

Kubernetes Lifecycle Management with Cluster API (v1alpha3)

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Open Source Enthusiast
Open Source Contributor (JHipster)
Love Travel & Photography



@humourmind  

In the beginning...



Kubernetes Distributions and Installers



82

What is a Kubernetes Cluster?

- **Infrastructure**
 - Networking
 - Firewall Rules
 - Servers
 - Load balancer
- **Kubernetes components**
- **Add-ons**
 - Disaster recovery (Velero)
 - Ingress (Contour, Gimbal)
 - Registry (Harbor)
 - Conformance (Sonobuoy)
- **User Apps**

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Kubernetes Components

- Container runtime
- kubelet
- etcd
- kube-apiserver
- kube-scheduler
- kube-controller-manager
- kube-proxy
- CNI provider
- CoreDNS

Kubernetes Components: Bootstrapping?

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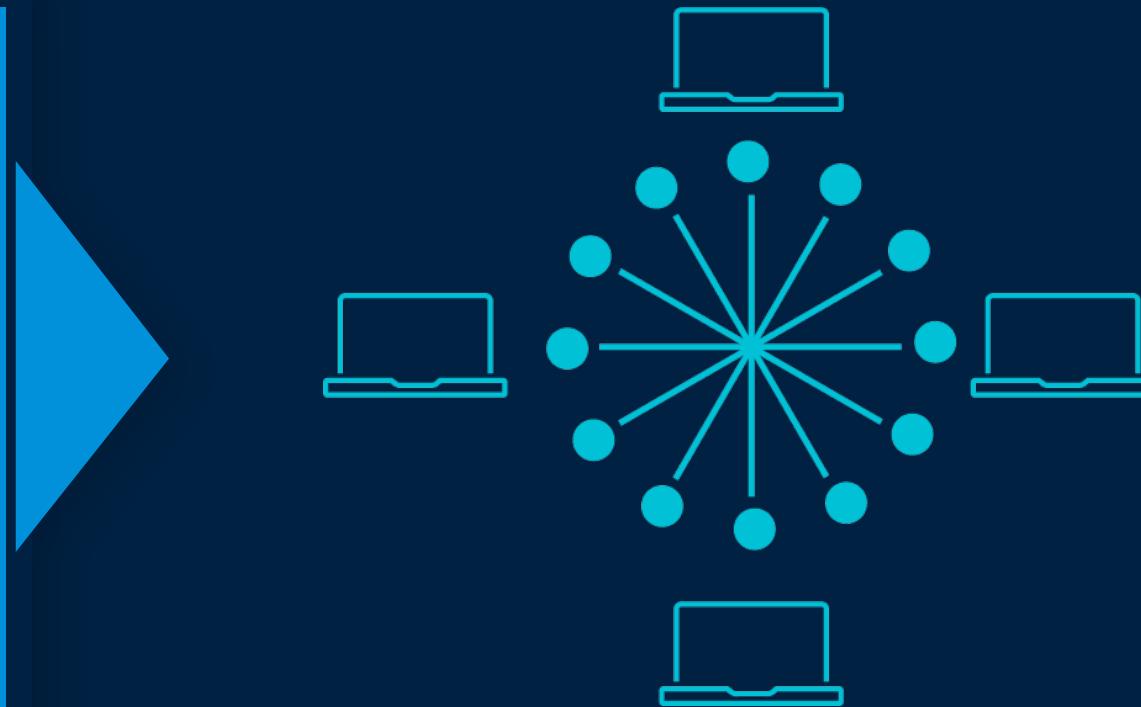




