



KubeCon



CloudNativeCon

North America 2018

Cluster API Deep Dive With a Case Study





KubeCon



CloudNativeCon

North America 2018

Robert Bailey

Software Engineer at Google

David Watson

Software Engineer at Samsung



Agenda



KubeCon



CloudNativeCon

North America 2018

- What's Cluster API?
- Upgrade as example
- Bootstrapping
- How to deploy
- Demo

Where we are



KubeCon



CloudNativeCon

North America 2018

- Cluster Management is difficult
- Tooling and ecosystem is fragmented
 - Too many tools to choose from
- Difficult to build higher order functionality
 - Additional automation
 - Consistent UX

What's Cluster API?



KubeCon



CloudNativeCon

North America 2018

Declarative API

- Cluster
- Machine
- Machine Set + Machine Deployment

Common Logic

- Machine Lifecycle (incl. Provisioning)
- Machine Upgrade

Pluggable Architecture

- Infrastructure platform (vSphere, GCP, AWS, etc.)
- Support for various Operating Systems

Tooling, Services

- Cluster Bootstrapping, Upgrade
- Auto-scaling, Repair, Node Auto-provisioning

What's Cluster API



KubeCon



CloudNativeCon

North America 2018

Cluster Config with Declarative API

What is configured?



KubeCon



CloudNativeCon

North America 2018

- **Cluster-level Configuration**

- **Network**

- Machine setup
 - # of machines?
- Platform-specific configuration
 - GCP project, machine type
- Software on those machines
 - Kubelet Version
 - Control Plane

```
apiVersion: "cluster-api.k8s.io/v1alpha1"
kind: Cluster
metadata:
  name: kubecon-demo
spec:
  clusterNetwork:
    services:
      cidrBlocks: ["10.96.0.0/12"]
    pods:
      cidrBlocks: ["192.168.0.0/16"]
    serviceDomain: "cluster.local"
```

What is configured?



KubeCon



CloudNativeCon

North America 2018

- Cluster-level Configuration
 - Network
- Machine setup
 - # of machines?
- Platform-specific configuration
 - GCP project, machine type
- Software on those machines
 - Kubelet Version
 - Control Plane

```
apiVersion: "cluster.k8s.io/v1alpha1"
kind: MachineSet
metadata:
  name: my-first-machineset
spec:
  replicas: 3
  template:
    metadata:
      spec:
        ...
    roles:
      - Node
```


What is configured?



KubeCon



CloudNativeCon

North America 2018

- Cluster-level Configuration
 - Network
- Machine setup
 - # of machines?
- **Platform-specific configuration**
 - **GCP project, machine type**
- Software on those machines
 - Kubelet Version
 - Control Plane

```
apiVersion: "cluster.k8s.io/v1alpha1"
kind: Machine
metadata:
  name: gce-master-kubecon
spec:
  providerConfig: >
  {
    "project": "gke-kubecon",
    "zone": "us-central1-f",
    "machineType": "n1-standard-2",
    "image": "/path/to/ubuntu-1604-lts"
  }
```

What is configured?



KubeCon



CloudNativeCon

North America 2018

- Cluster-level Configuration
 - Network
- Machine setup
 - # of machines?
- Platform-specific configuration
 - GCP project, machine type
- **Software on those machines**
 - **Kubelet Version**
 - **Control Plane**

```
apiVersion: "cluster.k8s.io/v1alpha1"
kind: Machine
metadata:
  name: gce-master-kubecon
spec:
  providerConfig: {
    ...
  }
  versions:
    kubelet: 1.7.4
    controlPlane: 1.7.4
```

