



KubeCon



CloudNativeCon



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# Introduction to Virtual Kubelet

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# Who are we



## Ria Bhatia

Product Manager, Microsoft Azure

[@rbitia](https://twitter.com/rbitia)

Maintainer of Virtual Kubelet Core



# Who are we



## Sravan Rengarajan

Product Manager, Microsoft Azure Container Compute

Provider Maintainer, Virtual Kubelet

Azure Kubernetes Service

Azure Container Instances





Virtual Kubelet

# Virtual Kubelet



- Open Sourced by Microsoft in 2017
- Extend the Kubernetes API to serverless container platforms like ACI, AWS Fargate, Alibaba Cloud ECI.

Virtual Kubelet on Twitter: "We're so excited to finally share this with everyone – we're now a CNCF project 😊"

<https://twitter.com/virtualkubelet/status/1070004361558843392>

**Virtual Kubelet** @virtualkubelet

We're so excited to finally share this with everyone – we're now a CNCF project 😊

CNCF @CloudNativeFdn [NEWS] CNCF to host @virtualkubelet in the #CloudNative Sandbox 🎉  
[github.com/cncf/toc/pull/...](https://github.com/cncf/toc/pull/...)

9:18 AM - 4 Dec 2018

29 Retweets 51 Likes

Niamh rhymes with Steve @niamhcahill\_pdx · 4 Dec 2018

Replying to @virtualkubelet

I am very excited to be learning all about Virtual Kubelet at the Microsoft Open workshop next week (before KubeCon)

The session gives an introduction into VK and showcases the HashCorp #Nomad provider.



**New to Twitter?**  
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**Worldwide trends**

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- FansGoFurther
- BTSBillboardTopGroup
- KILLTHISLOVEwithBLACKPINK
- #ThursdayThoughts
- Jisoo
- Loren Gabel
- BTS PAVED THE WAY
- Justin Brazeau