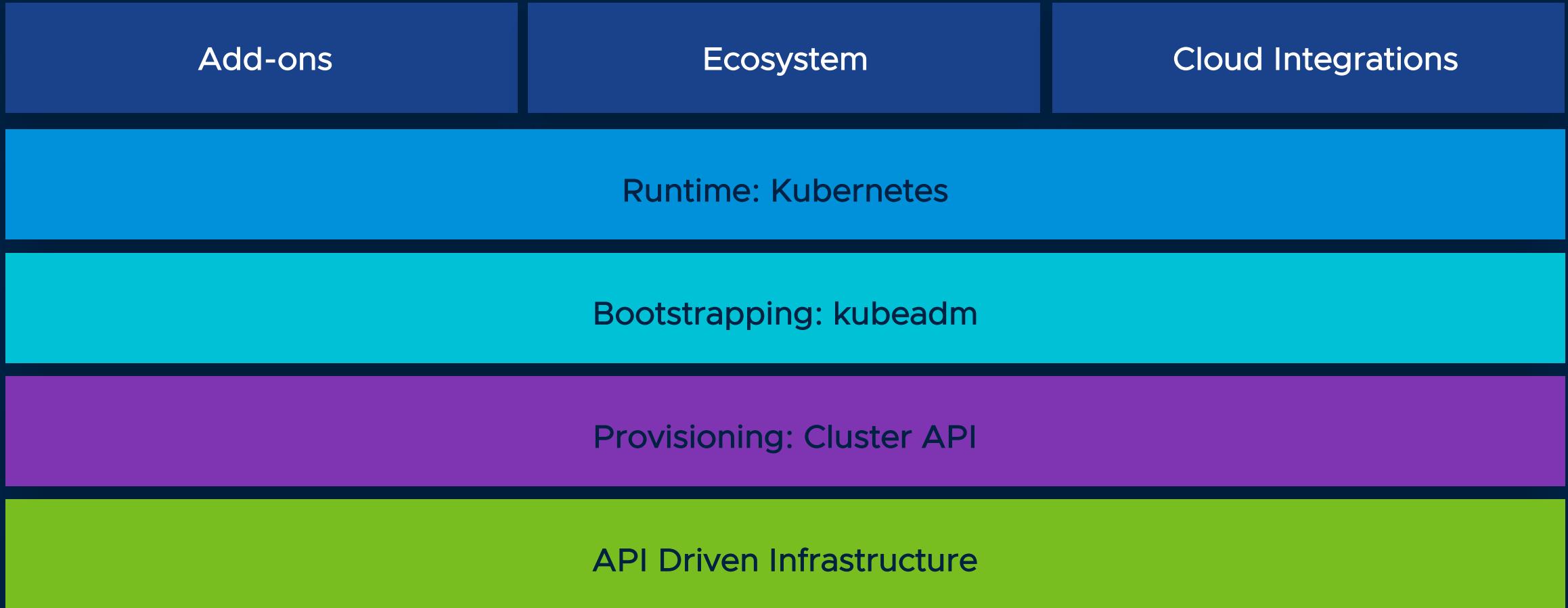
Consistent Kubernetes cluster bootstrapping

Kubernetes Cluster: Provisioning?

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Kubernetes in Layers





Cluster API

Declarative lifecycle management
