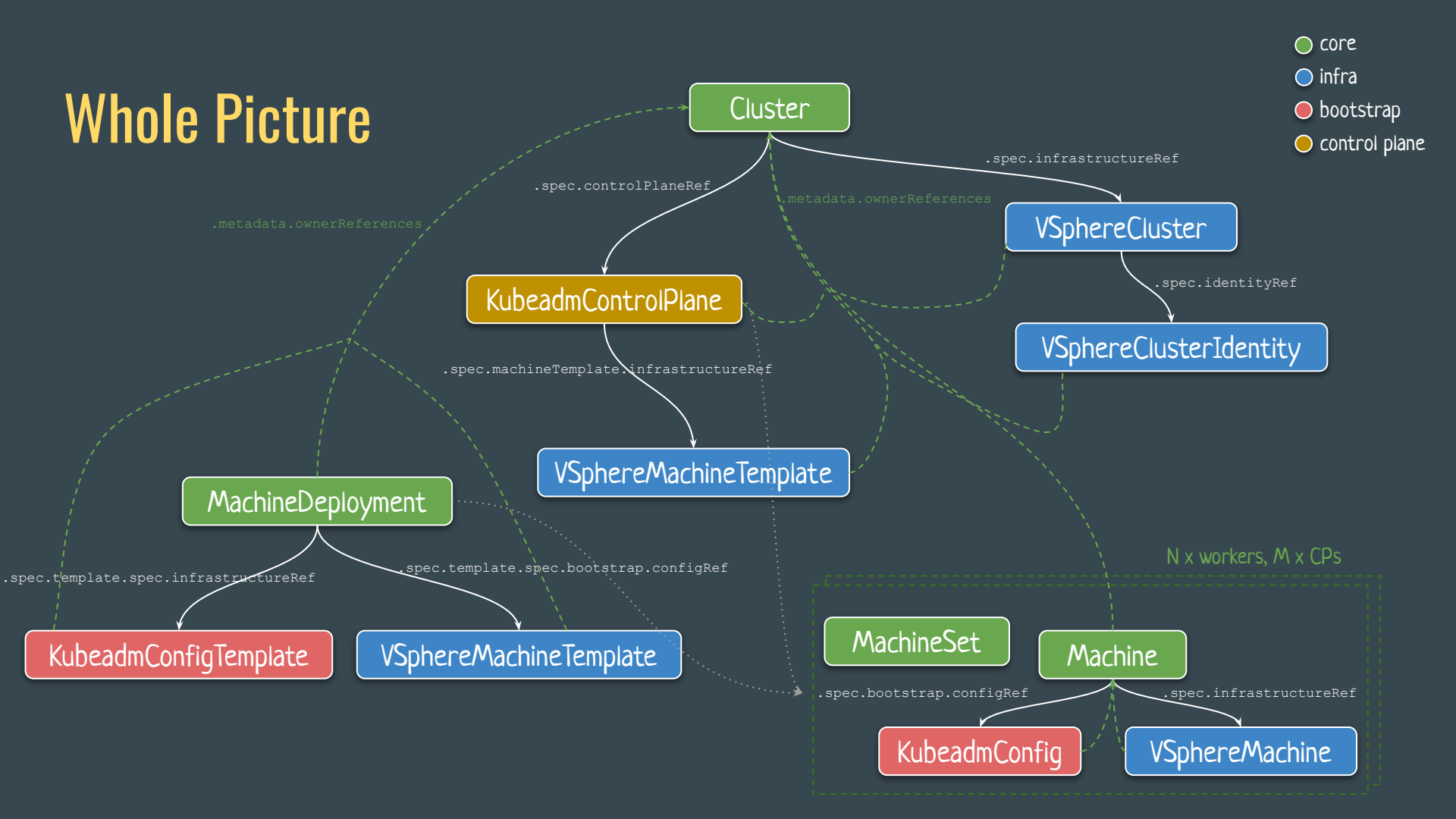

