

Kubernetes Lifecycle Management with Cluster API

“Mattias and Alicja

Awesome VMware People 😊”

Agenda

What on earth is VMware doing here today??!!??

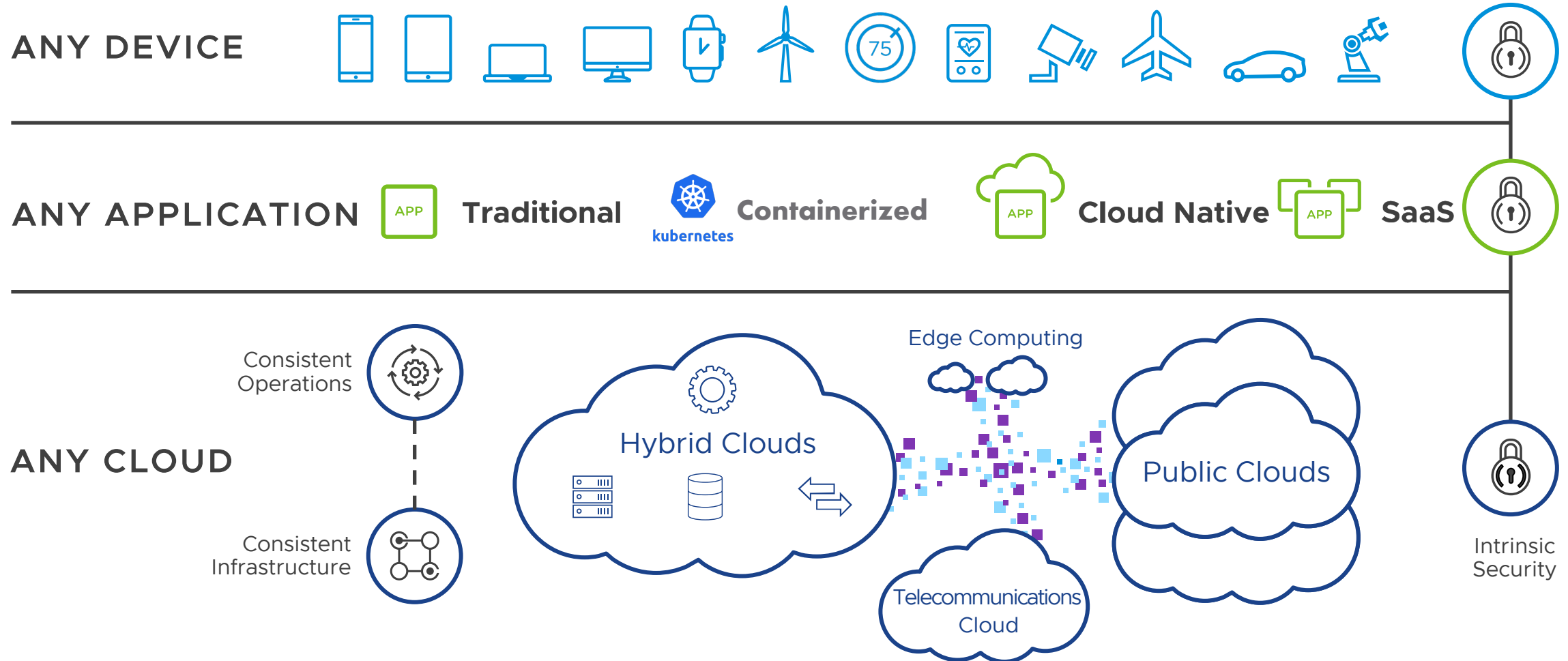
Kubernetes Multi Cloud

Demo

Burgers & Beeeeeeeer

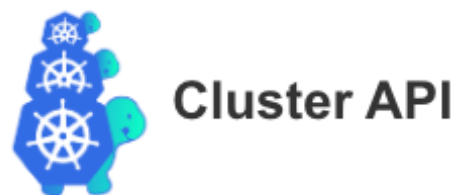
Where is the world headed?