of Kubernetes Clusters

Cluster API

12 SIG sponsored infrastructure provider implementations



sigs.k8s.io/cluster-api/#provider-implementations

Cluster API

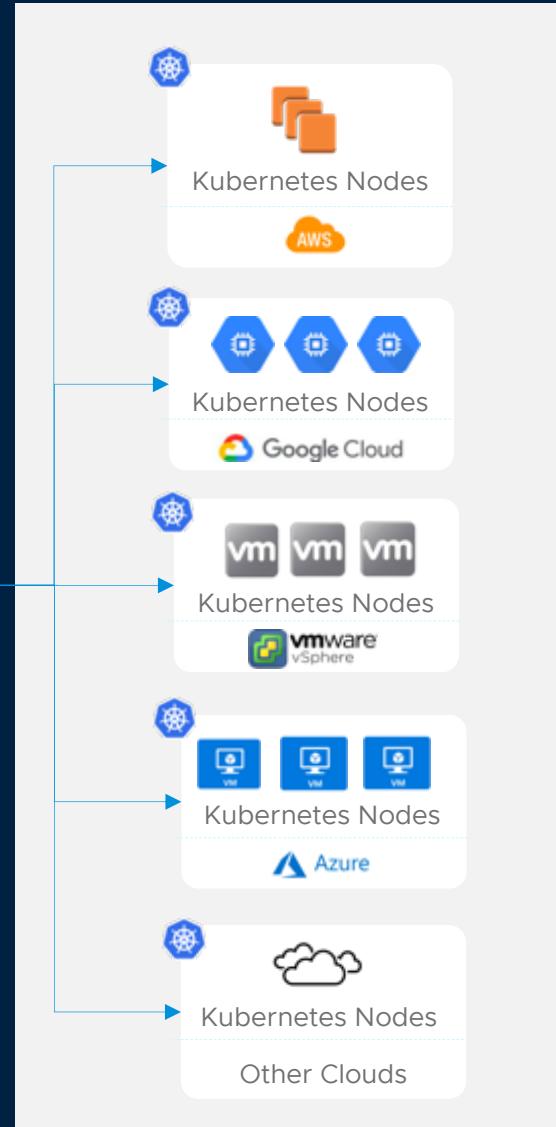
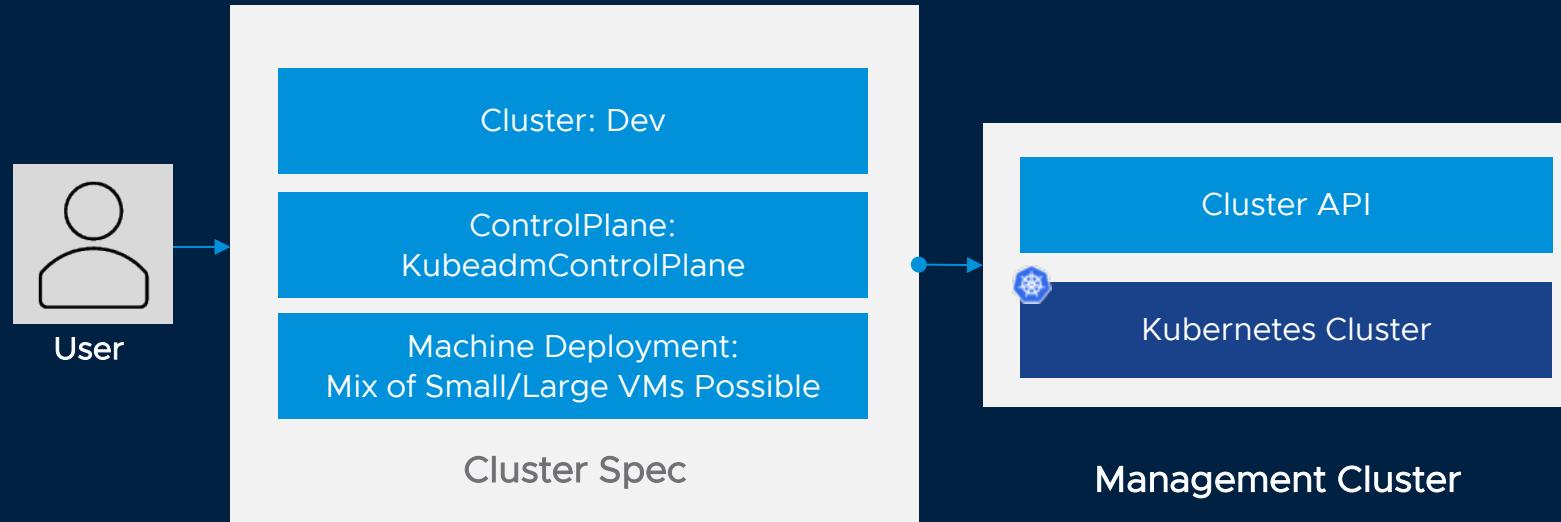
Community Participation