What's Cluster API



KubeCon



CloudNativeCon

North America 2018

Tooling, YAML, CRDs, Controllers

YAML to Objects

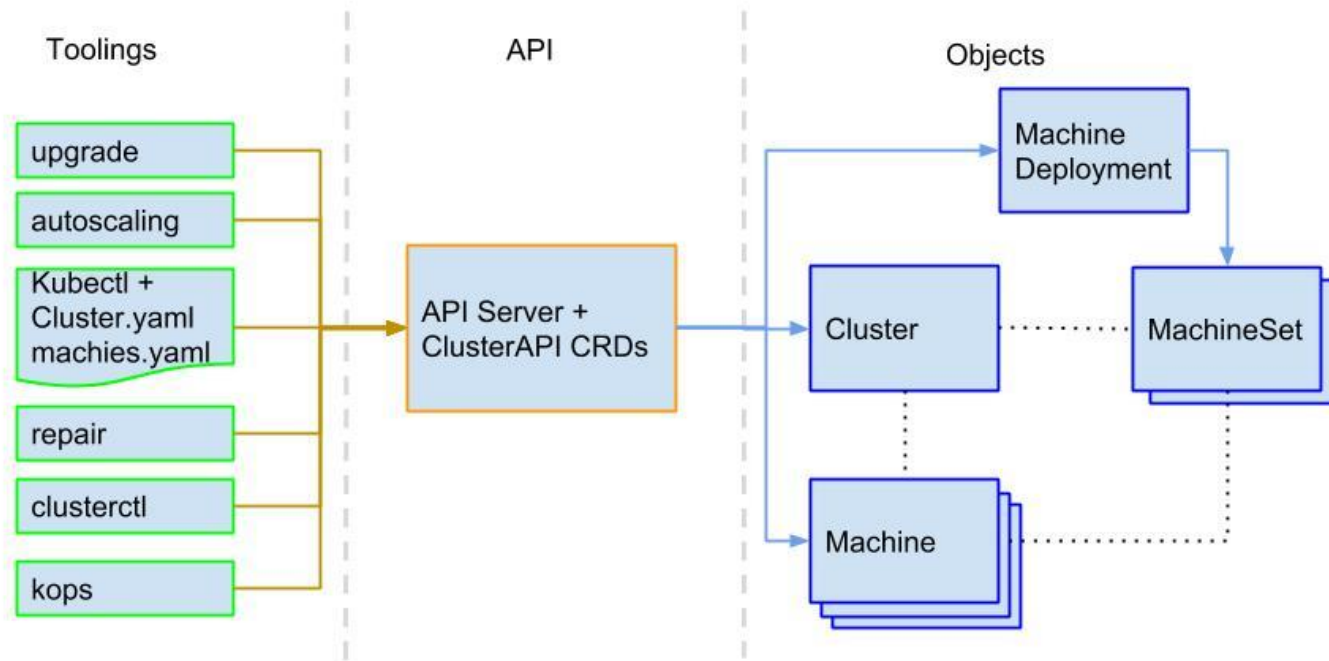


KubeCon



CloudNativeCon

North America 2018



Objects to Machines

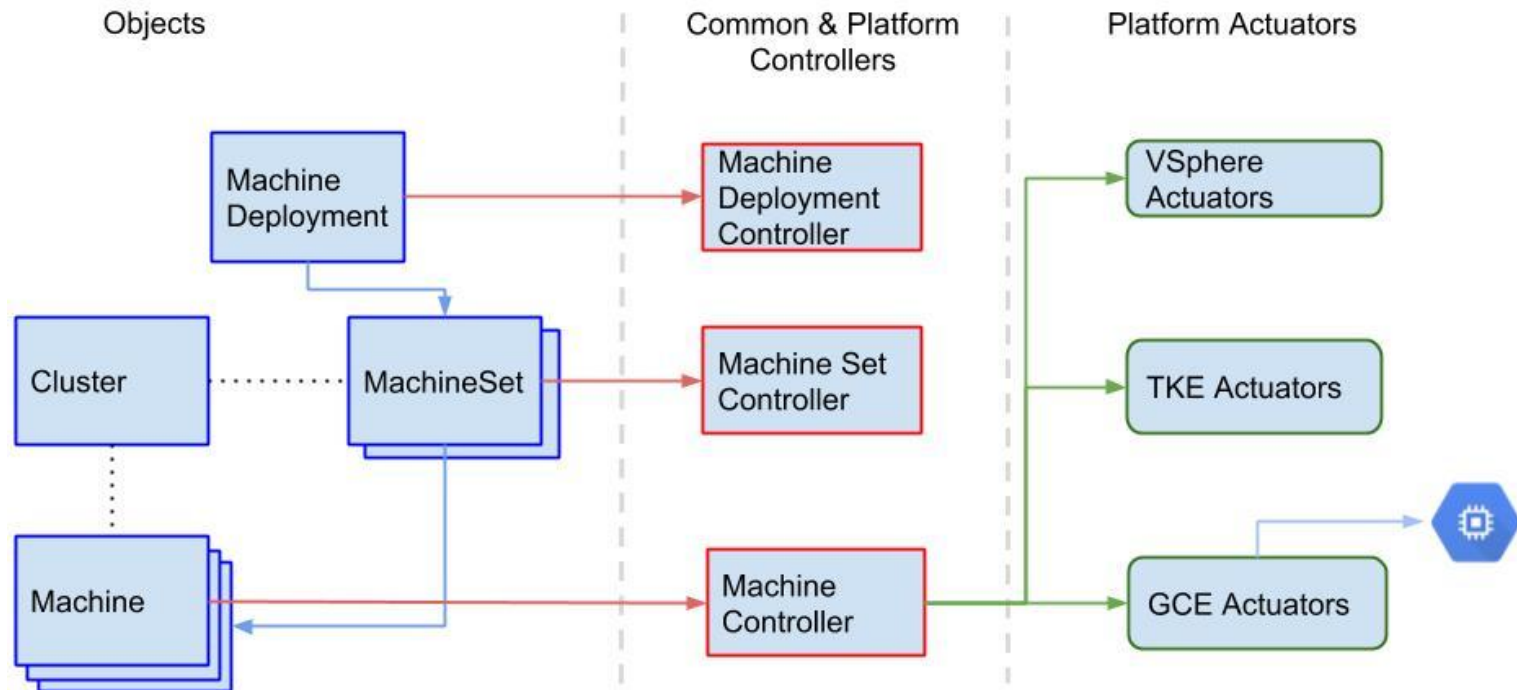


KubeCon



CloudNativeCon

North America 2018



Case Study: Upgrade



KubeCon



CloudNativeCon

North America 2018

How do we upgrade K8s
Cluster using Cluster API?



MachineDeployment

- replicas: 3
- nodes: MyNodes
- maxSurge: 1
- maxUnavailable: 0
- version: v1.8.3

Upgrade



KubeCon



CloudNativeCon

North America 2018

MachineDeployment

- replicas: 3
- nodes: MyNodes
- maxSurge: 1
- maxUnavailable: 0
- **version: v1.9.3**