The Essential, Ubiquitous Digital Foundation



What are we doing in the OSS space

CNCF projects we lead or contribute to



In the beginning...



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**

What is a Kubernetes Cluster?

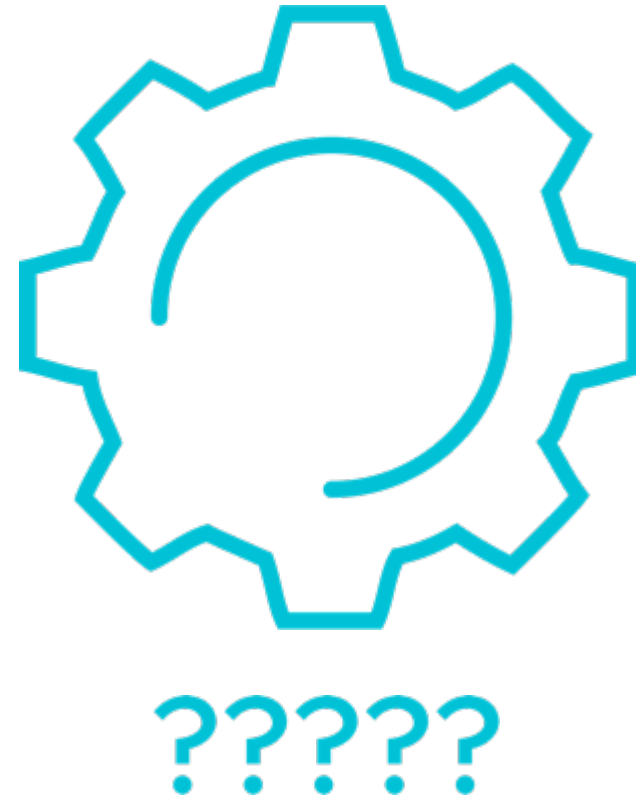
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Kubernetes Components

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

Kubernetes Components: Bootstrapping?

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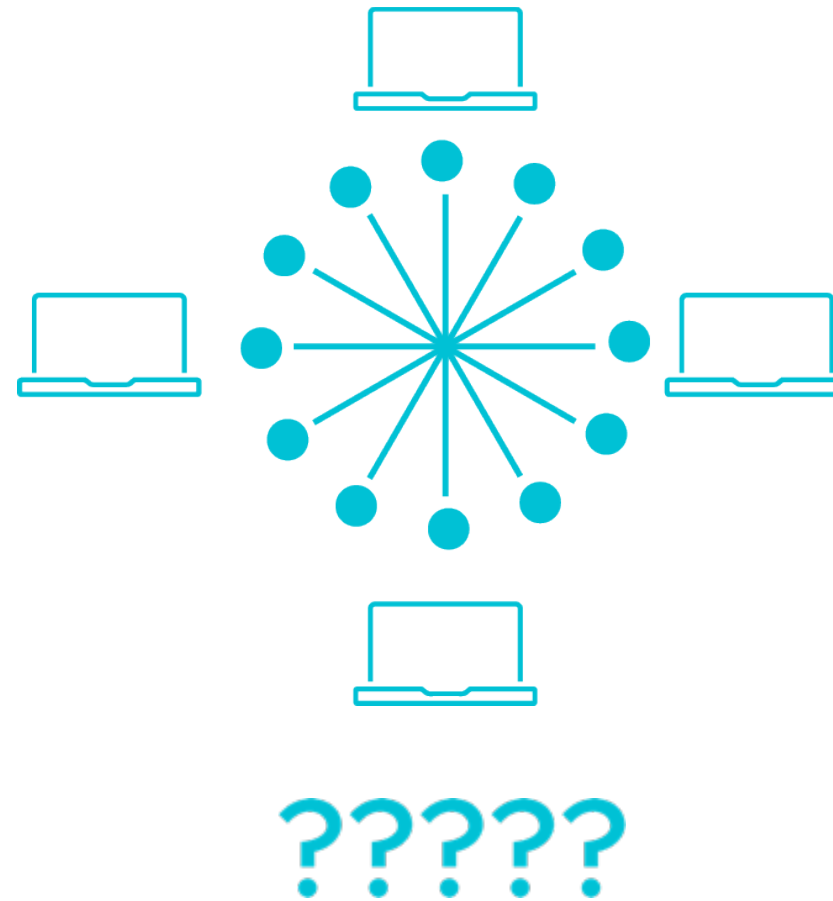
Consistent Kubernetes cluster bootstrapping



