



Interoperability of Open-Source Tools:

The Emergence of Interfaces



@k_gamanji



katie-gamanji



Katie Gamanji

Cloud Platform Engineer

@American Express



@k_gamanji



katie-gamanji



Katie Gamanji

Cloud Platform Engineer

@American Express

Technical Oversight Committee

@CNCF



@k_gamanji



katie-gamanji



Interoperability of Open-Source Tools:

The Emergence of Interfaces

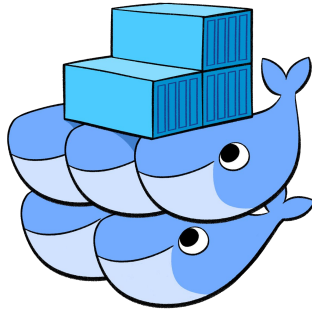


@k_gamanji



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Container Orchestrators



docker
SWARM

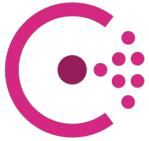


Apache
MESOS[™]



kubernetes





gRPC





CLOUD NATIVE Landscape





The Practical Past



The Innovation Wave



Emergence of Interfaces



The Practical Past



The Innovation Wave



Emergence of Interfaces



The Practical Past



The Innovation Wave



Emergence of Interfaces



58%

—
Production
Systems



2K

—
Contributors



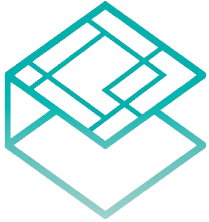
23K