Upgrade



KubeCon

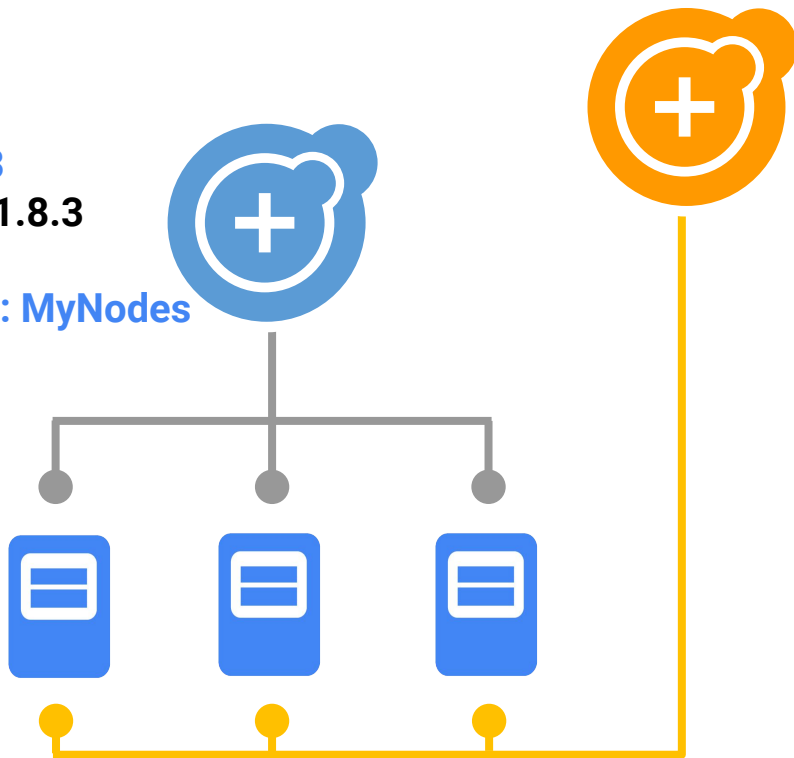


CloudNativeCon

North America 2018

MachineSet

- replicas: 3
- version: v1.8.3
- selector:
 - nodes: MyNodes



Upgrade



KubeCon

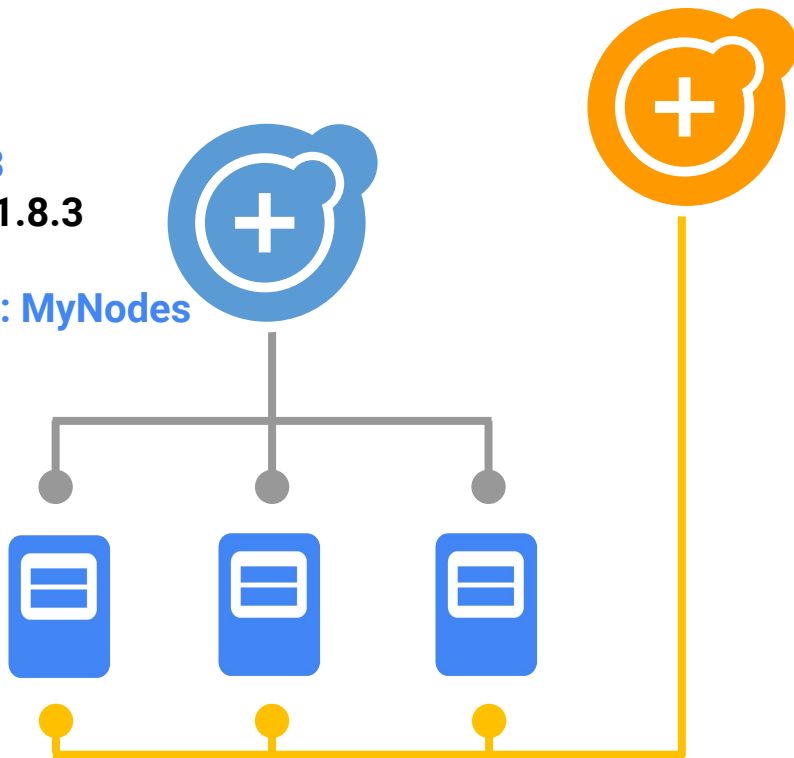


CloudNativeCon

North America 2018

MachineSet

- replicas: 3
- version: v1.8.3
- selector:
 - nodes: MyNodes



MachineSet

- replicas: 0
- version: v1.9.3
- selector:
 - nodes: MyNodes



Upgrade



KubeCon

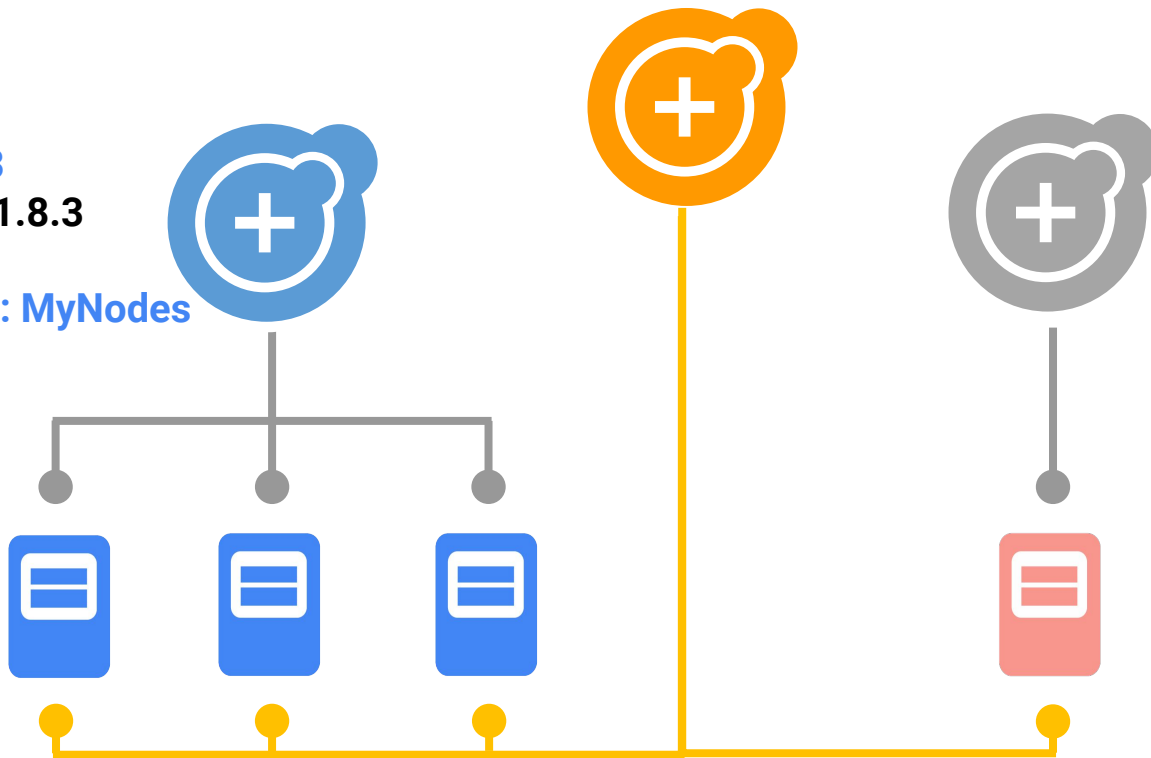


CloudNativeCon

North America 2018

MachineSet

- replicas: 3
- version: v1.8.3
- selector:
 - nodes: MyNodes



MachineSet

- replicas: 1
- version: v1.9.3
- selector:
 - nodes: MyNodes

Upgrade



KubeCon

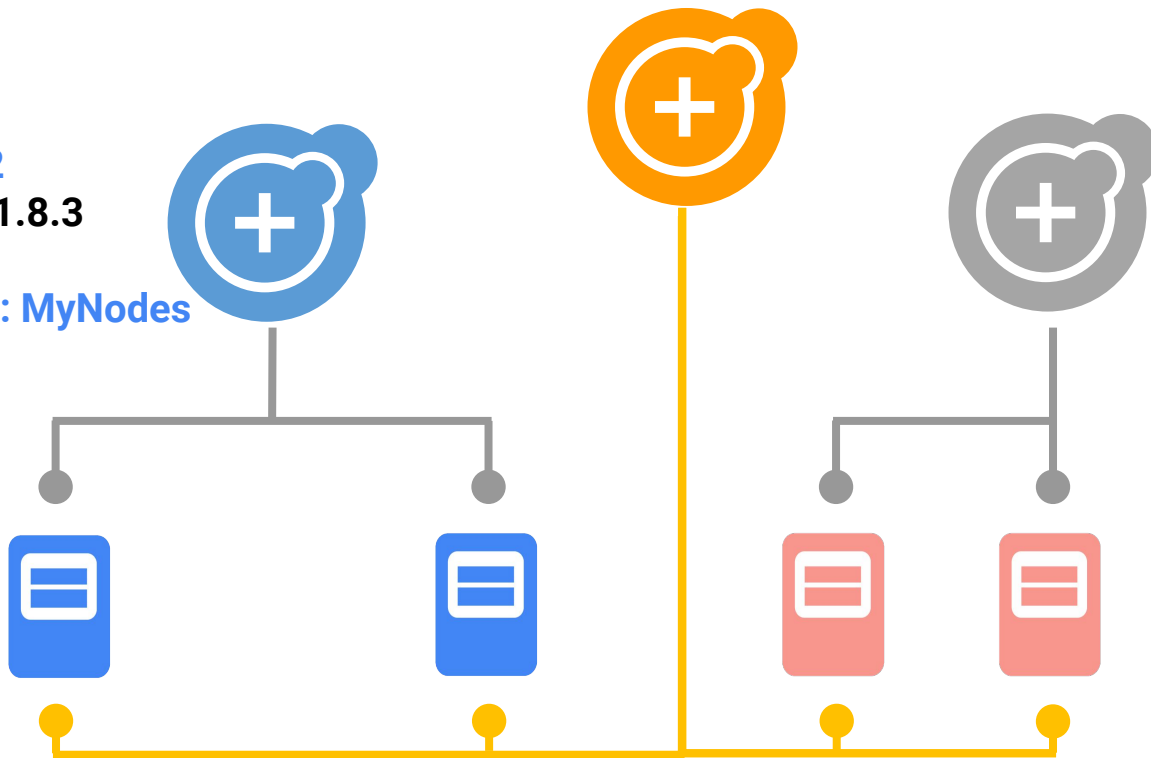


CloudNativeCon

North America 2018

MachineSet