- Owned by SIG Cluster Lifecycle
- Provides a consistent cluster bootstrapping experience
 - Declarative configuration model (InitConfiguration, ClusterConfiguration, JoinConfiguration)
 - `kubeadm init`: create a new control plane node
 - `kubeadm join`: join a new control plane or worker node
- Building block for higher-level systems
- Does not handle infrastructure

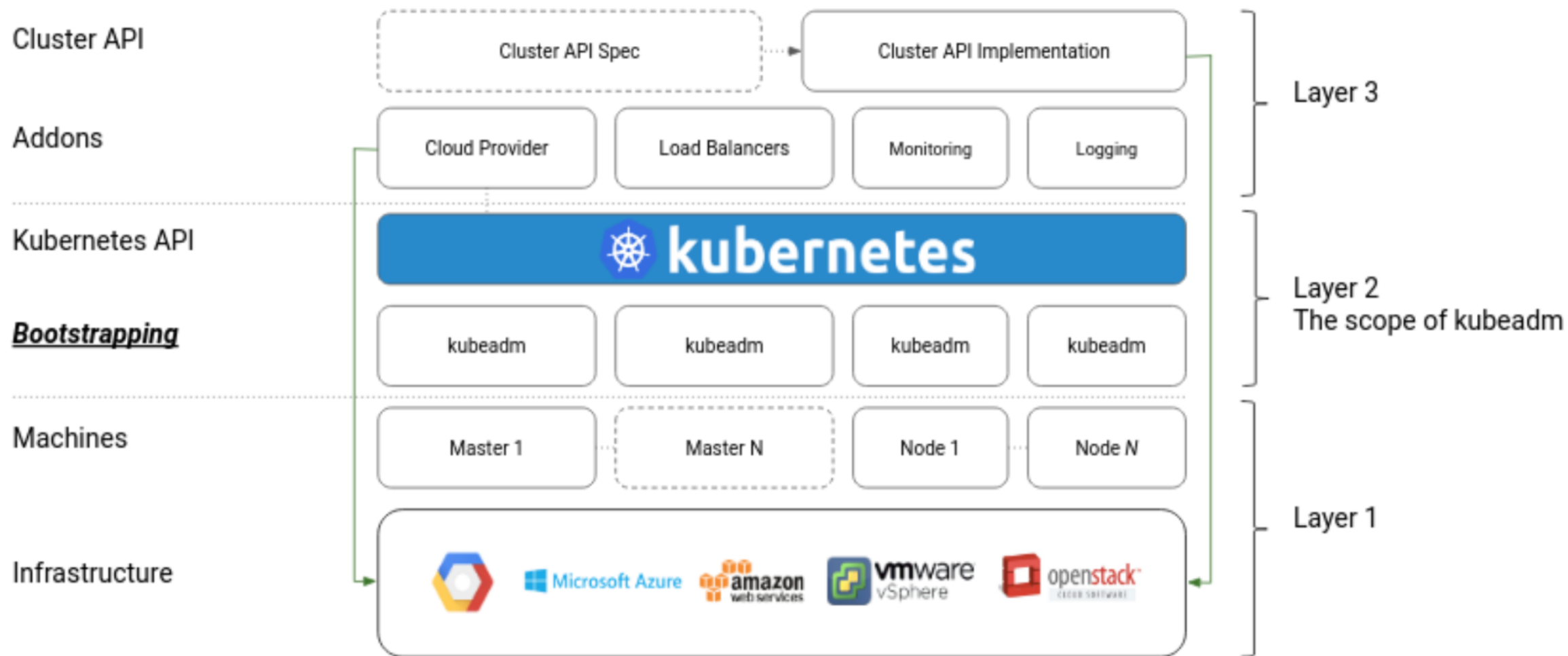
Kubernetes Cluster: Provisioning?