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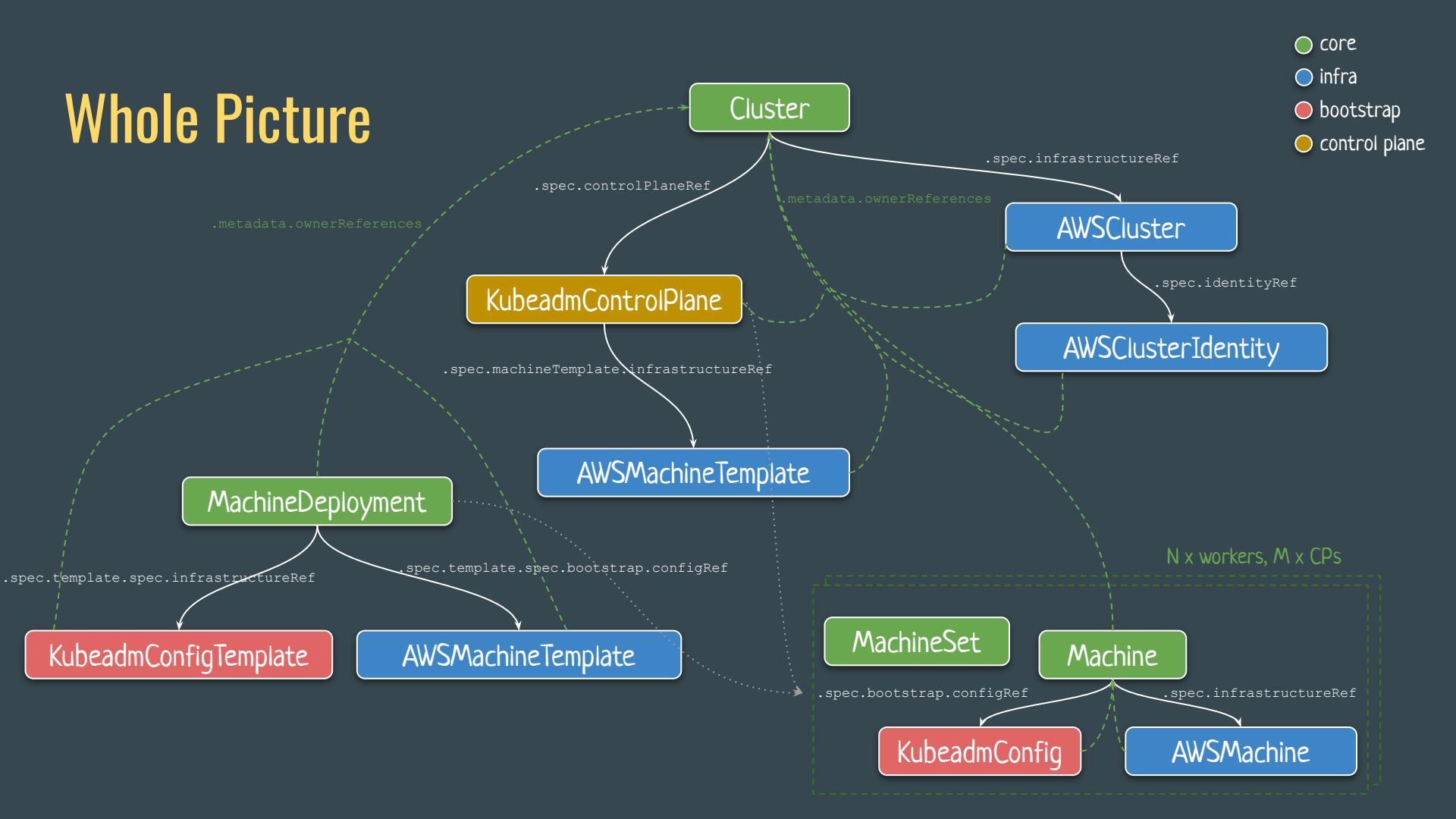