- replicas: 2
- version: v1.8.3
- selector:
 - nodes: MyNodes



MachineSet

- replicas: 2
- version: v1.9.3
- selector:
 - nodes: MyNodes

Upgrade



KubeCon

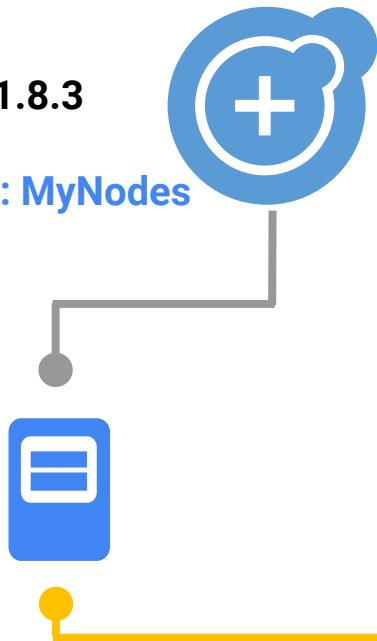


CloudNativeCon

North America 2018

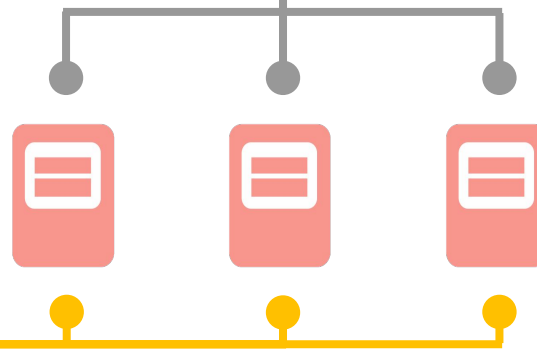
MachineSet

- replicas: 1
- version: v1.8.3
- selector:
 - nodes: MyNodes



MachineSet

- replicas: 3
- version: v1.9.3
- selector:
 - nodes: MyNodes



Upgrade



KubeCon

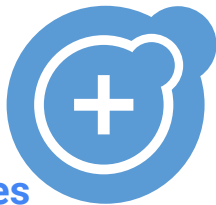


CloudNativeCon

North America 2018

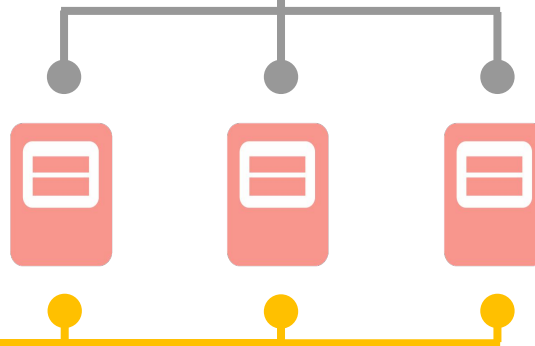
MachineSet

- replicas: 0
- version: v1.8.3
- selector:
 - nodes: MyNodes



MachineSet

- replicas: 3
- version: v1.9.3
- selector:
 - nodes: MyNodes





How to get cluster api
components up and running?