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 - Load balancer
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Schematic Overview

The rise of the k8s cluster





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

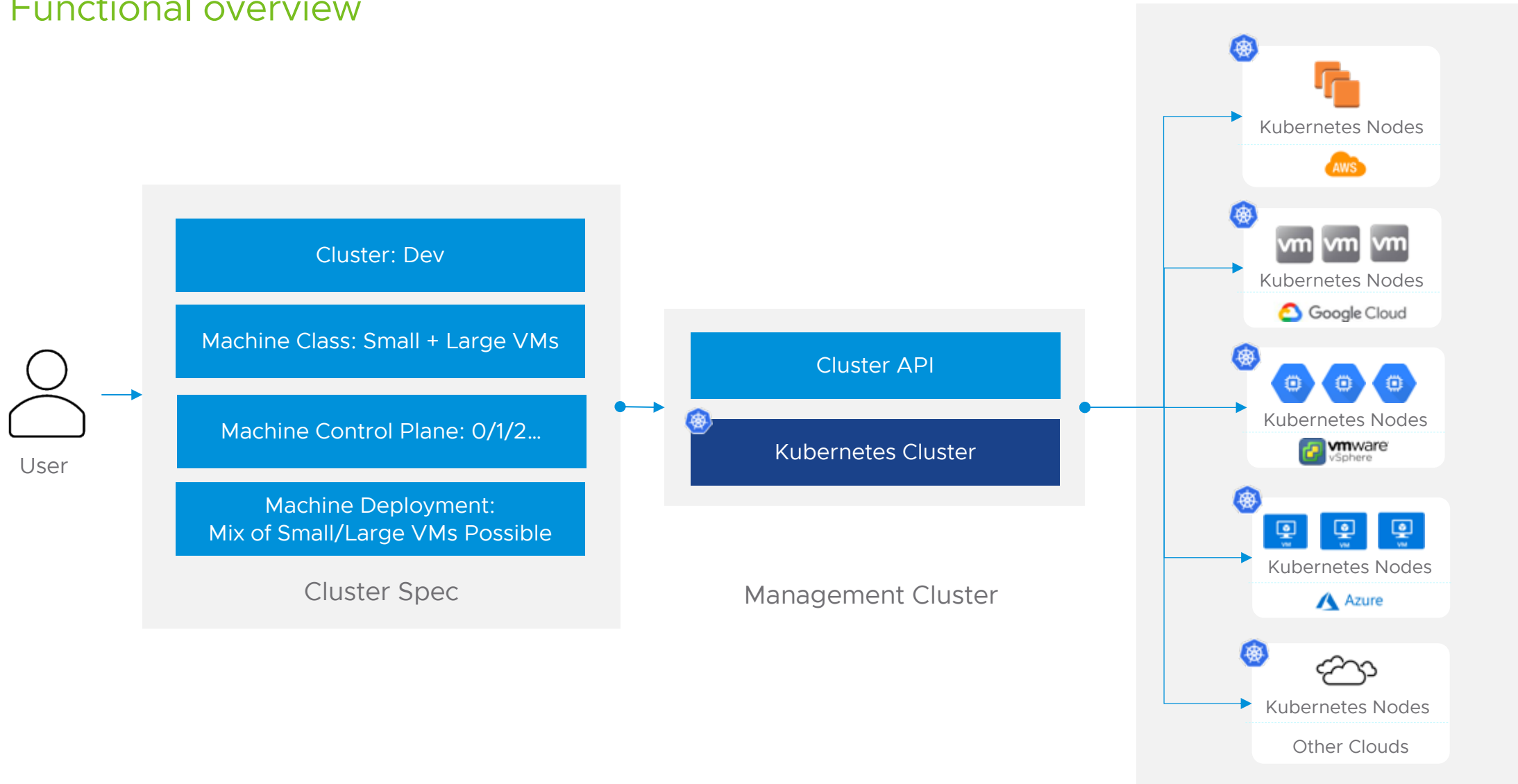
Vendor Participation



sigs.k8s.io/cluster-api

Cluster API

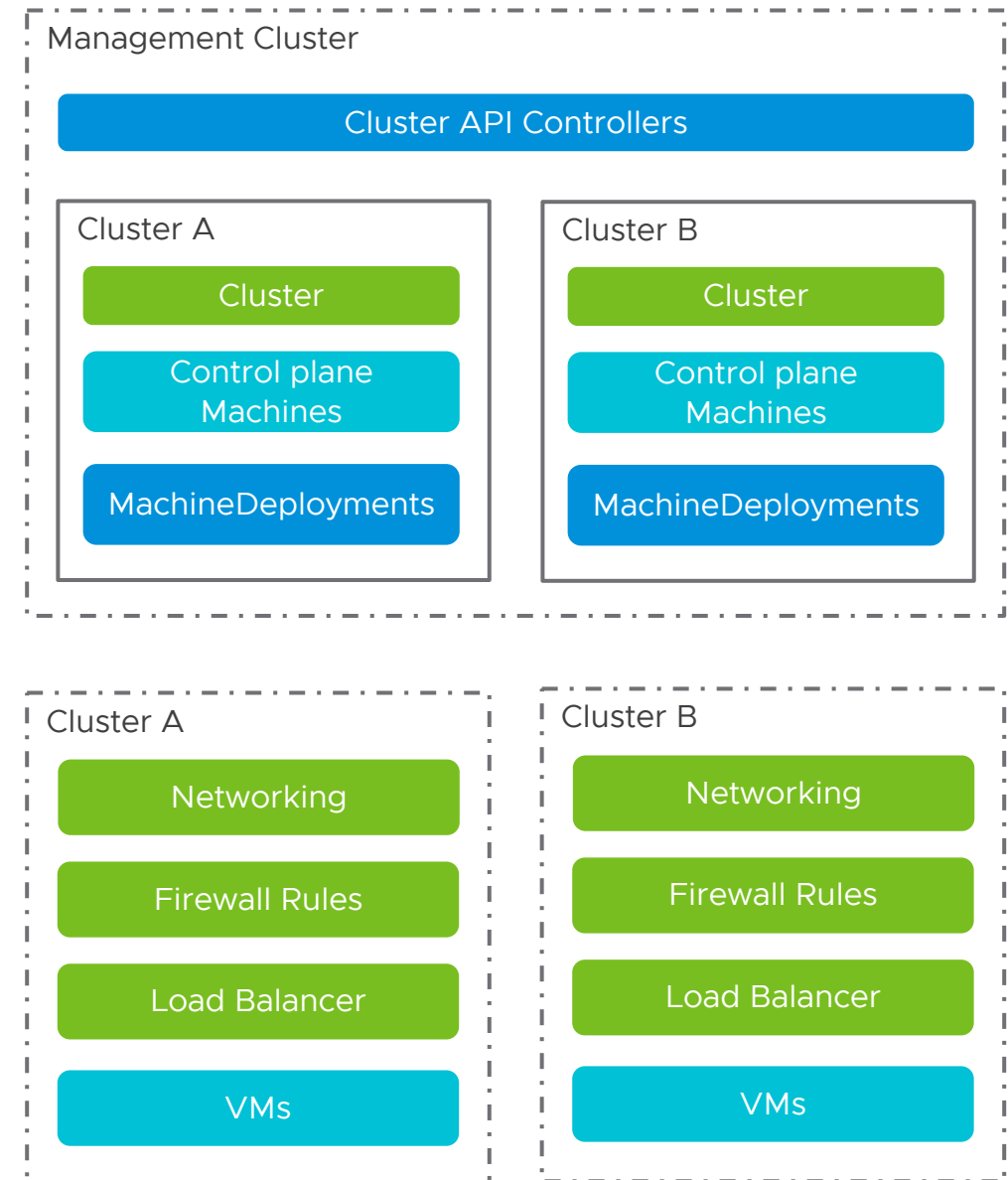
Functional overview



Cluster creation

Typical Workflow

- Cluster
- Machine(s) for the control plane
- Add-ons (CNI)
- MachineDeployment(s) for worker nodes



Cluster API: CRDs

- **Cluster** ←
 - Machine
 - MachineClass
 - MachineSet
 - MachineDeployment
- Spec
 - pod CIDR
 - service CIDR
 - service DNS suffix
 - embedded provider-specific configuration
 - Status
 - API server endpoints
 - Error details
 - embedded provider-specific status

Cluster Example

Cluster

Cluster-wide configuration

Generic networking concepts like pod and service ranges or DNS domain

Providers can modify and override behavior where needed



```
apiVersion: "cluster.k8s.io/v1alpha1"
kind: Cluster
metadata:
  name: demo1
spec:
  clusterNetwork:
    services:
      cidrBlocks: ["10.96.0.0/12"]
  pods:
    cidrBlocks: ["192.168.0.0/16"]
    serviceDomain: "cluster.local"
  providerSpec:
    value:
      apiVersion: "awsprovider/v1alpha1"
      kind: "AWSClusterProviderSpec"
      region: "us-east-1"
      sshKeyName: "default"
```