sigs.k8s.io/cluster-api

Cluster API

Functional overview



Cluster API

Building on core Kubernetes concepts

Kubernetes



Pod



ReplicaSet



Deployment

Cluster API



Machine



MachineSet



MachineDeployment



Cluster



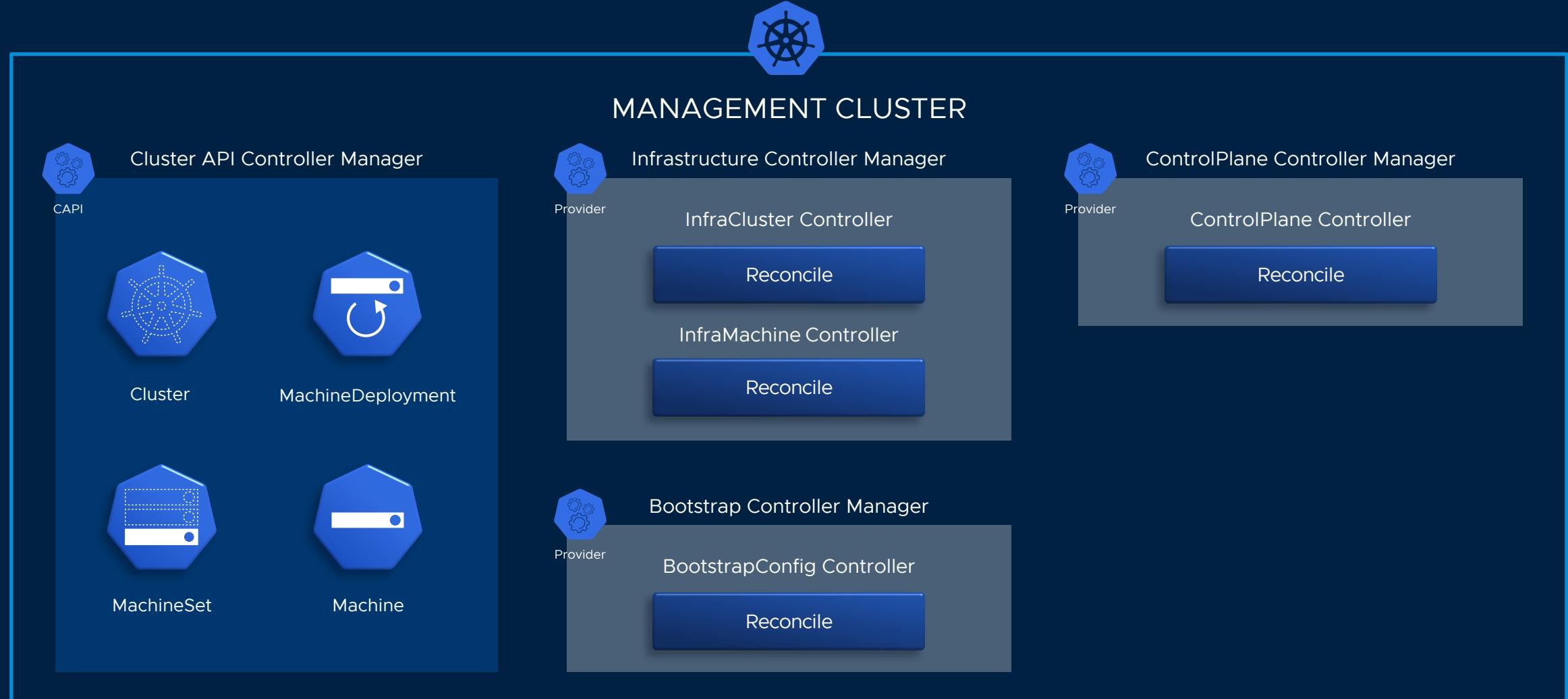
CP

ControlPlane

Cluster API

Declarative, pluggable lifecycle management of Kubernetes clusters

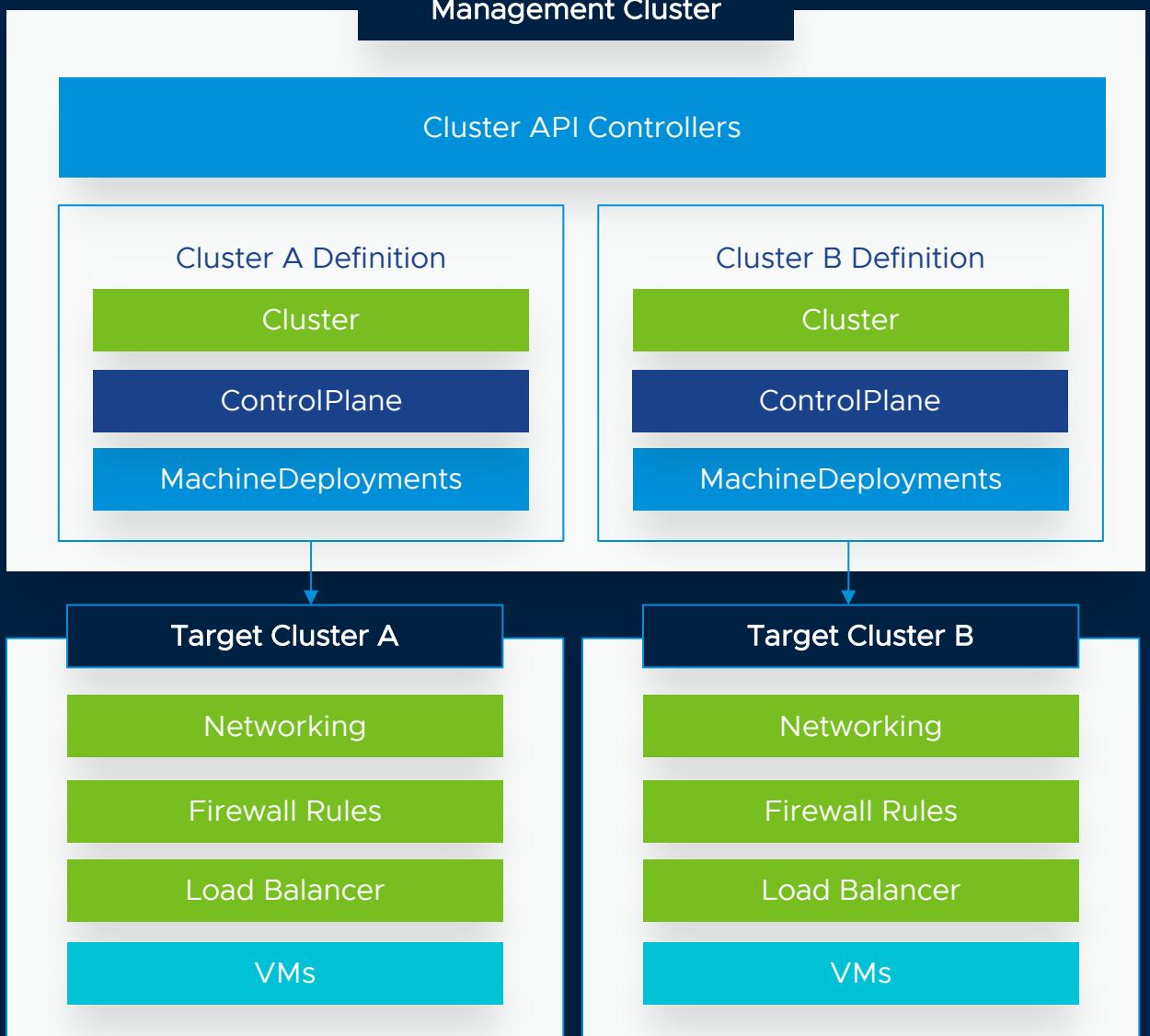
- Kubebuilder
- Cluster API
- Provider



Cluster creation

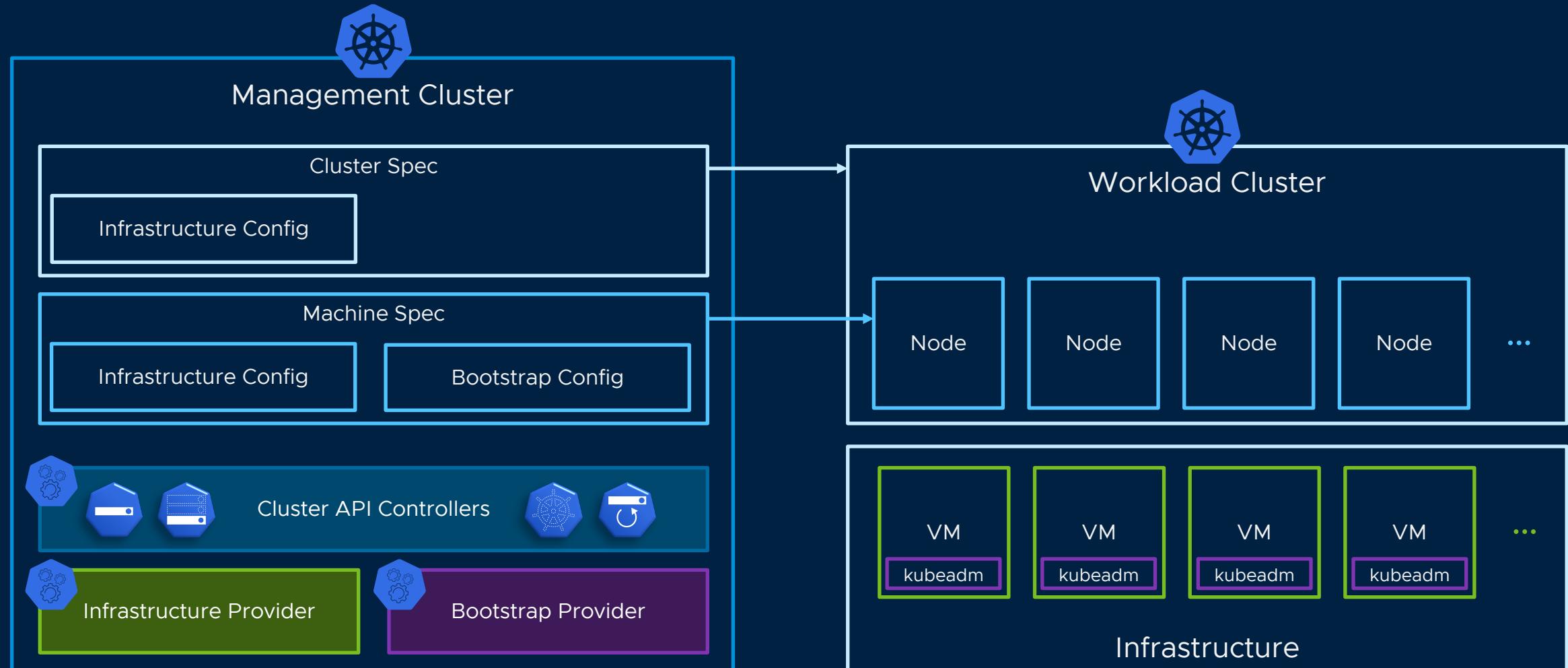
Management Cluster

- Install CRDs, controllers, providers into management cluster
- Create objects
 - Cluster
 - ControlPlane
 - Add-ons (CNI)
 - MachineDeployment(s) for worker nodes
- CAPI creates infrastructure & bootstraps target cluster



Cluster API

Declarative, pluggable lifecycle management of Kubernetes clusters



Deployment & MachineDeployment

```
apiVersion: apps/v1
kind: Deployment
metadata:
  labels:
    app.kubernetes.io.instance: waveform
  name: waveform-proxy
  namespace: waveform
spec:
  progressDeadlineSeconds: 600