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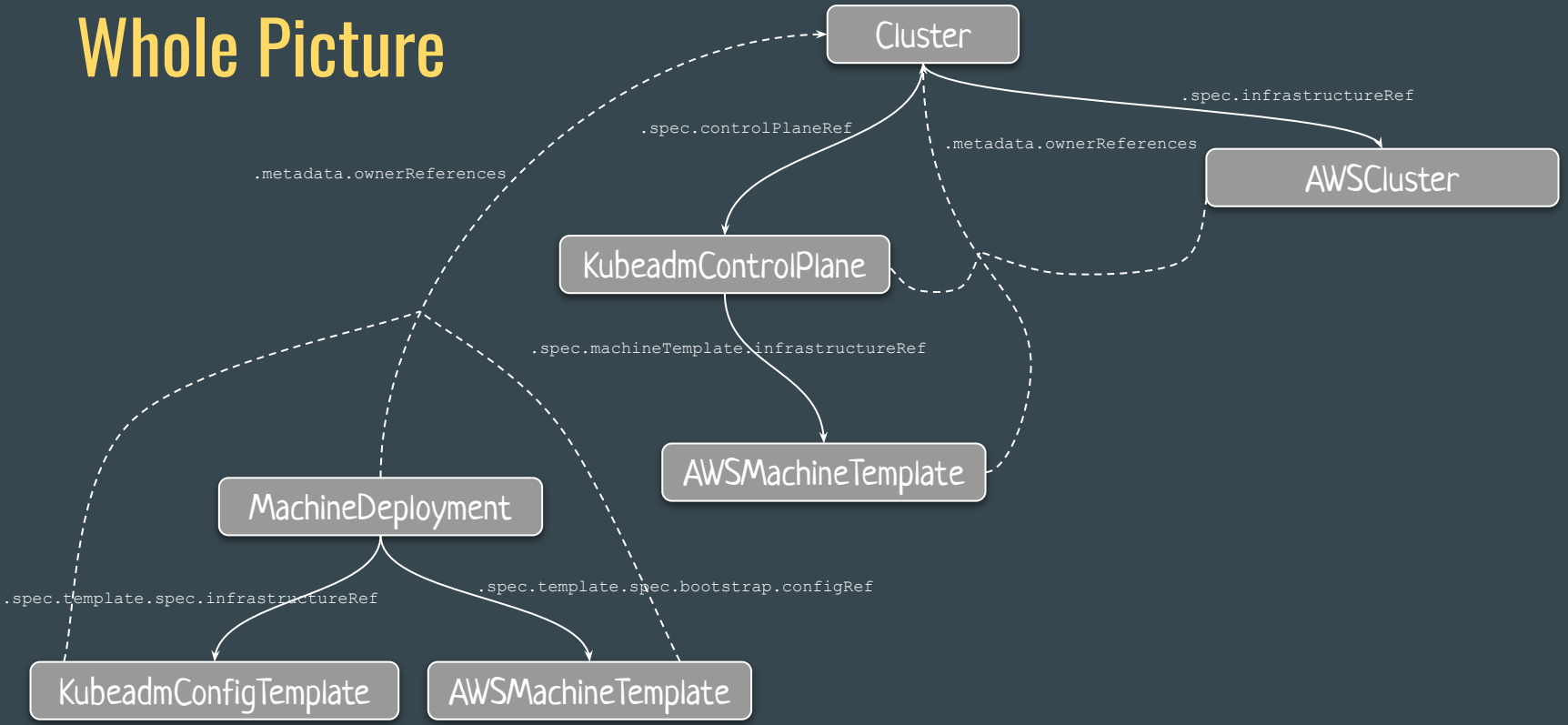