Cluster API

Abstractions

Cluster



Machine



MachineSet



MachineDeployment



MachineClass



Pod



ReplicaSet



Deployment



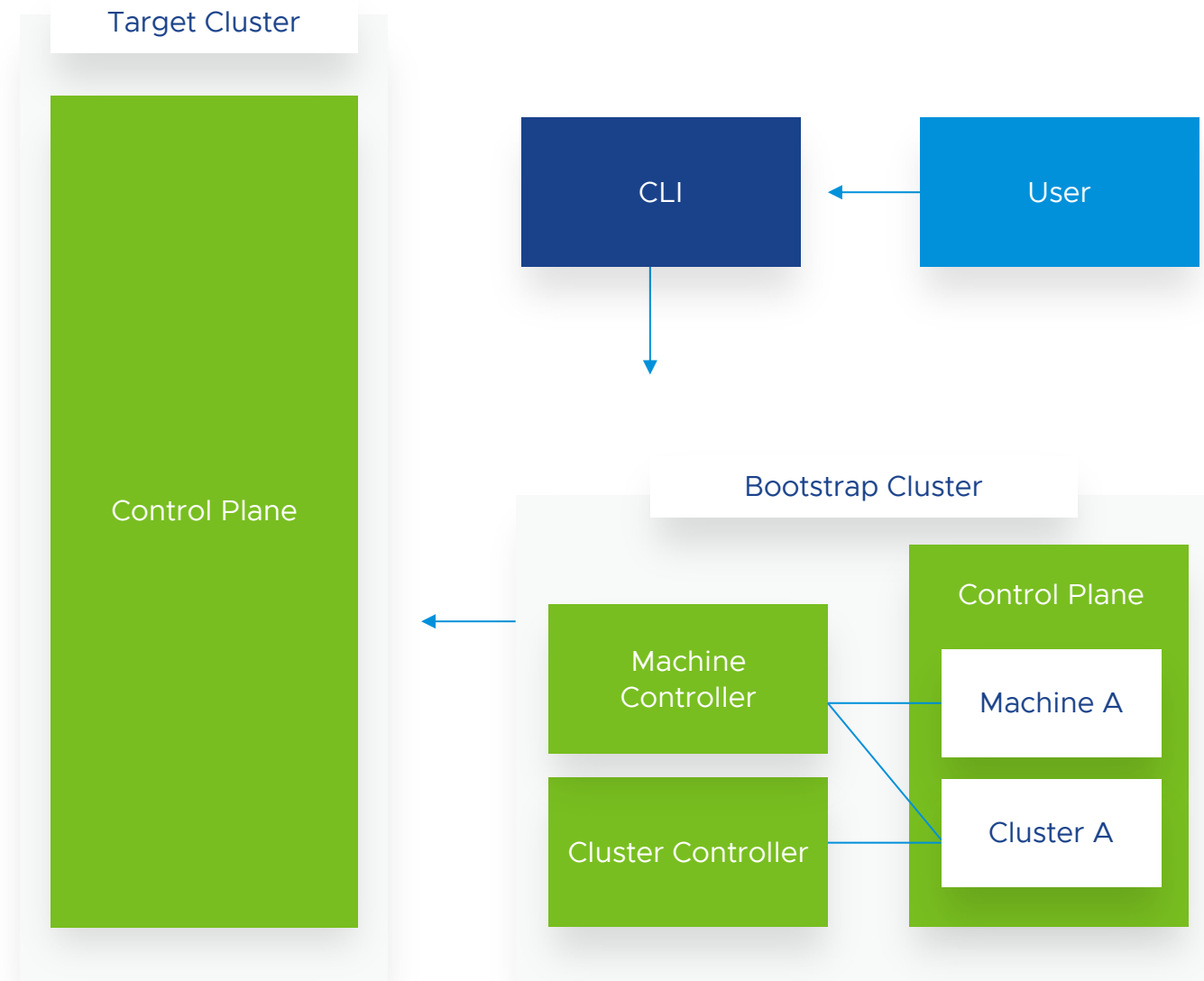
StorageClass



Cluster creation

Pivot Workflow

- Start with “bootstrap” cluster (kind)
- Install CRDs, controllers, actuators into bootstrap cluster
- Create objects (cluster, machine, etc.)
 - Creates infrastructure & bootstraps target cluster
- Copy Cluster API & objects into target cluster
- Delete kind bootstrap cluster
- Use target cluster for all future management