—
KubeCon
Attendees

The Practical Past



The Practical Past



CNI

Container Network Interface



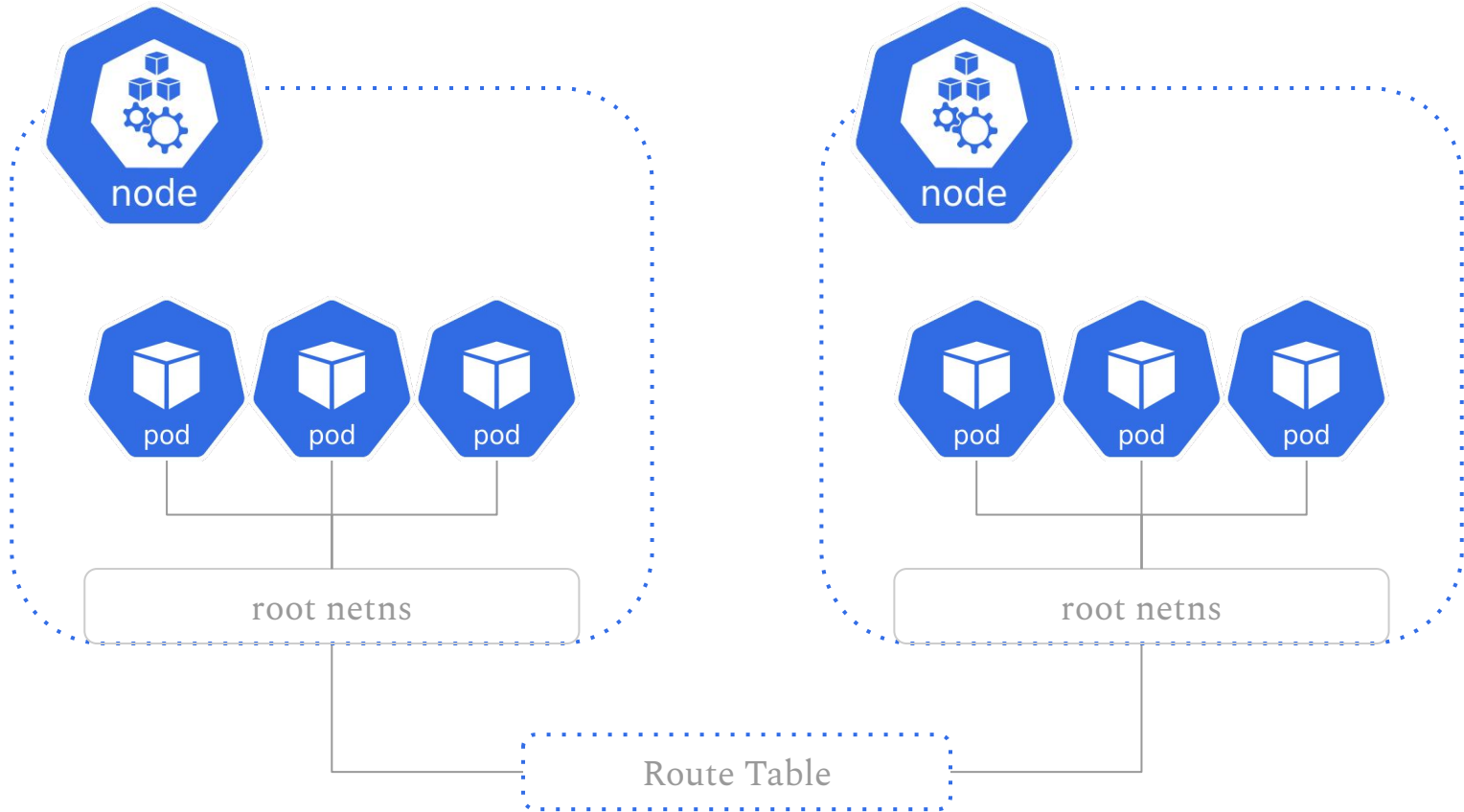
CRI

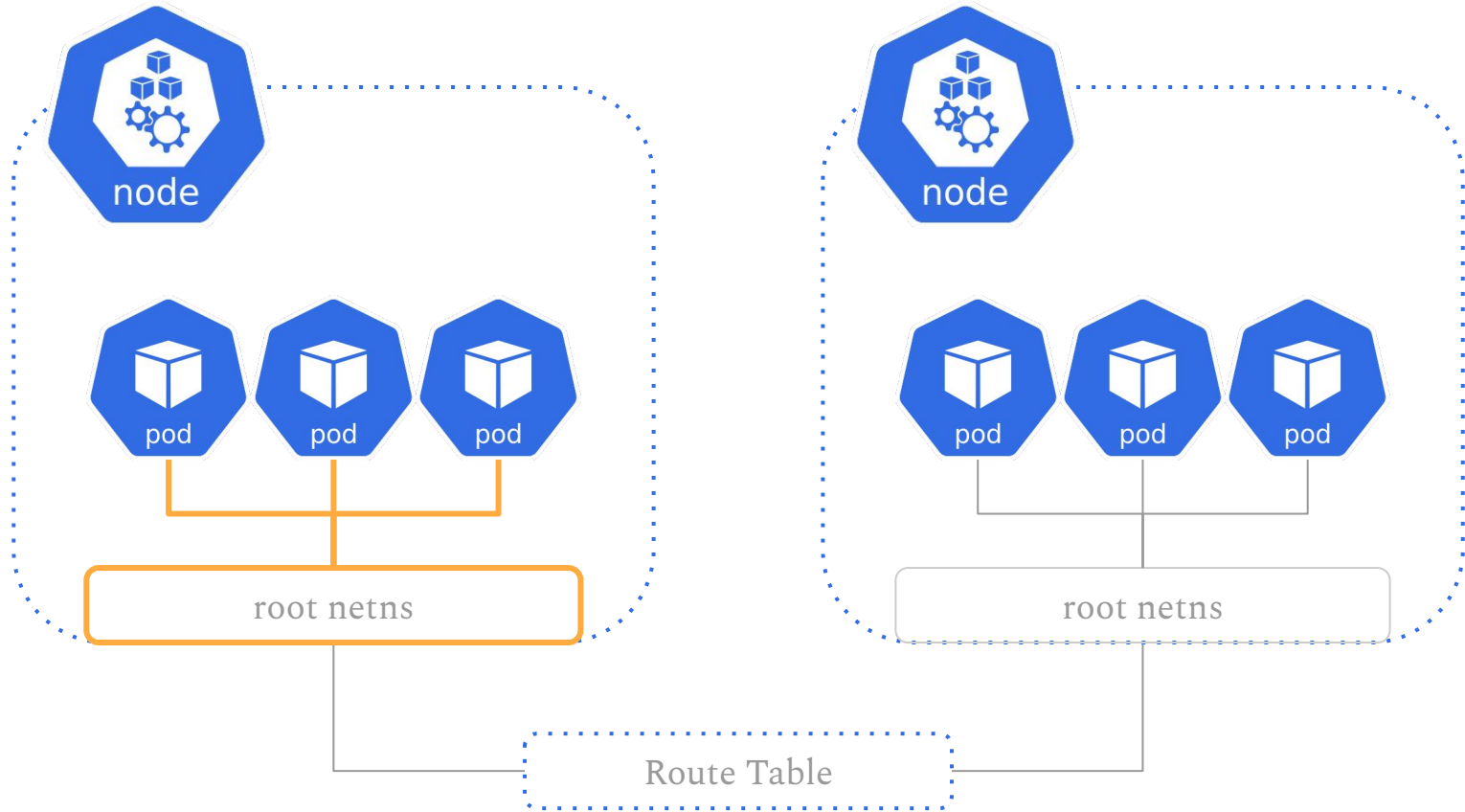
Container Runtime Interface

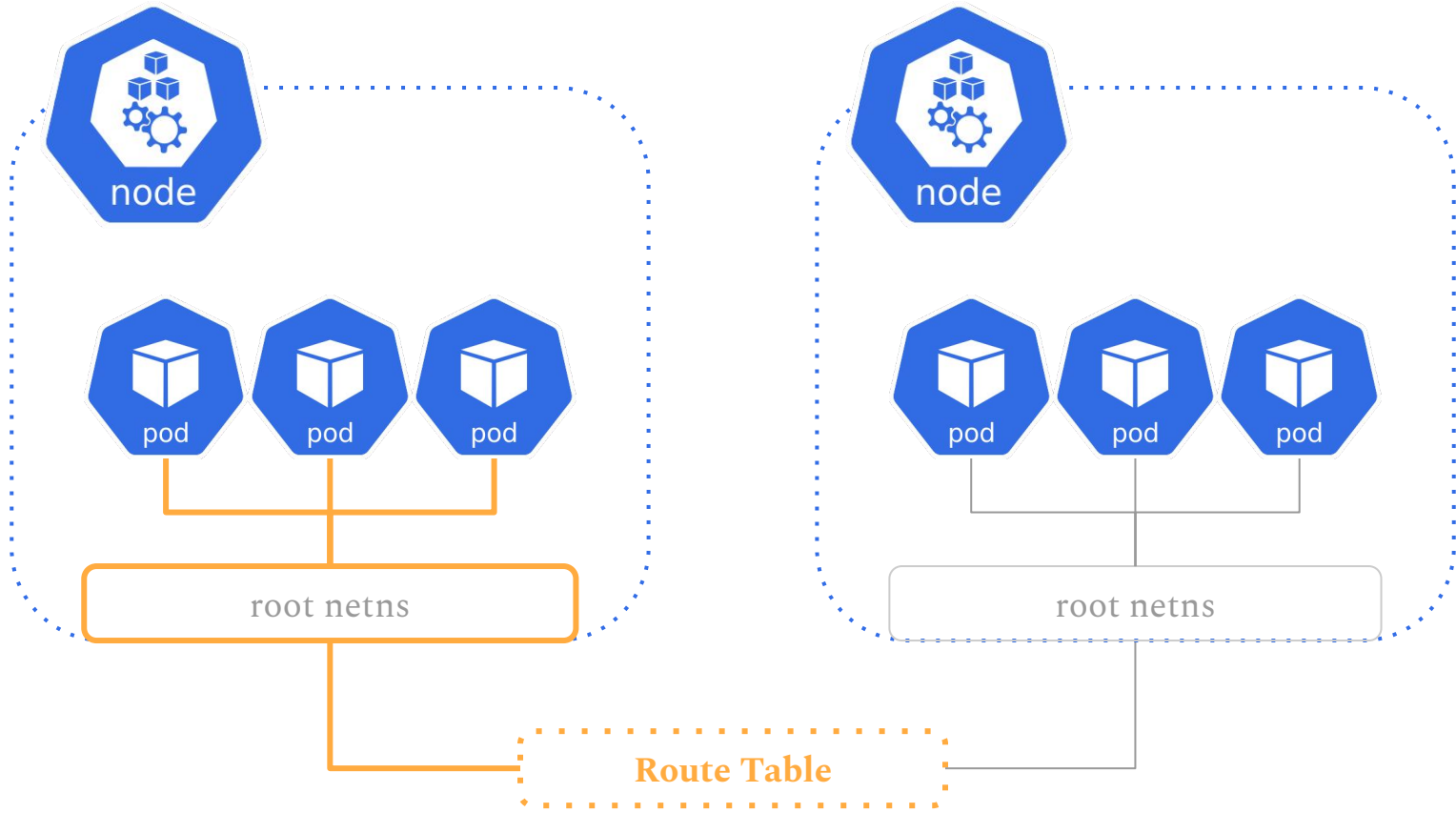
CNI

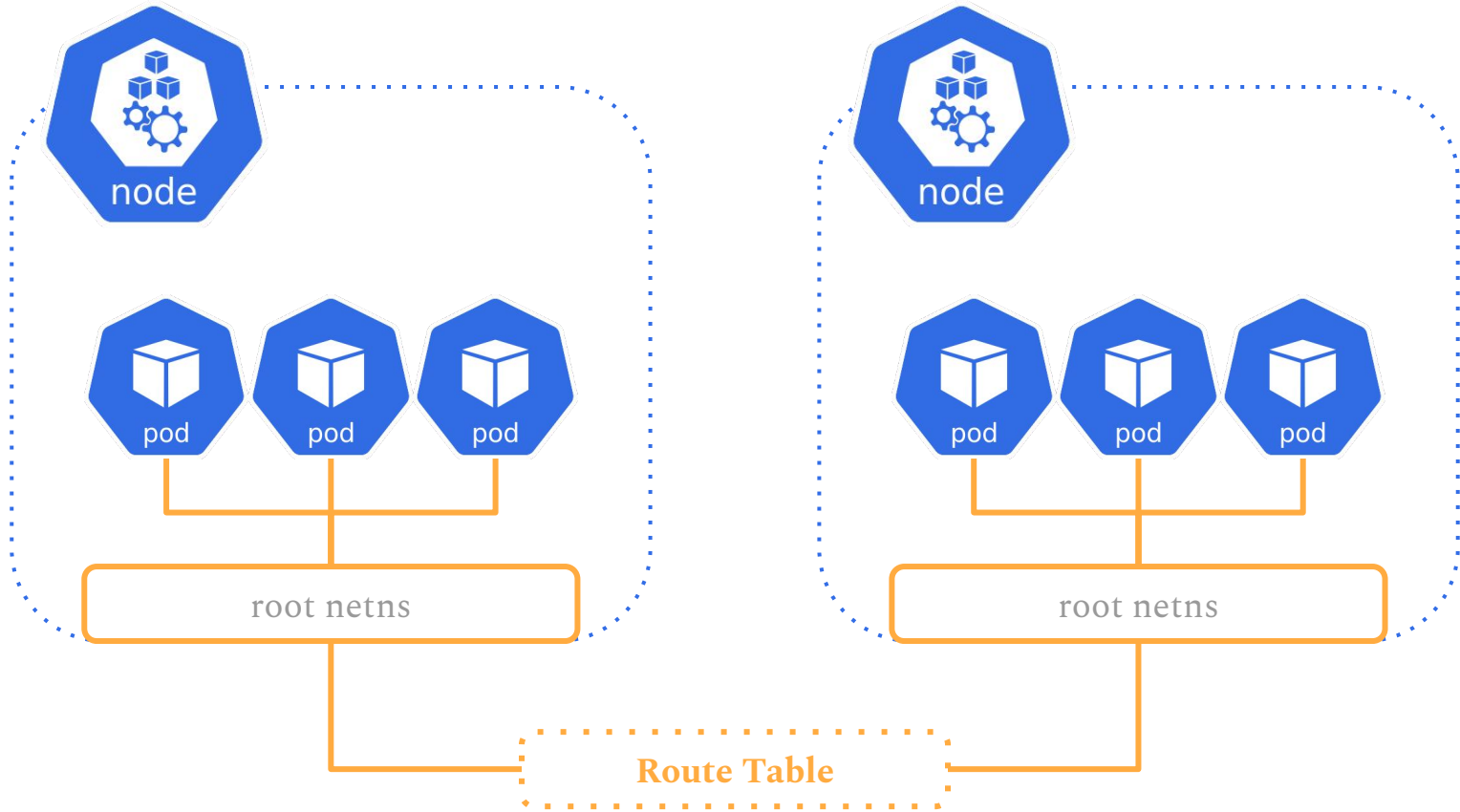
Container Network Interface

Each pod has a unique IP









CNI

“

Provides only network connectivity of containers and removes allocated resources on container deletion.

”