  replicas: 1
  revisionHistoryLimit: 10
  selector:
    matchLabels:
      app.kubernetes.io/component: proxy
      app.kubernetes.io/name: waveform
  strategy:
    rollingUpdate:
      maxSurge: 25%
      maxUnavailable: 25%
      type: RollingUpdate
  template:
    metadata:
      creationTimestamp: null
      labels:
        app.kubernetes.io/component: proxy
        app.kubernetes.io/name: waveform
    spec:
```

```
apiVersion: cluster.x-k8s.io/v1alpha3
kind: MachineDeployment
metadata:
  labels:
    cluster.x-k8s.io/cluster-name: wp-capv-1
  name: wp-capv-1-md-0
  namespace: wp-capv-1
spec:
  clusterName: wp-capv-1
  minReadySeconds: 0
  progressDeadlineSeconds: 600
  replicas: 4
  revisionHistoryLimit: 1
  selector:
    matchLabels:
      cluster.x-k8s.io/cluster-name: wp-capv-1
  strategy:
    rollingUpdate:
      maxSurge: 1
      maxUnavailable: 0
      type: RollingUpdate
  template:
    metadata:
      labels:
        cluster.x-k8s.io/cluster-name: wp-capv-1
        node-pool: wp-capv-1-worker-pool
    spec:
```