Bootstrapping - 10 km view

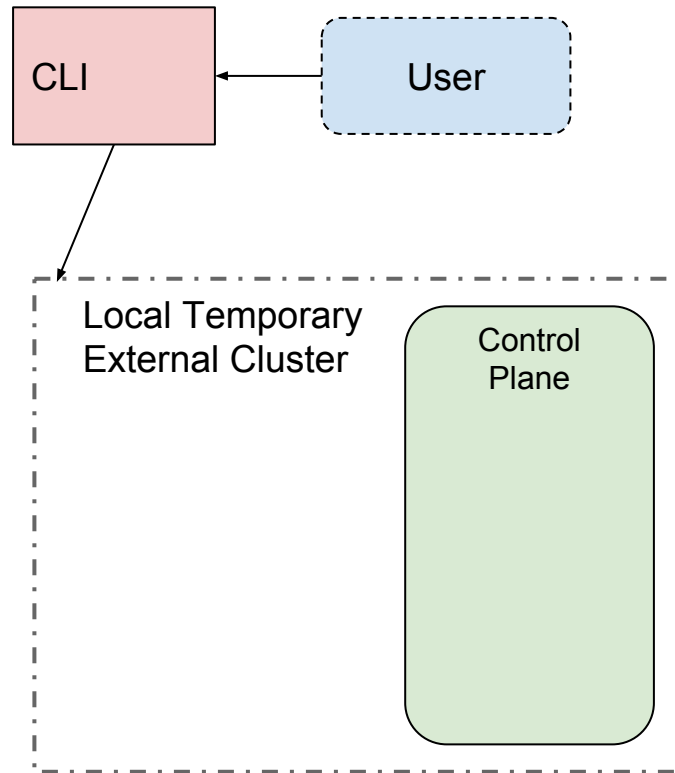


KubeCon



CloudNativeCon

North America 2018



Bootstrapping - 10 km view

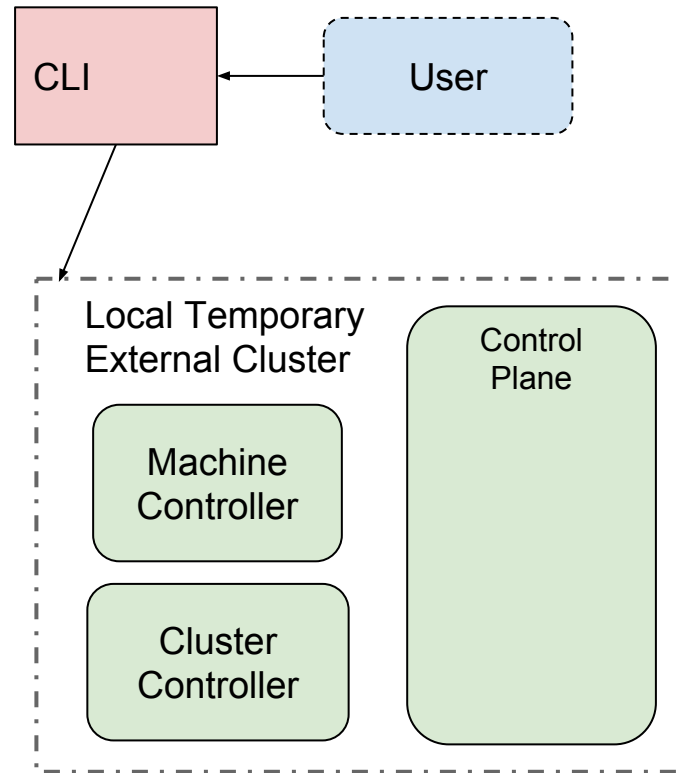


KubeCon



CloudNativeCon

North America 2018



Bootstrapping - 10 km view

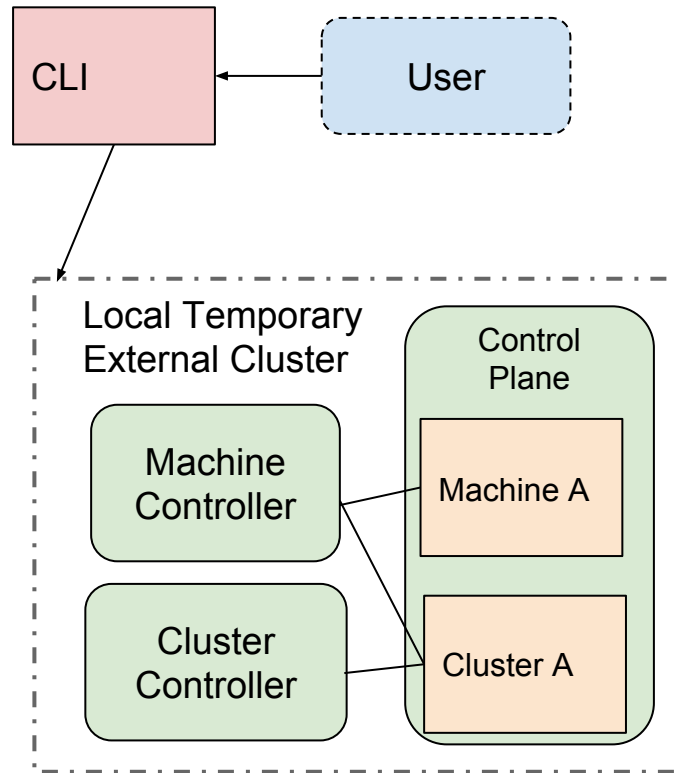