CNI

Container Network Interface



CALICO



flannel



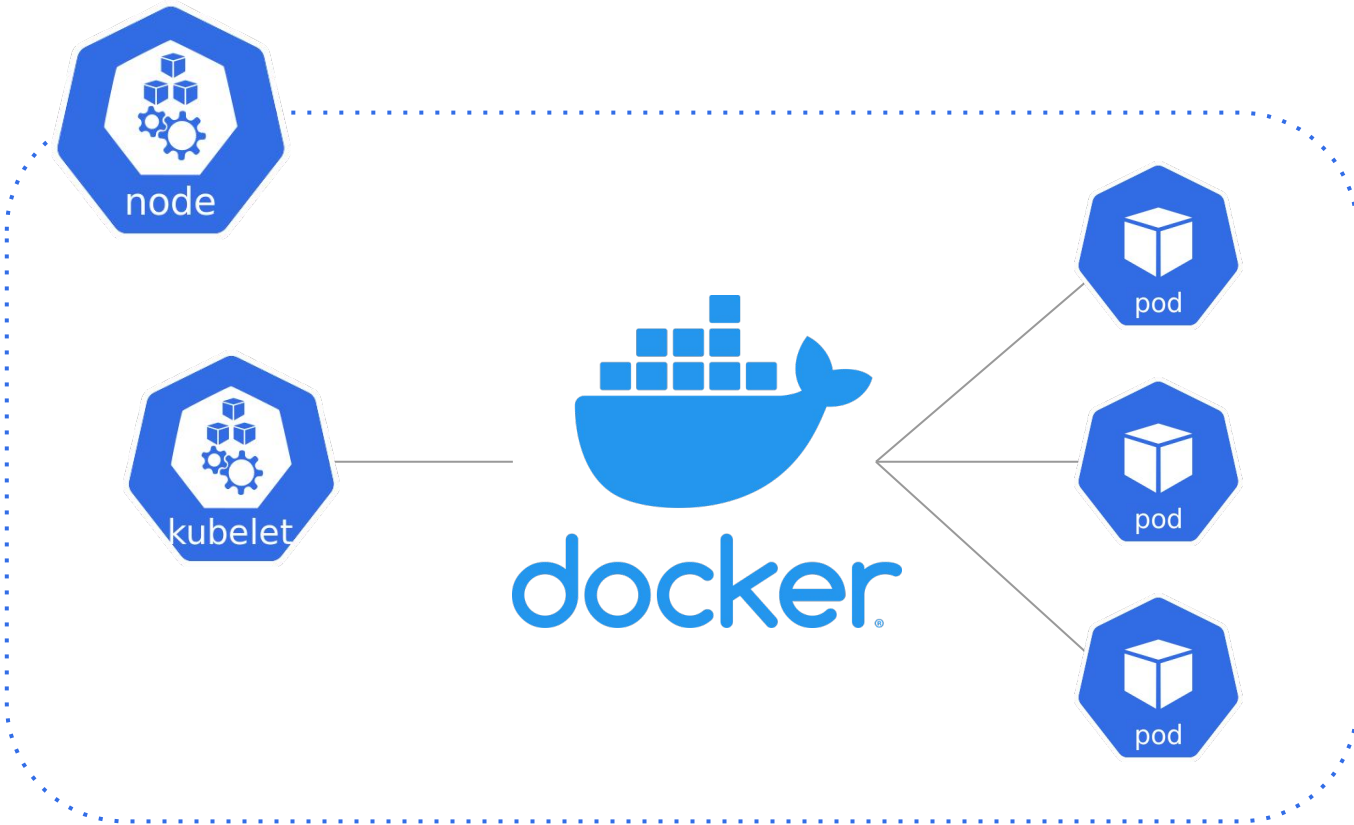
cilium

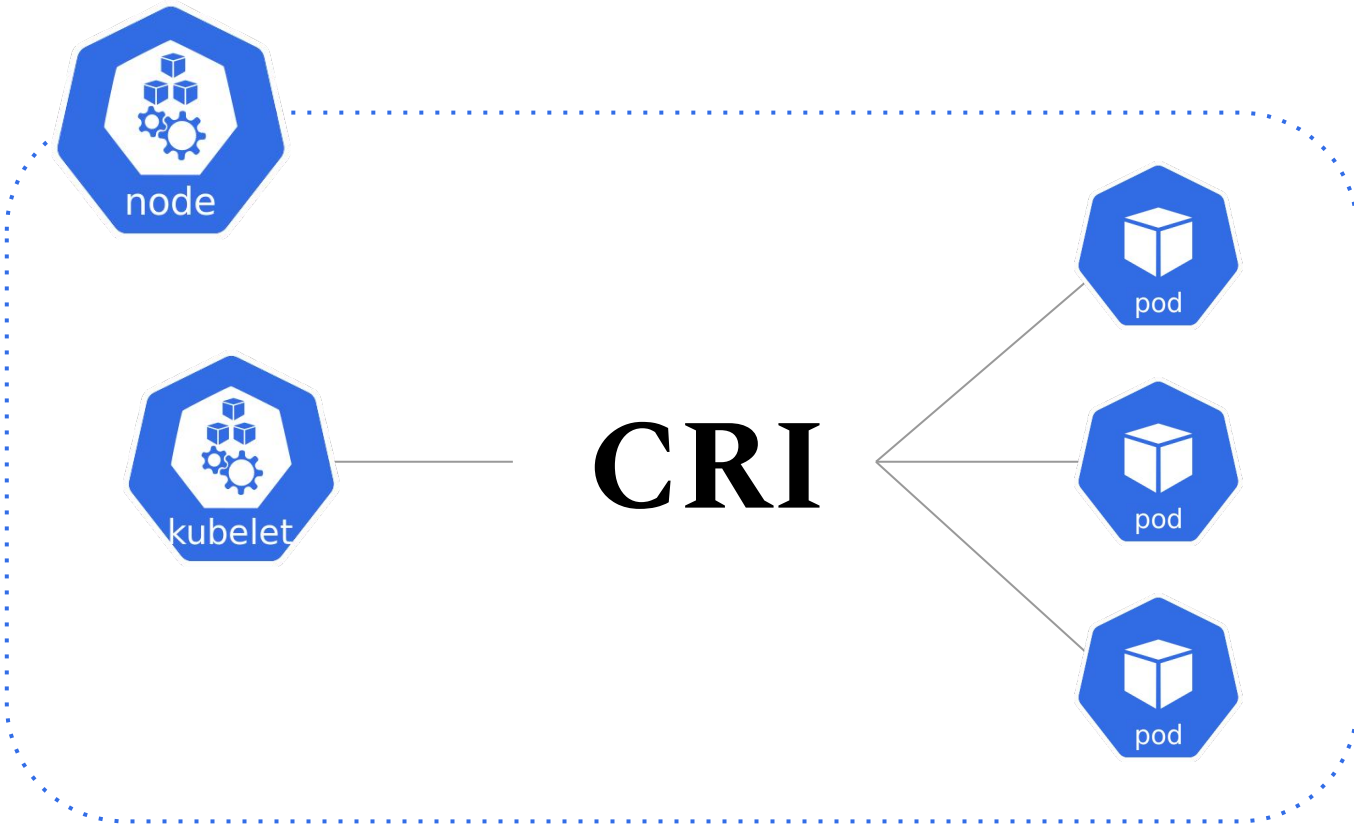


weave
net

CRI

Container Runtime Interface





CRI

“ Provides an abstraction layer over
the integration of container
runtimes (inc. Docker) ”