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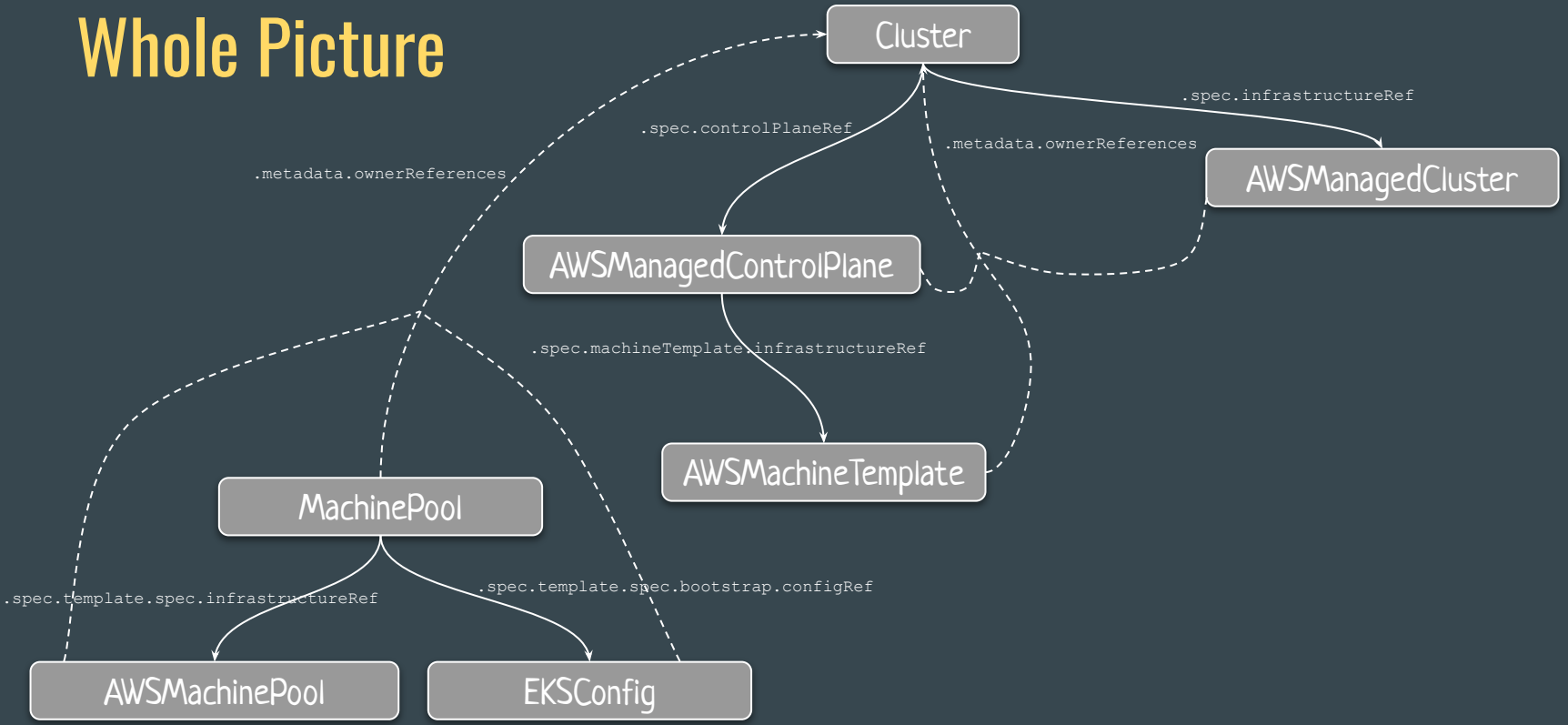
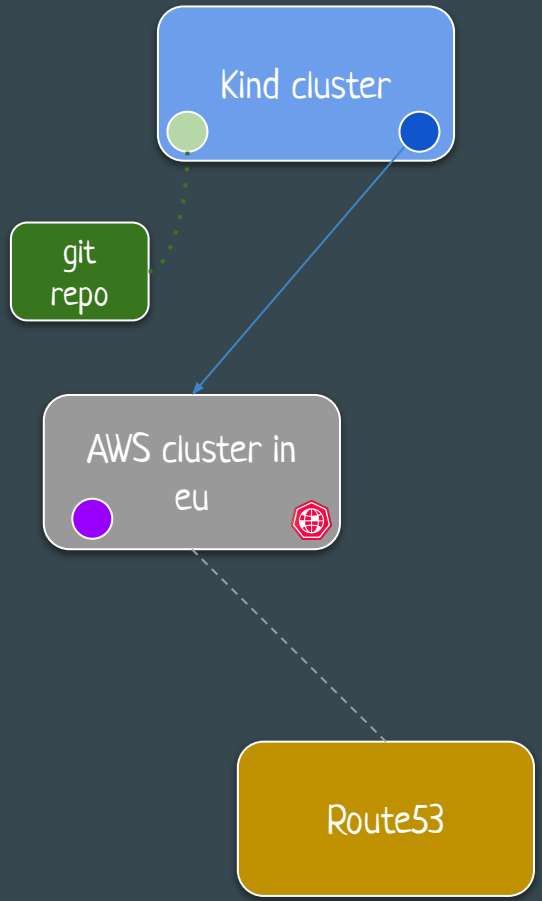