KubeCon



CloudNativeCon

North America 2018



Bootstrapping - 10 km view

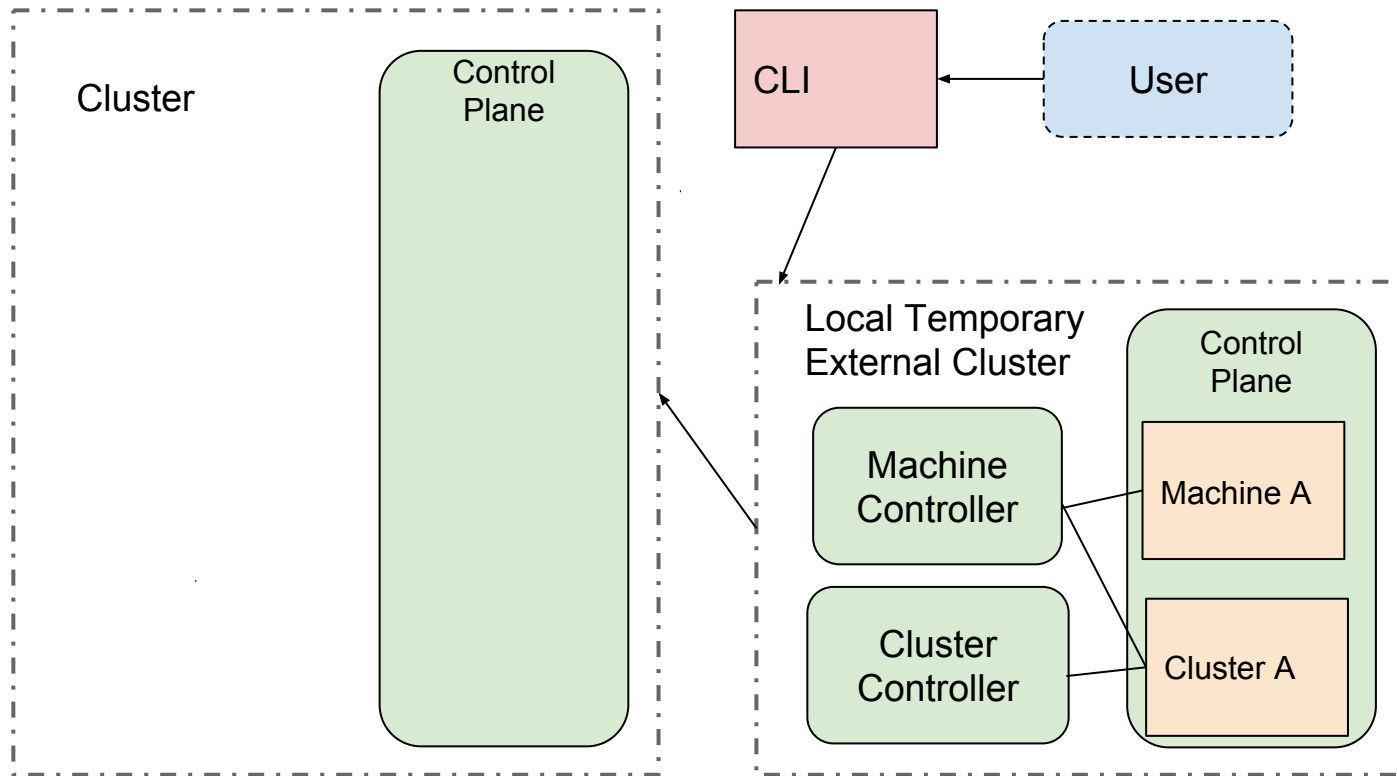


KubeCon



CloudNativeCon

North America 2018



Bootstrapping - 10 km view

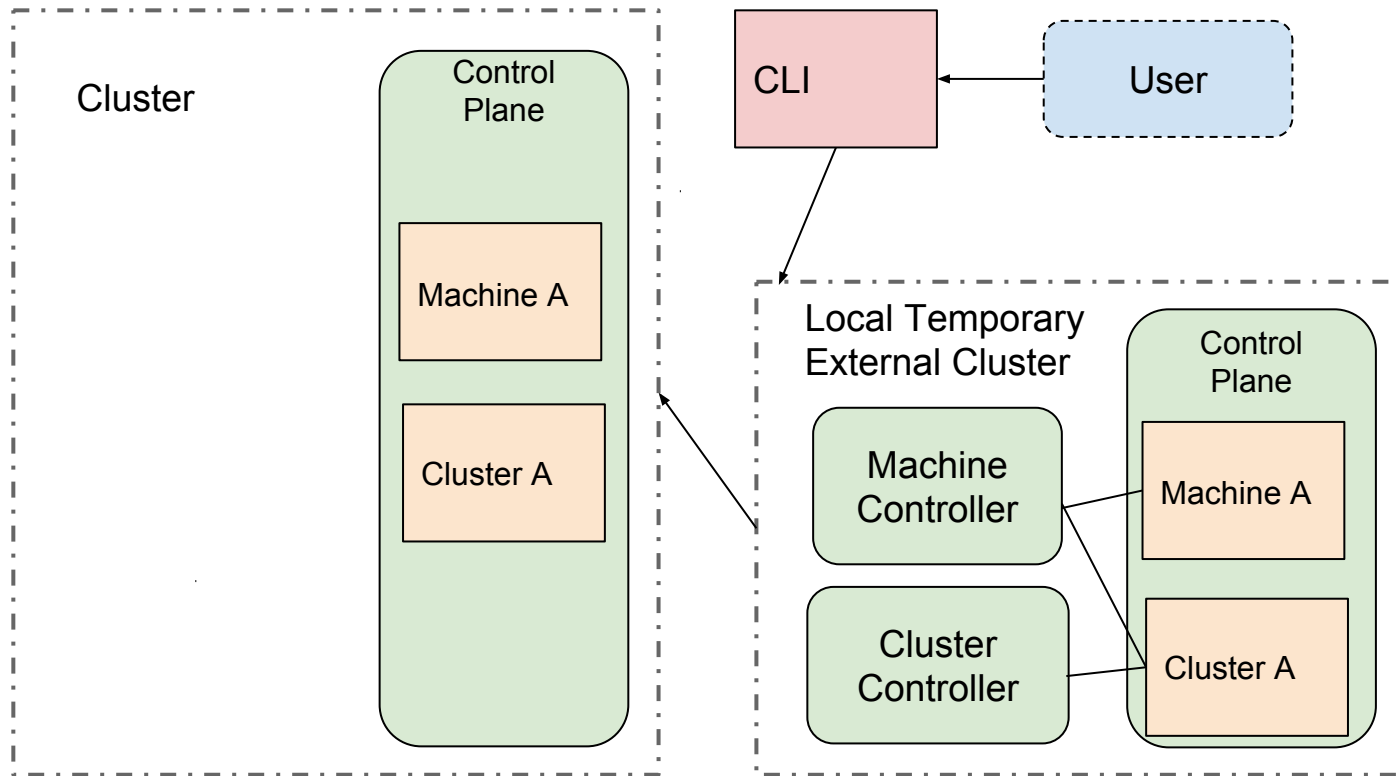


KubeCon



CloudNativeCon

North America 2018