ReplicaSet & MachineSet

```
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  labels:
    app.kubernetes.io/component: proxy
  name: waveform-proxy-6485455c5d
  namespace: waveform
spec:
  replicas: 1
  selector:
    matchLabels:
      app.kubernetes.io/component: proxy
      app.kubernetes.io/name: waveform
      pod-template-hash: 6485455c5d
  template:
    metadata:
      creationTimestamp: null
      labels:
        app.kubernetes.io/component: proxy
        app.kubernetes.io/name: waveform
        pod-template-hash: 6485455c5d
    spec:
```

```
apiVersion: cluster.x-k8s.io/v1alpha3
kind: MachineSet
metadata:
  labels:
    cluster.x-k8s.io/cluster-name: wp-capv-1
  name: wp-capv-1-md-0-7f7d564594
  namespace: wp-capv-1
spec:
  clusterName: wp-capv-1
  deletePolicy: Random
  replicas: 4
  selector:
    matchLabels:
      cluster.x-k8s.io/cluster-name: wp-capv-1
      machine-template-hash: "3938120150"
  template:
    metadata:
      labels:
        cluster.x-k8s.io/cluster-name: wp-capv-1
        machine-template-hash: "3938120150"
        node-pool: wp-capv-1-worker-pool
    spec:
```

Pod & Machine

```
apiVersion: v1
kind: Pod
metadata:
  labels:
    app.kubernetes.io/component: proxy
  name: waveform-proxy-6485455c5d-cfgl4
  namespace: waveform
spec:
  containers:
    image: waveformhq/proxy:6.1
    imagePullPolicy: IfNotPresent
    name: waveform-proxy
    ports:
      - containerPort: 2878
        protocol: TCP
      - containerPort: 9411
        protocol: TCP
    resources: {}
    securityContext:
      privileged: false
    terminationMessagePath: /dev/termination-log
    terminationMessagePolicy: File
```

```
apiVersion: cluster.x-k8s.io/v1alpha3
kind: Machine
metadata:
  labels:
    cluster.x-k8s.io/cluster-name: wp-capv-1
  name: wp-capv-1-md-0-7f7d564594-hwjnh
  namespace: wp-capv-1
spec:
  bootstrap:
    configRef:
      apiVersion: bootstrap.cluster.x-k8s.io/v1alpha3
      kind: KubeadmConfig
      name: wp-capv-1-md-0-xgtfh
      namespace: wp-capv-1
    clusterName: wp-capv-1
    infrastructureRef:
      apiVersion: infrastructure.cluster.x-k8s.io/v1alpha3
      kind: VSphereMachine
      name: wp-capv-1-worker-qb7gw
      namespace: wp-capv-1
    version: v1.18.2+vmware.1
```