CRI

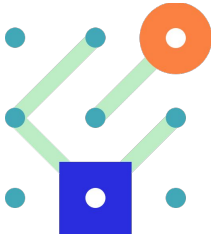
Container Runtime Interface



The Innovation Wave



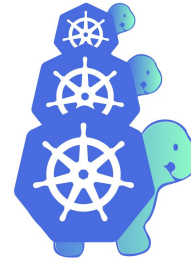
The Innovation Wave



SMI
Service Mesh Interface



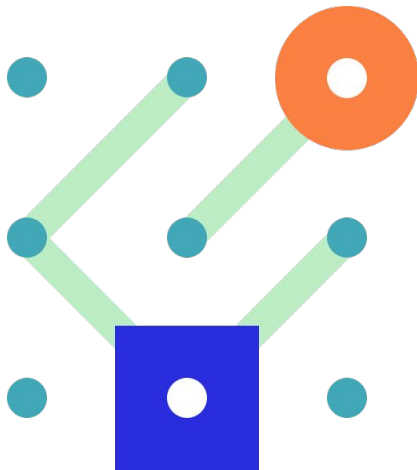
CSI
Container Storage Interface



ClusterAPI
Cluster Provisioning

SMI

Service Mesh Interface

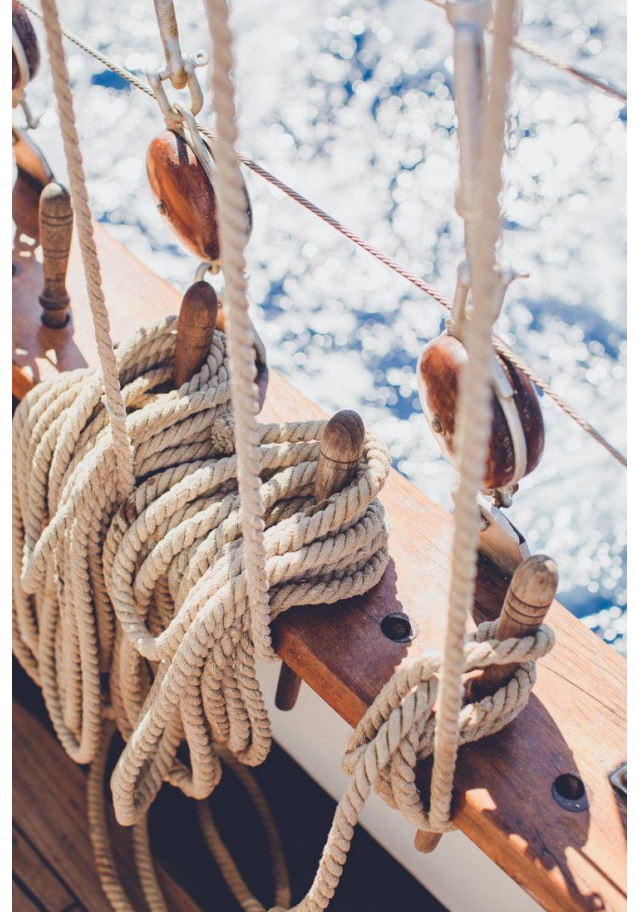


Service Mesh

“

Dedicated infrastructure layer that manages service-to-service traffic within a distributed environment.

”



SMI

Service Mesh Interface

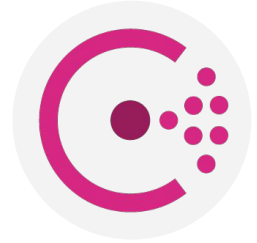
- Traffic policy
- Traffic telemetry
- Traffic management

SMI

Service Mesh Interface



Istio



HashiCorp

Consul



linkerd

CSI

Container Storage Interface

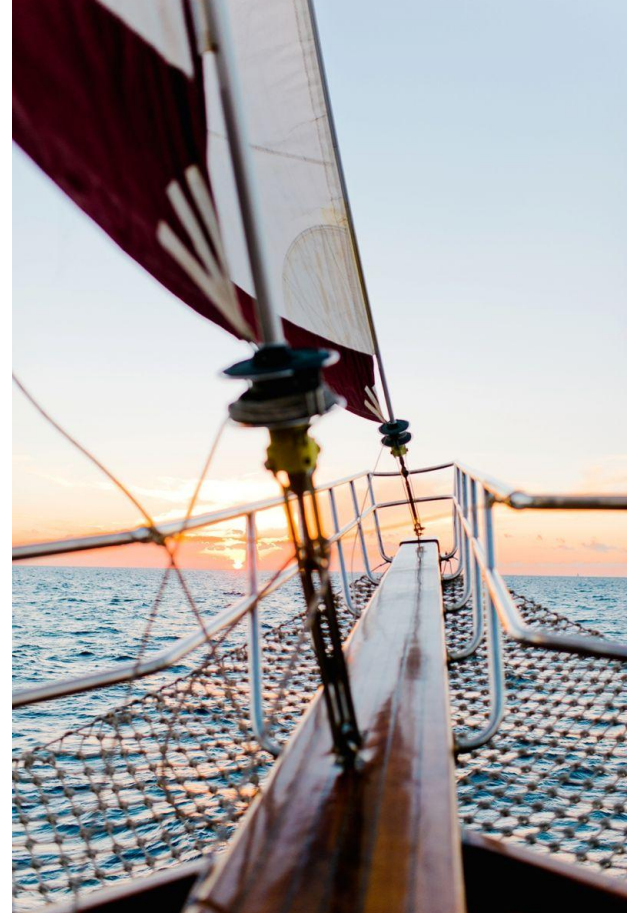


CSI

“

Promotes a pluggable interface for application to consume external storage providers.

”