Demo

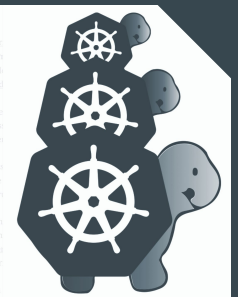
Demo



Setup

- Argo CD
- ClusterAPI
- example app
- k8gb

..then we merged a pr



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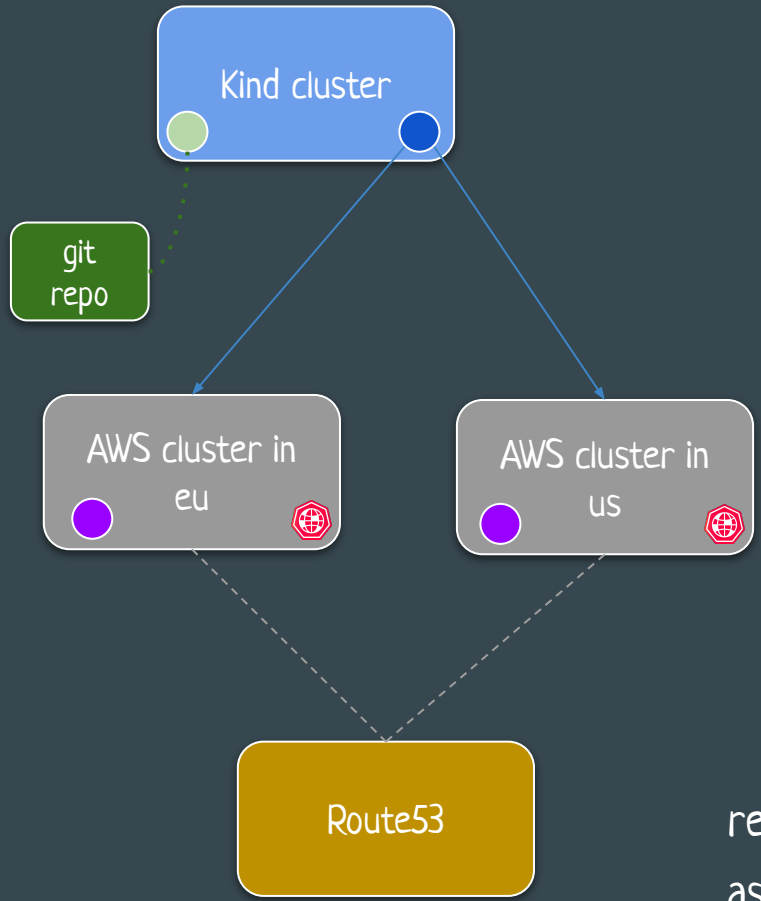
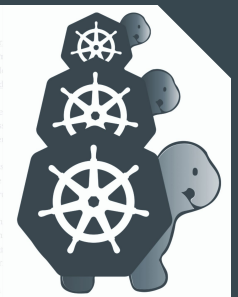


What happened?

1. Merged PR with new cluster
2. k8s cluster was created
3. c{n,s,p}i was installed
4. k8gb was installed and configured
5. example app and nginx was installed

repo: jkremser/fosdemo-clusters

ascii recording



What's there (by CAPI)

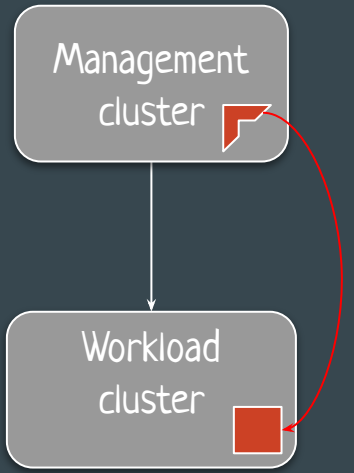
- control plane for other clusters
- scaling (nodes)
- cluster updates (k8s version)
- infrastructure as code

What's also there (bring your own YAMLs)

- CNI (Container Network Interface) - Cilium
- CSI (Container Storage Interface) - aws-ebs-csi-driver
- CPI (Cloud Provider Interface) - AWS' cloud-controller-manager
- global load balancing using k8gb
- nginx as ingress controller
- app

Content Delivery

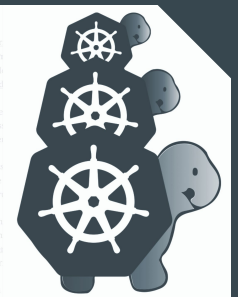
- CAPI + ClusterResourceSet
- cluster-api-addon-provider-helm + HelmChartProxy
- Flux + HelmRelease
- secrets? (SOPS, Vault CSI / agents)
- operator in MC doing something to WCs -> custom



How to start

- CAPD
  a. create local cluster with Kind
  b. `clusterctl init --infrastructure docker`
  c. `clusterctl generate cluster foo | k apply -f -`

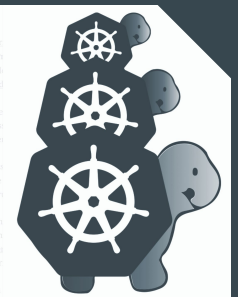
- k8gb - local playground setup described at k8gb.io



Takeaways

- k8gb and other distributed systems that require similar configuration across multiple clusters fits well with CAPI

- we achieved real high availability as code



Thank You!

Q&A

bit.ly/k8gb-capi

jiri.kremser@gmail.com