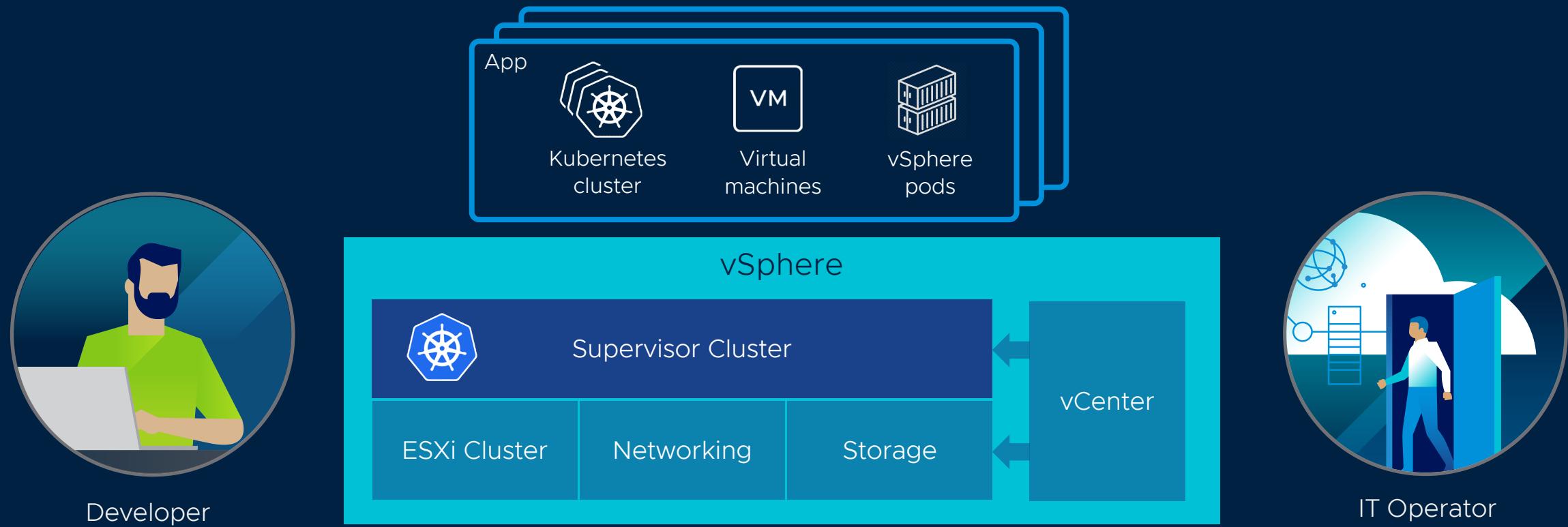
vSphere with Kubernetes

Tanzu Kubernetes Grid Service

Rearchitecting vSphere with Native Kubernetes

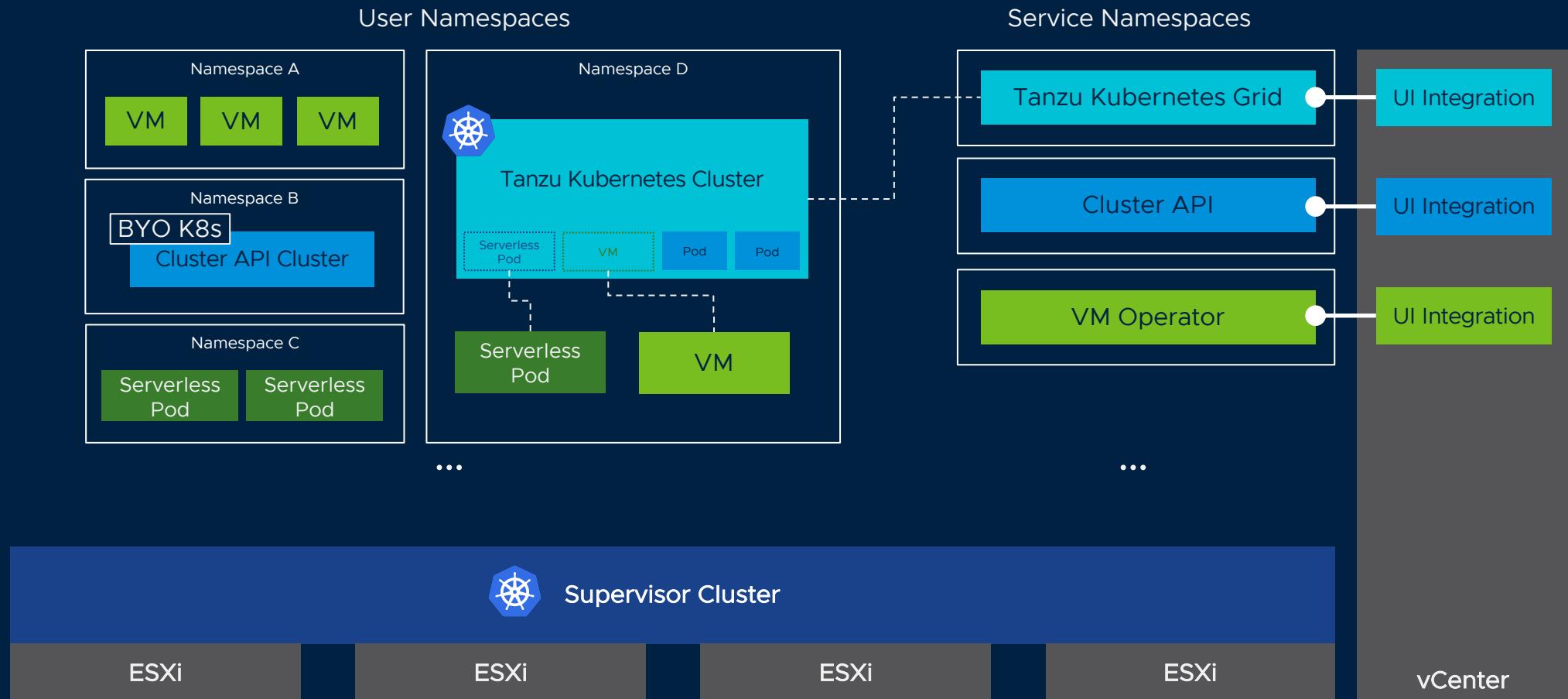
Transforming vSphere into the App Platform of the Future

vSphere with Native Kubernetes | App-focused Management | Dev & IT Ops Collaboration