Virtual  
Kubelet

**Announcing v1.0!**





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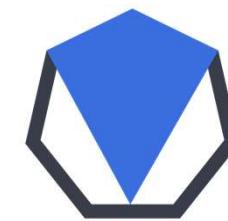
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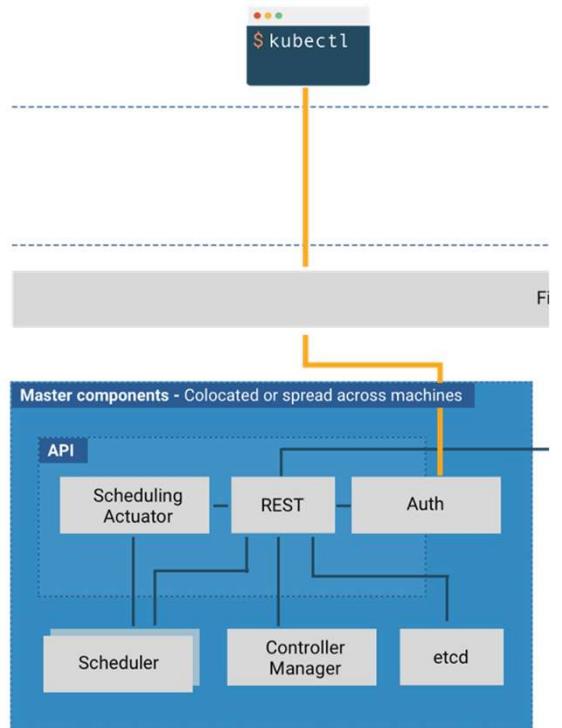
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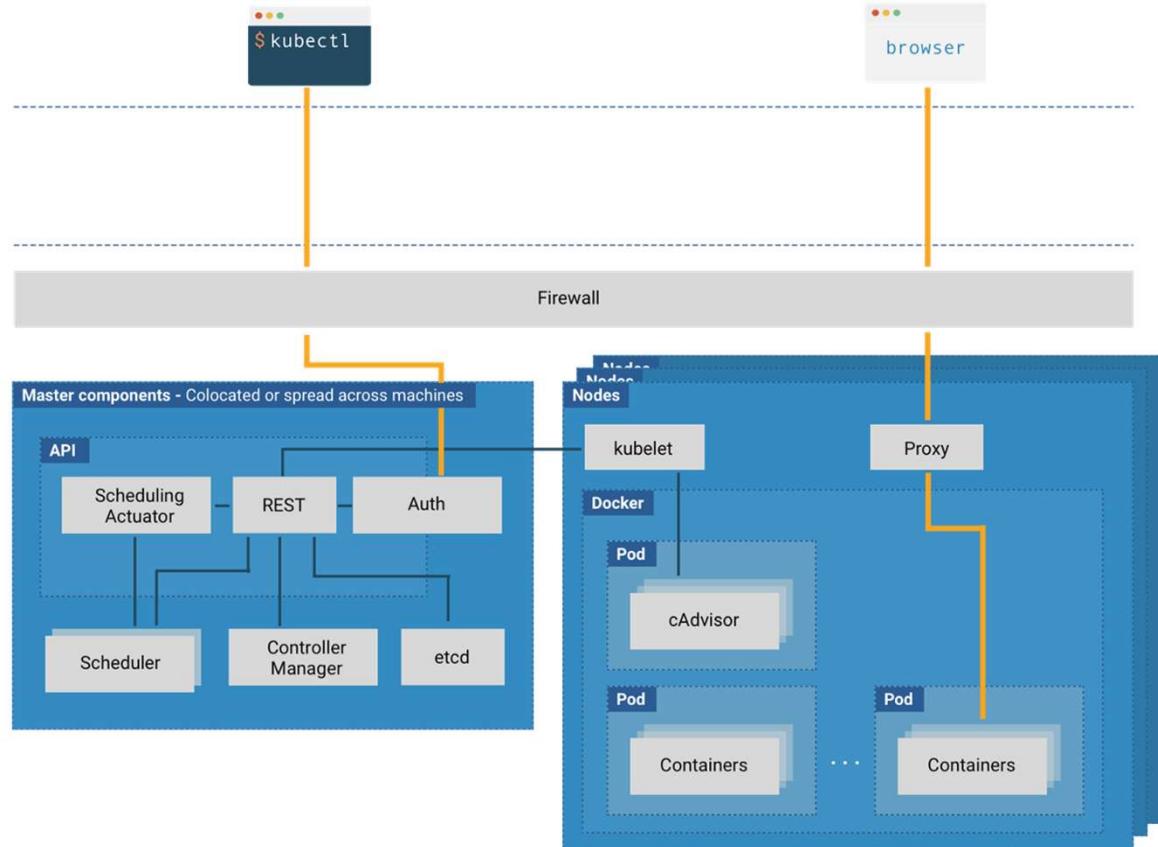
# Kubernetes Architecture

*In two slides....*

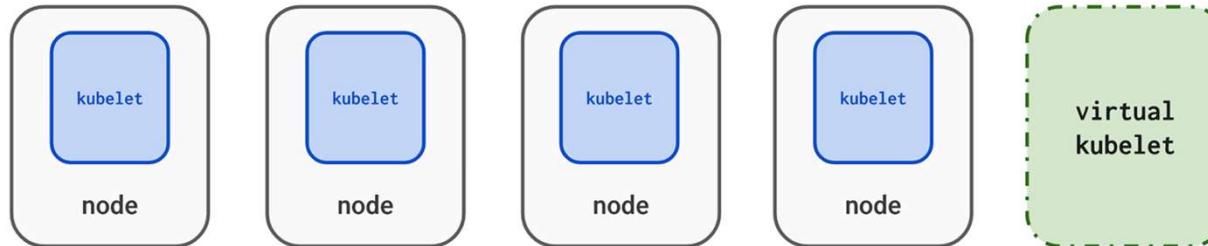
# A Long Time Ago.....







## Kubernetes API



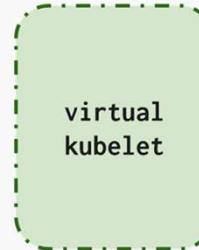
Typical kubelets implement the pod and container operations for each node as usual.

Virtual kubelet registers itself as a “node” and allows developers to deploy pods and containers with their own APIs.