Bootstrapping - 10 km view

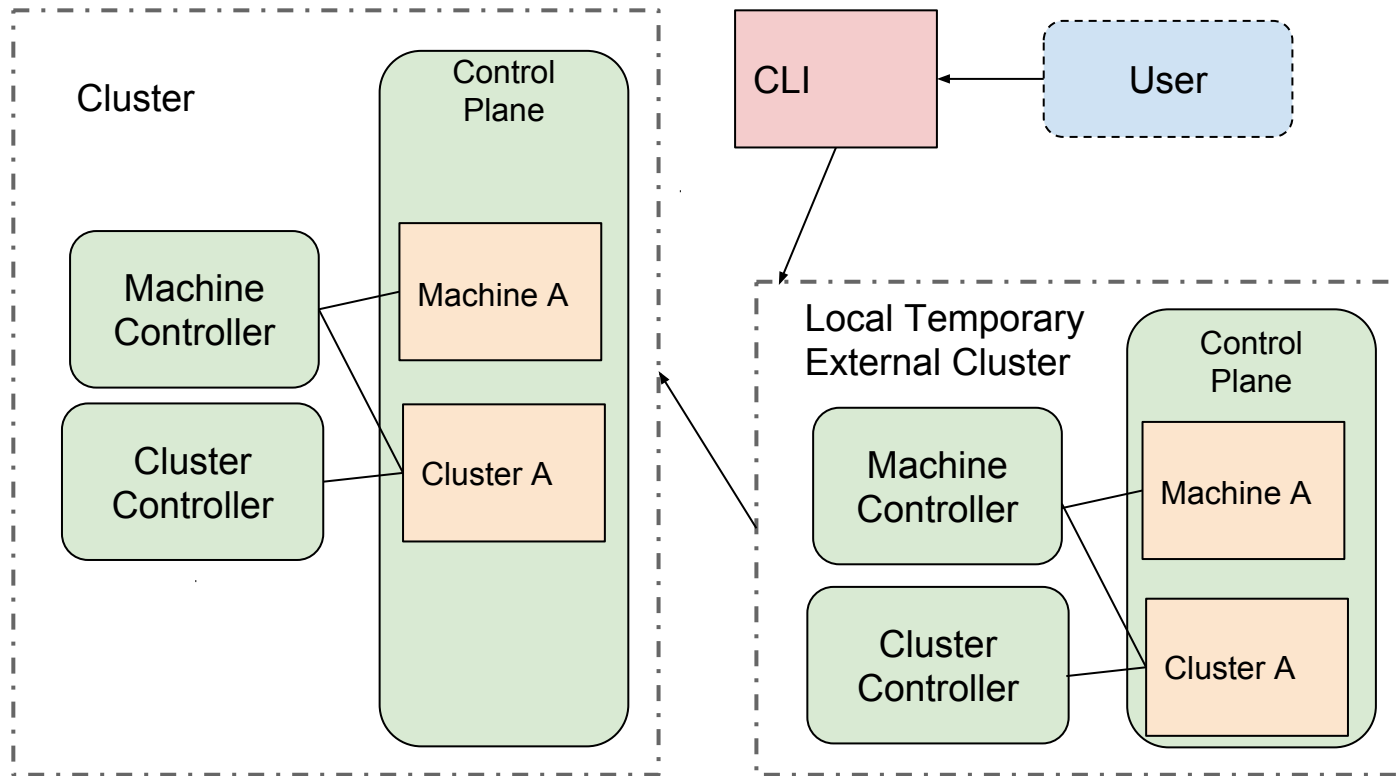


KubeCon



CloudNativeCon

North America 2018



Bootstrapping - 10 km view

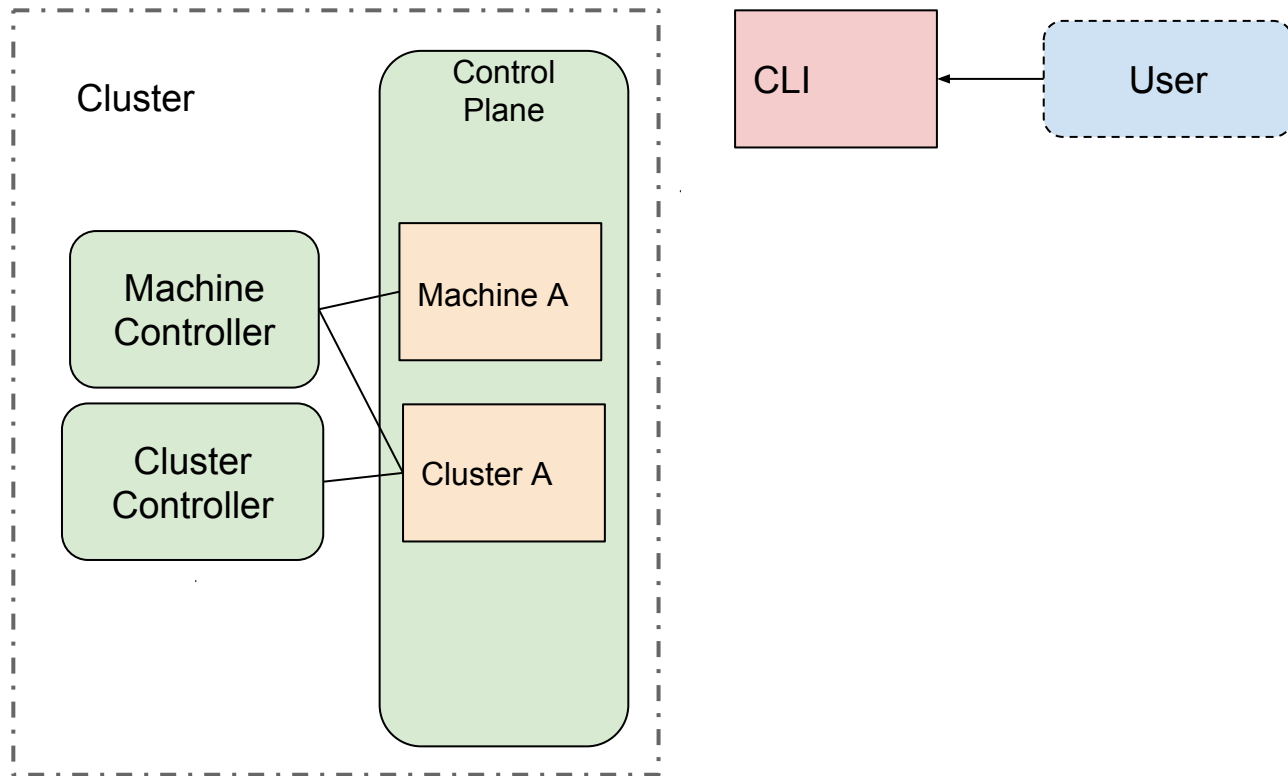


KubeCon



CloudNativeCon

North America 2018



Deploy



KubeCon



CloudNativeCon

North America 2018

In Cluster or not?