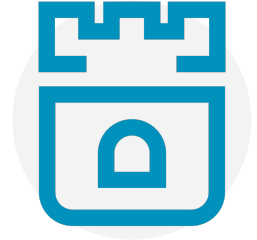


CSI

Container Storage Interface



STORAGEOS



ROOK



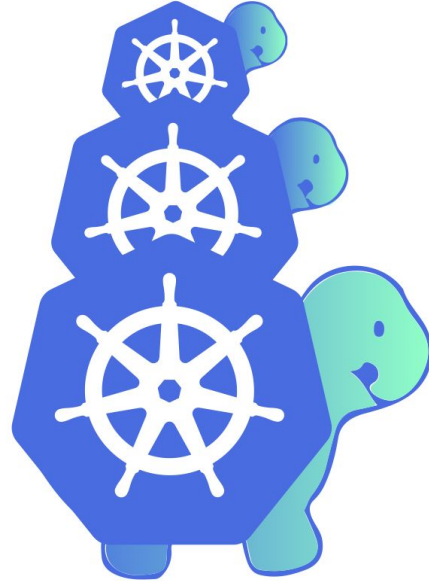
ceph



OpenEBS

ClusterAPI

Cluster Provisioning



Bootstrap Tools



kubeadm



KUBESPRAY



kops



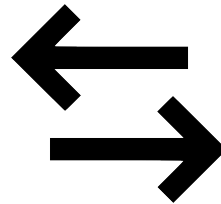
TECTONIC

Challenges

Bootstrap Providers



Cross-cloud



Tool migration



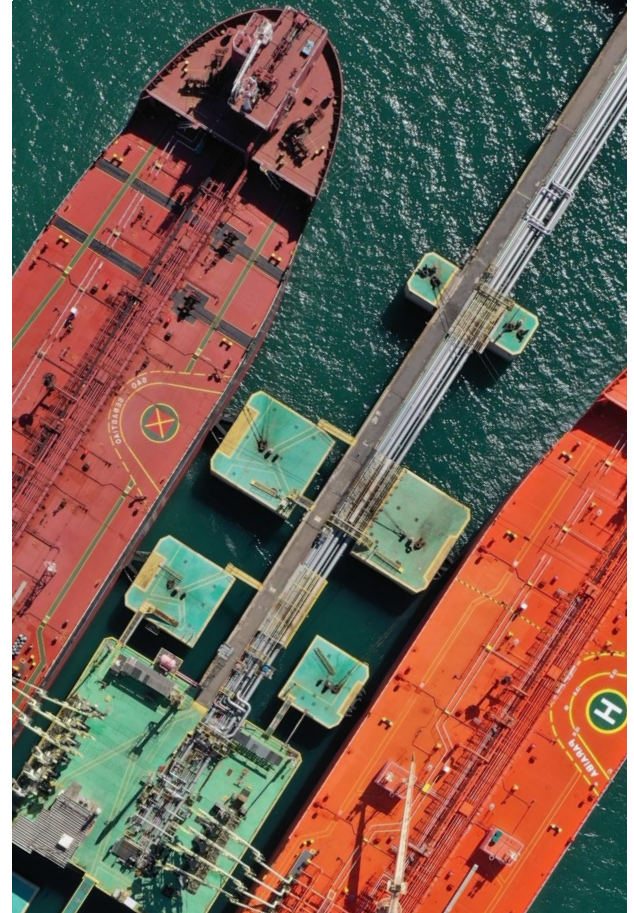
China & Russia

Cluster API

“

Provision of declarative APIs for cluster creation, configuration, and management.

”



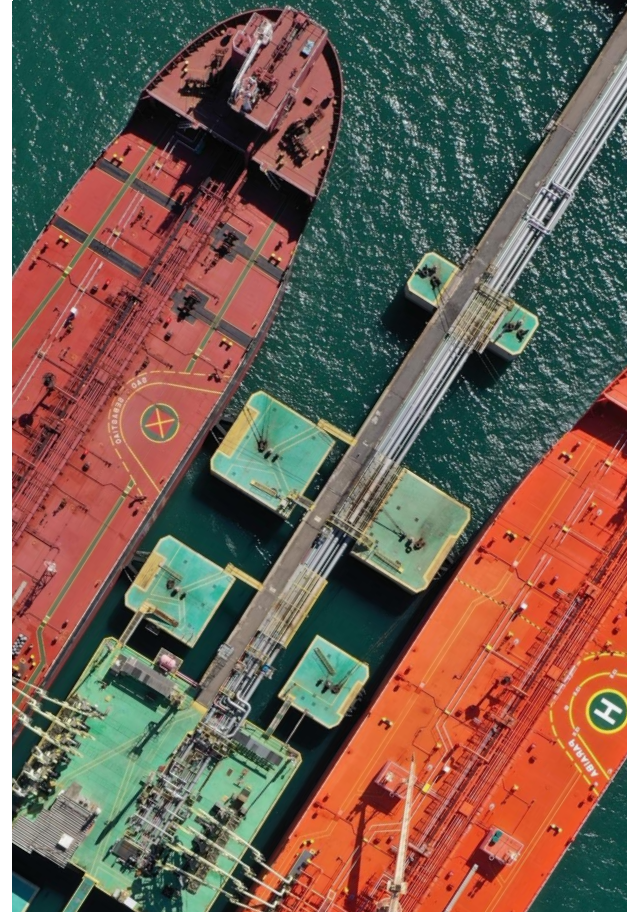
ClusterAPI

SIG-cluster-lifecycle:

- Initial release: April 2019
- API: **v1alpha2**

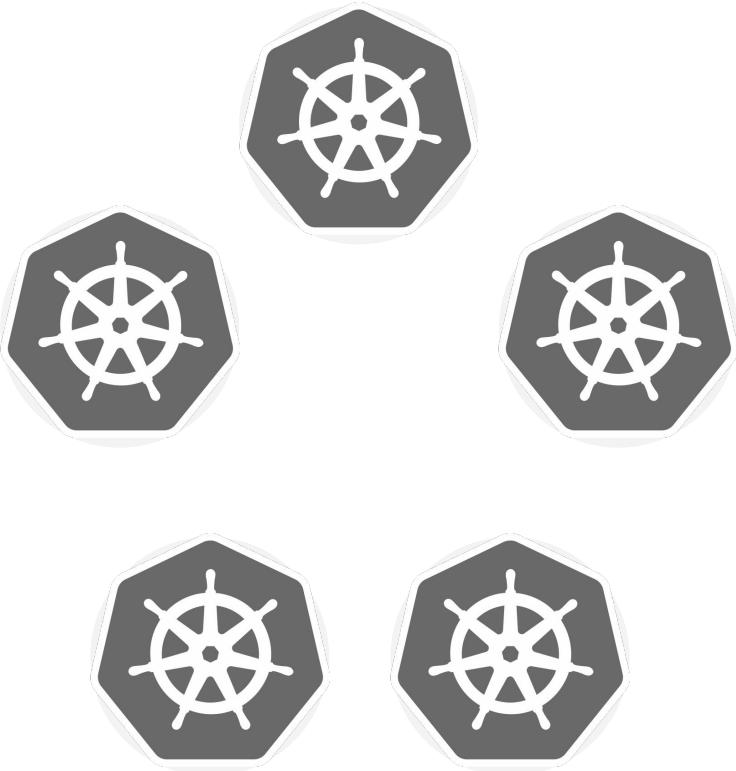


Google Cloud



1 / 4

—

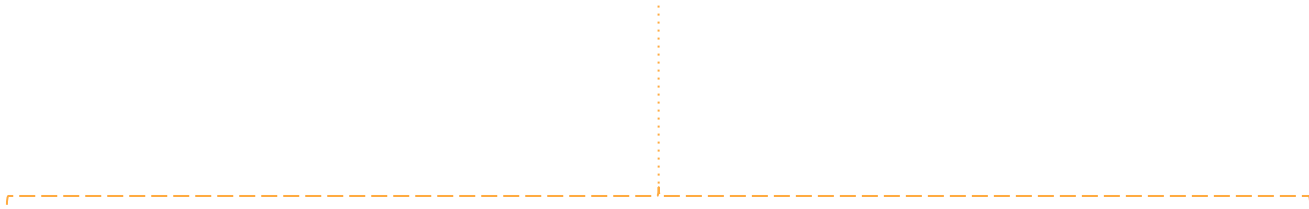


Management cluster

2 / 4



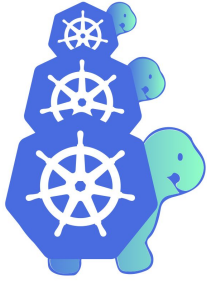
Controller managers



Target clusters

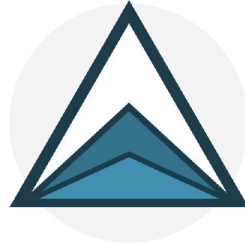
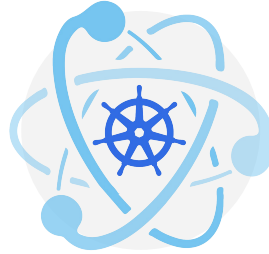
3 / 4: Controller Managers

—



ClusterAPI
CRDs

+



Bootstrap
Providers

+



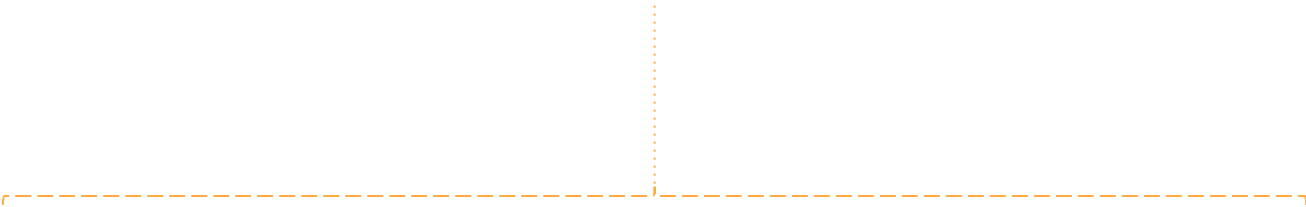
Infrastructure
Providers

Management cluster

4 / 4



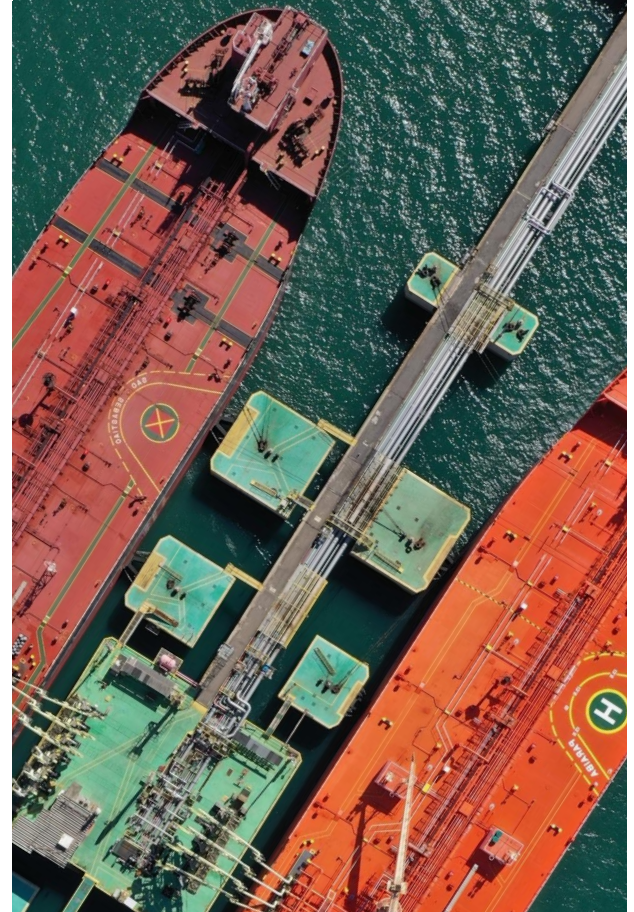
Controller managers



Target clusters

ClusterAPI CRDs

- **Cluster**
 - CIDRs for pods and services + DNS suffix
- **Machine**
 - kubelet and control plane versions
- **MachineSet**
- **MachineDeployment**





KUBESPRAY

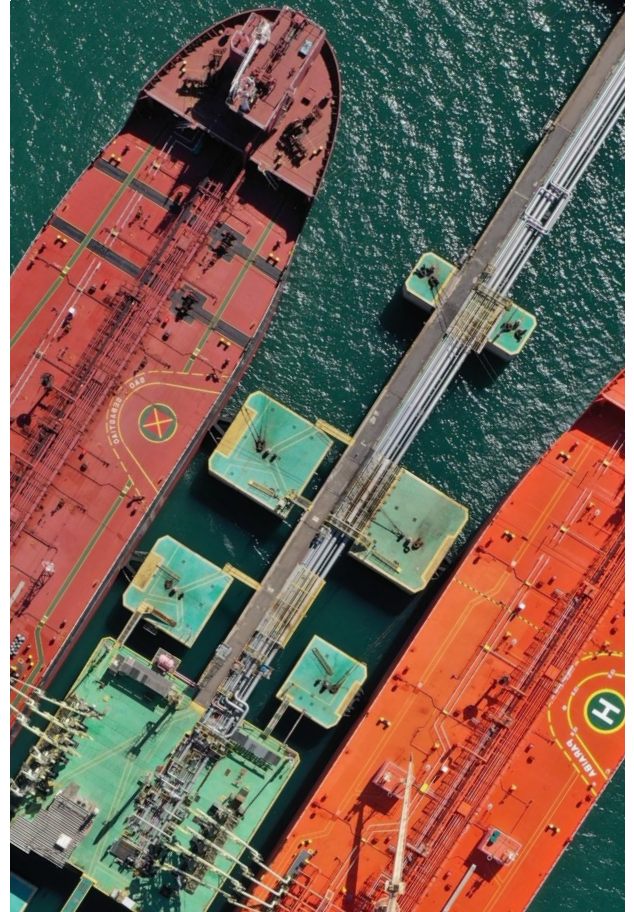
```

|— bastion-ssh-config
|   |— tasks
|   └─ templates
|— bootstrap-os
|   |— defaults
|   |— files
|   └─ tasks
|— container-engine
|   |— containerd
|   |— cri-o
|   |— docker
|   |— docker-storage
|   └─ meta
|— etcd
|   |— defaults
|   |— handlers
|   |— meta
|   |— tasks
|   └─ templates
|— kubernetes
|   |— client
|   |— kubeadm
|   |— master
|   |— node
|   |— node-label
|   |— preinstall
|   └─ tokens
|— kubernetes-apps
|   |— ansible
|   |— cloud_controller
|   |— cluster_roles
|   └─
|— container_engine_accelerator
|   |— csi_driver
|   |— external_provisioner
|   |— helm
|   |— ingress_controller
|   └─ meta
|— metrics_server
|— network_plugin
|— persistent_volumes
|— policy_controller
|— registry
|   └─ rotate_tokens
|— kubespray-defaults
|   |— defaults
|   |— meta
|   └─ tasks
|— network_plugin
|   |— calico
|   |— canal
|   |— cilium
|   |— cloud
|   |— cni
|   |— flannel
|   |— kube-router
|   └─ [...]