Manage Kubernetes



⏪

Cluster Groups

Clusters

Workspaces

Namespaces

Workloads

Policies

Cluster Inspection

Settings

DOWNLOAD CLI ^

Latest CLI version: v0.1-1798d7f7

LIGHT

Clusters14

DETACH

DELETE

NEW CLUSTER ⌵

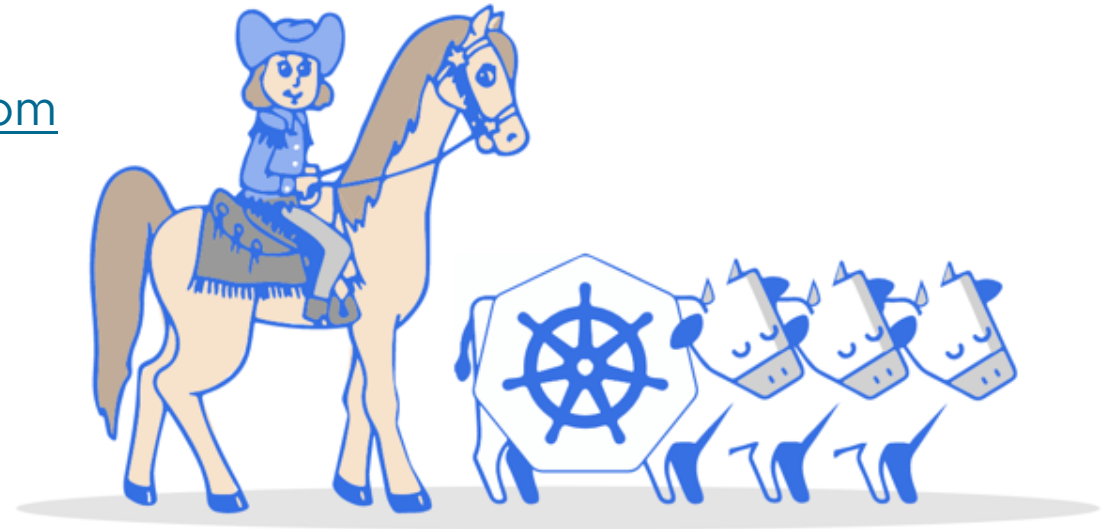
ATTACH CLUSTER

	Cluster	Provider	Type	Status	Health	Version	Allocated Memory	Allocated CPU	Nodes	Labels
☐	azure-dev-cluster-01		Attached	Ready		v1.15.3	10% 1.54 GB / 16.02 GB	40% 1.6 CPUs / 4 CPUs	1	
☐	development-cluster-0		Provisioned	Ready		v1.14.1	6% 1.85 GB / 30.33 GB	38% 3 CPUs / 8 CPUs	4	
☐	development-cluster-2		Provisioned	Ready		v1.14.1	2% 936 MB / 45.49 GB	24% 2.88 CPUs / 12 CPUs	6	
☐	enterprise-pks-dev		Attached	Ready		v1.13.5	31% 3.63 GB / 11.54 GB	23% 1.4 CPUs / 6 CPUs	3	environment: development
☐	enterprise-pks-production		Attached	Ready		v1.13.5	44% 5.09 GB / 11.54 GB	40% 2.41 CPUs / 6 CPUs	3	environment: production +1
☐	enterprise-pks-staging		Attached	Ready		v1.13.5	54% 6.23 GB / 11.54 GB	47% 2.8 CPUs / 6 CPUs	3	environment: staging +1
☐	gke-prod-cluster2		Attached	Ready		v1.12.8-gke.10	13% 1.36 GB / 10.56 GB	45% 1.69 CPUs / 3.76 CPUs	4	