OperatingSystem  
CreatePod

Capacity

UpdatePod



NodeConditions

GetPods

GetPodStatus

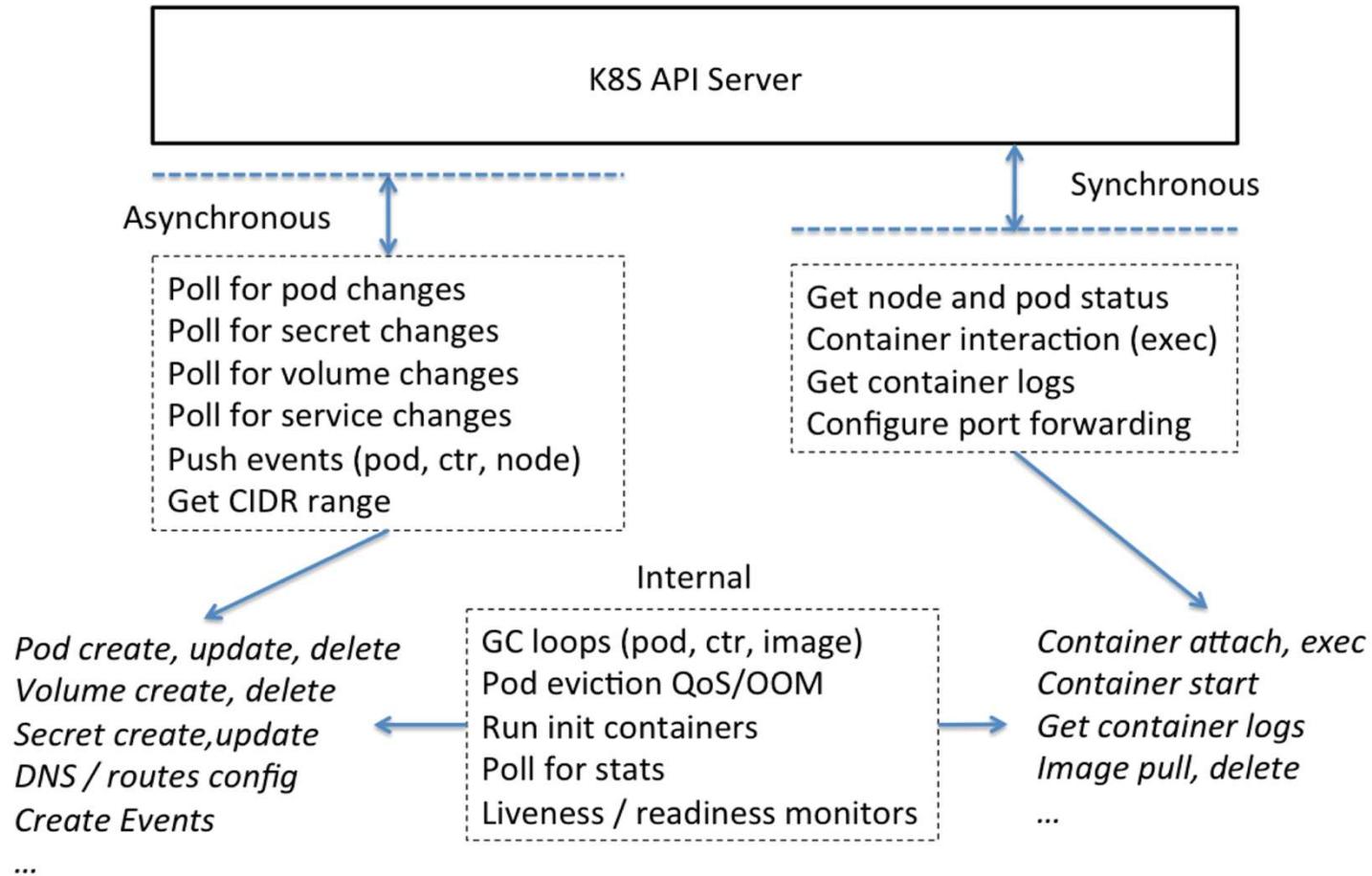
GetPod

# Anatomy of a Node



- Kubernetes is fundamentally a node-based scheduling system
- A node comes with a number of conventions and constraints
  - Pods are run in the same address space
  - Pods are executed using low-level operating system primitives (cgroups / namespaces)
  - Pods share node resources - kernel, ephemeral disk, container images
  - Pods inherit certain aspects of node configuration
  - Node is a static size
  - Privileged containers expect to interact directly with node resources
  - A node is a single fault domain - affinity consideration