Deploy - In Cluster

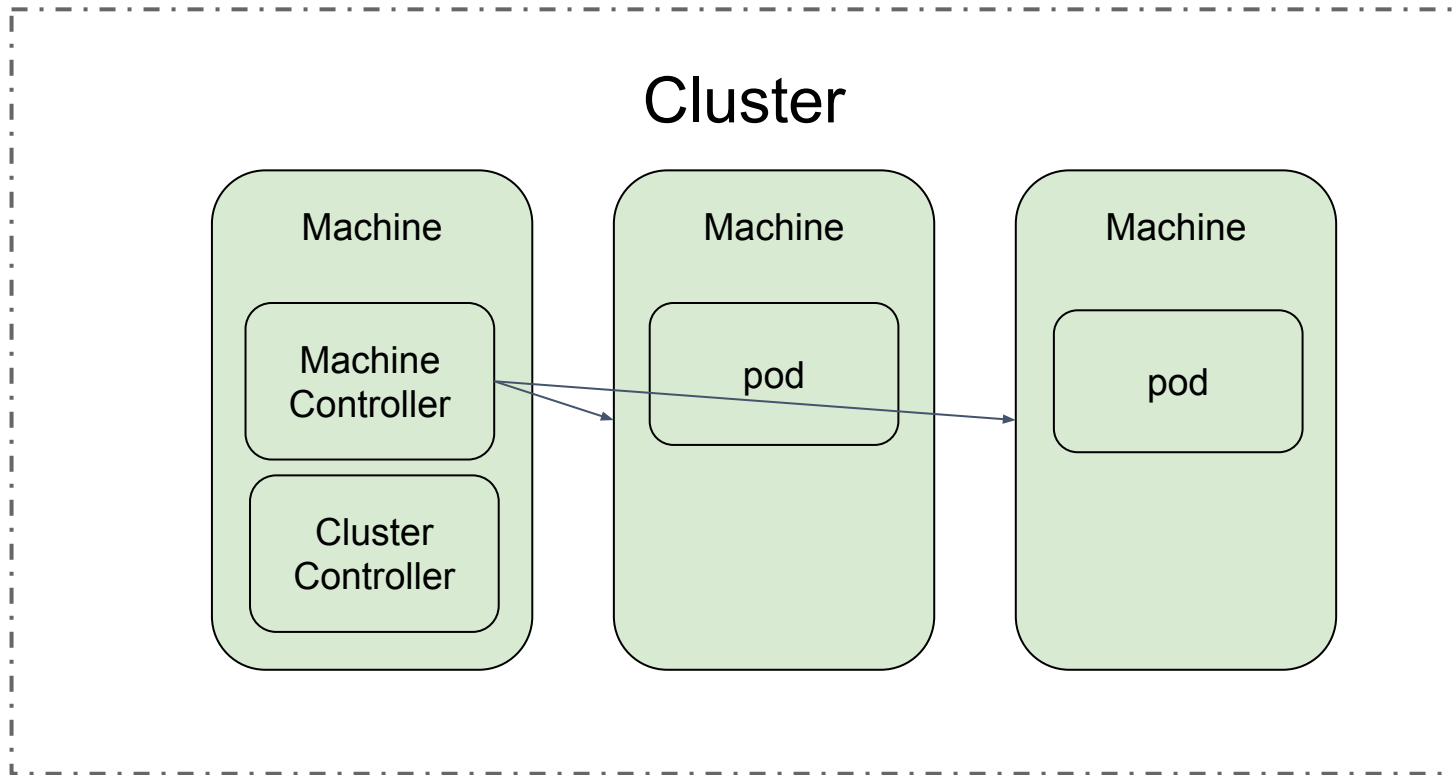


KubeCon



CloudNativeCon

North America 2018



Deploy - Out of Cluster

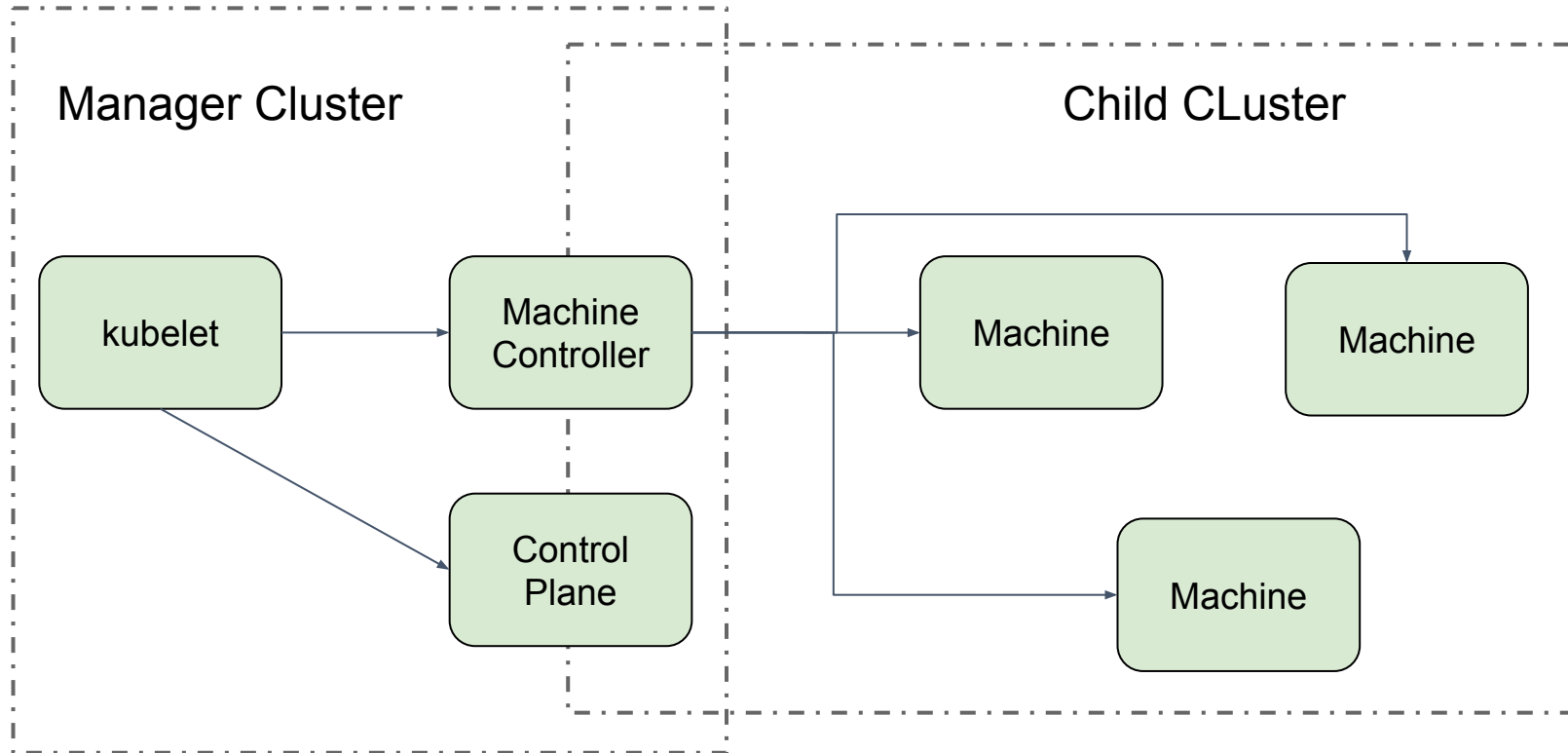


KubeCon



CloudNativeCon

North America 2018



Provider Support



KubeCon



CloudNativeCon

North America 2018

- AWS
- Azure
- DigitalOcean
- GCP
- OpenStack
- Tencent Cloud
- VSphere
- ...

DEMO



KubeCon



CloudNativeCon

North America 2018

DEMO

More Information



KubeCon



CloudNativeCon

North America 2018

- <https://github.com/kubernetes-sigs/cluster-api>
- Joining Kubernetes-sig-cluster-lifecycle
- Weekly meeting on Wed @ 10:00 PT
- Office Hours: Weekly on Wed @ 06:00 AM and Tues @ 12:00 PT
- Slack: #cluster-api



KubeCon



CloudNativeCon

North America 2018

Questions?