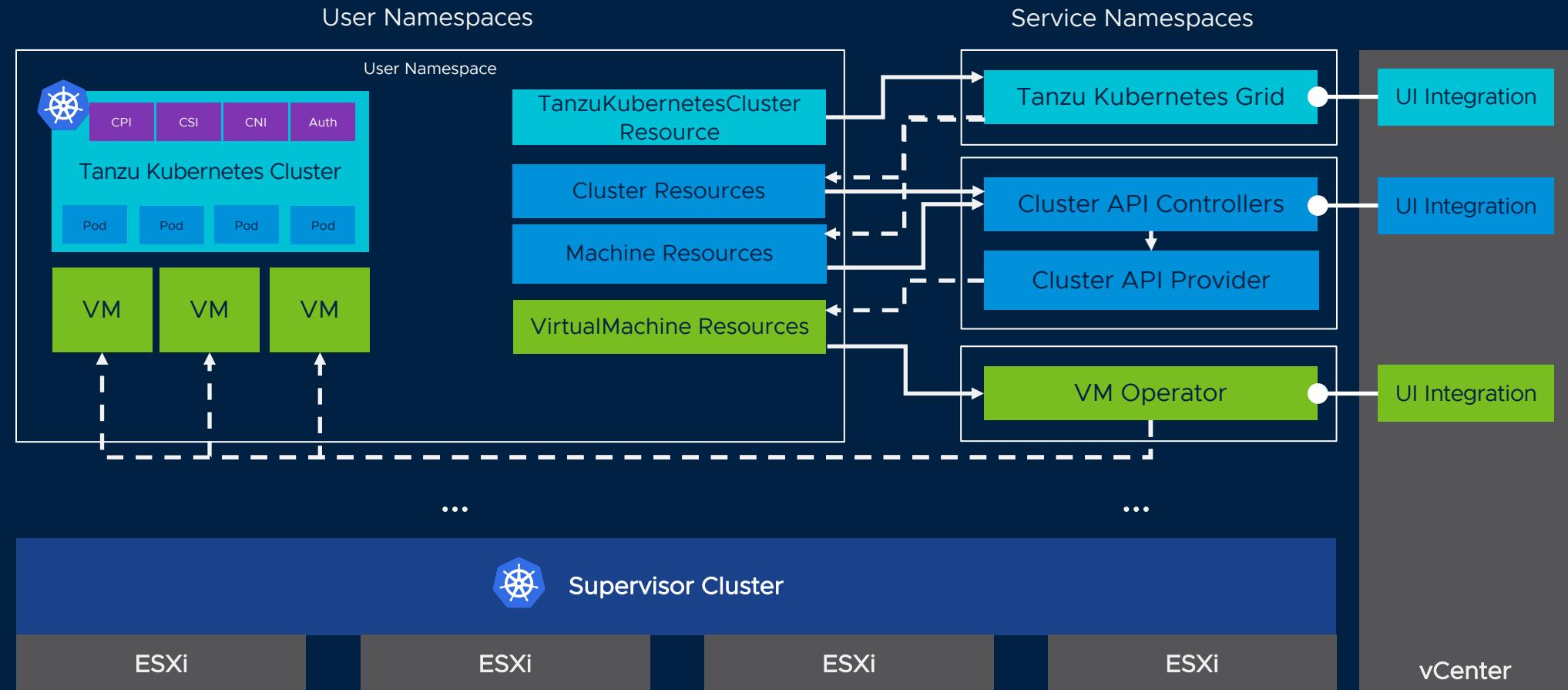
Improved Economics | Control at Scale | Increased Velocity

Supervisor Cluster



Tanzu Kubernetes Clusters

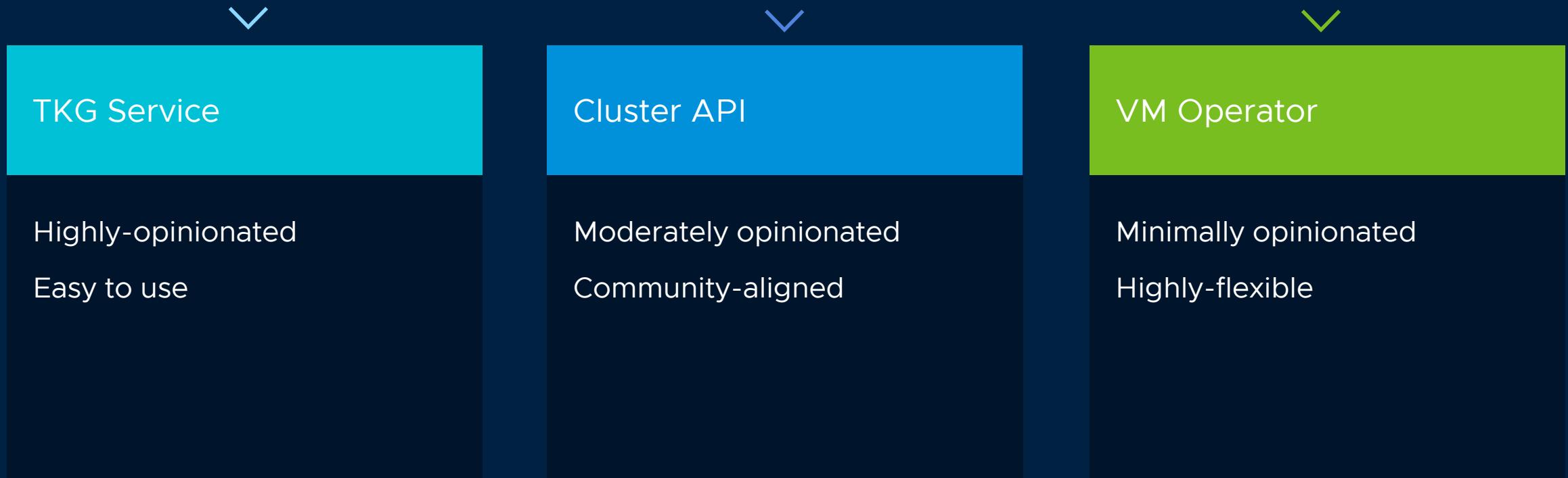
Layered approach



3 Layer Cake

Layered approach

Different layers for different use cases.



Thank You