# Anatomy of a Node: Node Agent



# Introduction to Virtual Kubelet



- VK treats the concept of pods and nodes *in the abstract*
  - A node is a bounded amount of resource
  - A pod is a set of containers running within a sandbox
- The specifics of how these are manifested is contained within a pluggable Provider
- Common code in VK is relatively small
  - Registers with the API server as a client
  - Polls for state changes in Objects
  - Reports back state of "node" and "pods"
  - Handles synchronous interaction with containers
- VK can itself be deployed as a Pod

# Why Virtual Kubelet?



- Flexibility of abstraction
- Flexibility of resource consumption
  - Greater granularity – pay for pods, not nodes
- Hybrid use-case - traditional cluster with a VK node for bursting / batch / on-demand pricing
- Single cluster high availability - a VK in each availability zone
- IOT edge connector - a VK schedules to a set of IOT devices
- Alternate Kubelet – VK as a node agent in a different kind of node



# Provider Interface

EDITOR

```
// Provider contains the methods required to implement a Virtual Kubelet provider
type Provider interface {
    // Takes a Kubernetes Pod and deploys it within the provider
    CreatePod(ctx context.Context, pod *v1.Pod) error

    // Takes a Kubernetes Pod and updates it within the provider
    UpdatePod(ctx context.Context, pod *v1.Pod) error

    // Takes a Kubernetes Pod and deletes it from the provider
    DeletePod(ctx context.Context, pod *v1.Pod) error

    // Retrieves a pod by name from the provider (can be cached)
    GetPod(ctx context.Context, namespace, name string) (*v1.Pod, error)

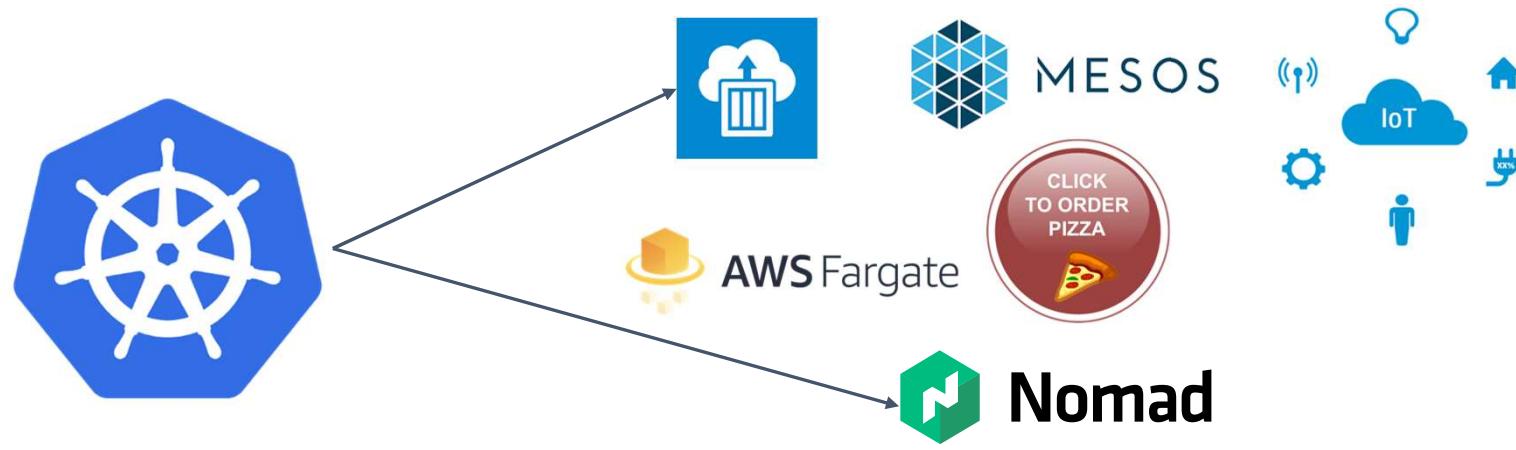
    // Retrieves the logs of a container by name from the provider
    GetContainerLogs(ctx context.Context, namespace, podName, containerName string, tail int) (string, error)
}

.....
```

# Provider Definition



- Provide the back-end plumbing necessary to support the lifecycle management of pods, containers and supporting resources in the context of Kubernetes.
- Conform to the current API provided by Virtual Kubelet.
- Not have access to the Kubernetes API Server and has a well-defined callback mechanism for getting data like secrets or configmaps.