```

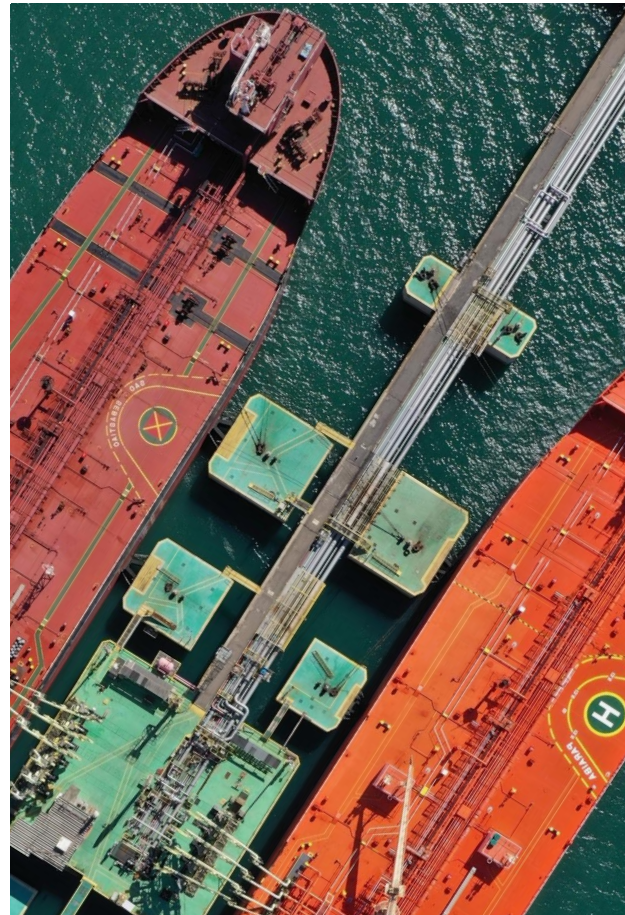


```
apiVersion: ${{ v1alpha2 }}
kind: Cluster
metadata:
  name: test-cluster
spec:
  clusterNetwork:
    pods:
      cidrBlocks: ["192.168.0.0/16"]
  infrastructureRef:
    apiVersion: ${{ v1alpha2 }}
    kind: AWSCluster
    name: test-cluster
```





```
apiVersion: ${{ v1alpha2 }}
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  name: test-cluster
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  infrastructureRef:
    apiVersion: ${{ v1alpha2 }}
    kind: AWSCluster
    name: test-cluster
```

```
apiVersion: ${{ v1alpha2 }}
kind: AWSCluster
metadata:
  name: test-cluster
spec:
  region: eu-central-1
  sshKeyName: default
```



```
apiVersion: ${{ v1alpha2 }}
kind: Cluster
metadata:
  name: test-cluster
spec:
  clusterNetwork:
    pods:
      cidrBlocks: ["192.168.0.0/16"]
  infrastructureRef:
    apiVersion: ${{ v1alpha2 }}
    kind: GCPCluster
    name: test-cluster
```

```
apiVersion: ${{ v1alpha2 }}
kind: GCPCluster
metadata:
  name: test-cluster
spec:
  region: europe-west3
  project: CAPI
  network:
    name: default-capi
```

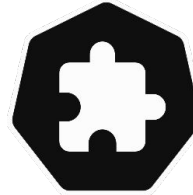


```
apiVersion: ${ v1alpha2 }}
kind: Cluster
metadata:
  name: test-cluster
spec:
  clusterNetwork:
    pods:
      cidrBlocks: ["192.168.0.0/16"]
  infrastructureRef:
    apiVersion: ${ v1alpha2 }}
    kind: AzureCluster
    name: test-cluster
```

```
apiVersion: ${ v1alpha2 }}
kind: AzureCluster
metadata:
  name: test-cluster
spec:
  location: westeurope
  networkSpec:
    vnet:
      name: default-capi
  resourceGroup: capi
```

ClusterAPI

Takeaways



Building blocks



Cloud agnostic



Experimental

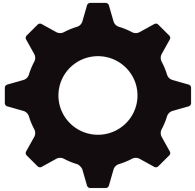
Emergence of Interfaces



Non-opinionated

The Perspective

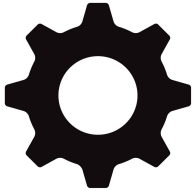
The Perspective



Innovation

Vendors

The Perspective



Innovation

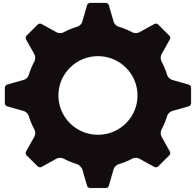
Vendors



Extensibility

End users

The Perspective



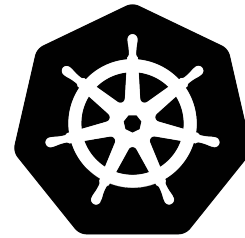
Innovation

Vendors



Extensibility

End users



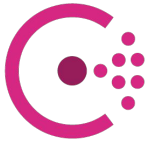
Interoperability

Community





CLOUD NATIVE Landscape





The Practical Past



The Innovation Wave



Emergence of Interfaces

Emergence of Interfaces

“

The central engine of
innovation,
which anchors extensibility
by embracing contrasting
solutions.

”



Resources

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