☐	gke-staging-cluster1		Attached	Ready		v1.12.8-gke.10	13% 2.71 GB / 21.11 GB	33% 2.47 CPUs / 7.52 CPUs	8	
☐	prod-cluster		Provisioned	Ready		v1.14.1	10% 3.09 GB / 30.33 GB	50% 3.98 CPUs / 8 CPUs	4	
☐	production-ha-capa		Provisioned	Ready		v1.14.1	1% 936 MB / 98.56 GB	22% 5.73 CPUs / 26 CPUs	13	
☐	staging-cluster-aws-1		Provisioned	Ready		v1.14.1	4% 3.15 GB / 75.81 GB	29% 5.8 CPUs / 20 CPUs	10	
☐	sudo0711-default-k8s-cluster		Attached	Ready		v1.12.8-gke.10	39% 3.09 GB / 7.92 GB	89% 2.51 CPUs / 2.82 CPUs	3	
☐	us1-dev-cloudhealthtec		Provisioned	Ready		v1.14.1	1% 1.49 GB / 174.37 GB	17% 7.6 CPUs / 46 CPUs	23	

How to get involved

Join Us!

- [Cluster API discuss forum](#)
- [sig-cluster-lifecycle](#) Google Group to gain access to documents and calendars.
- Cluster API working group sessions
 - Weekly on Wednesdays @ 10:00 PT on [Zoom](#)
- Provider implementer office hours
 - Weekly on Tuesdays @ 12:00 PT ([Zoom](#))
 - and Wednesdays @ 15:00 CET ([Zoom](#))
- Chat with us on [Slack](#): #cluster-api



sigs.k8s.io/cluster-api

Demo



Thank You

Cluster creation

Management Cluster

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