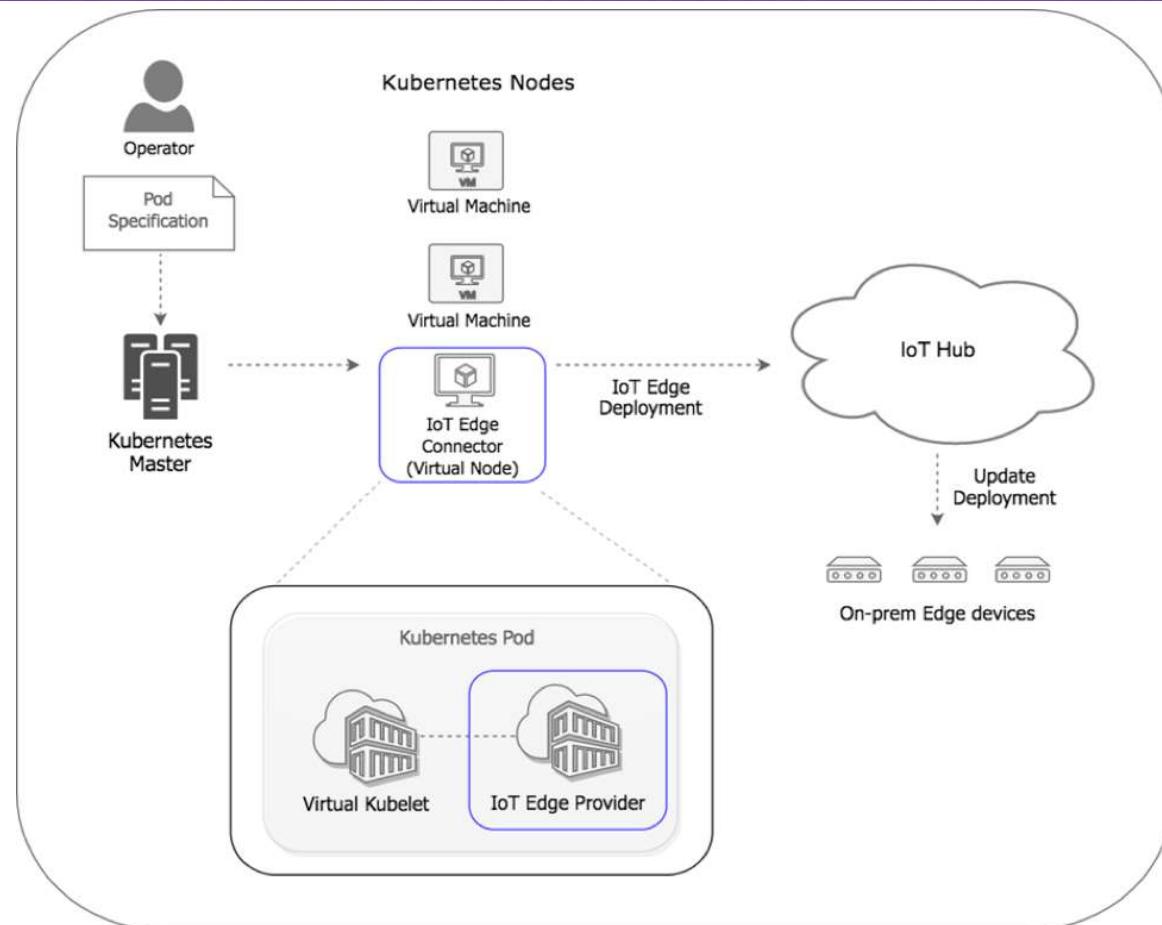
Extend Kubernetes workloads to any service you like!

# Providers in Virtual Kubelet

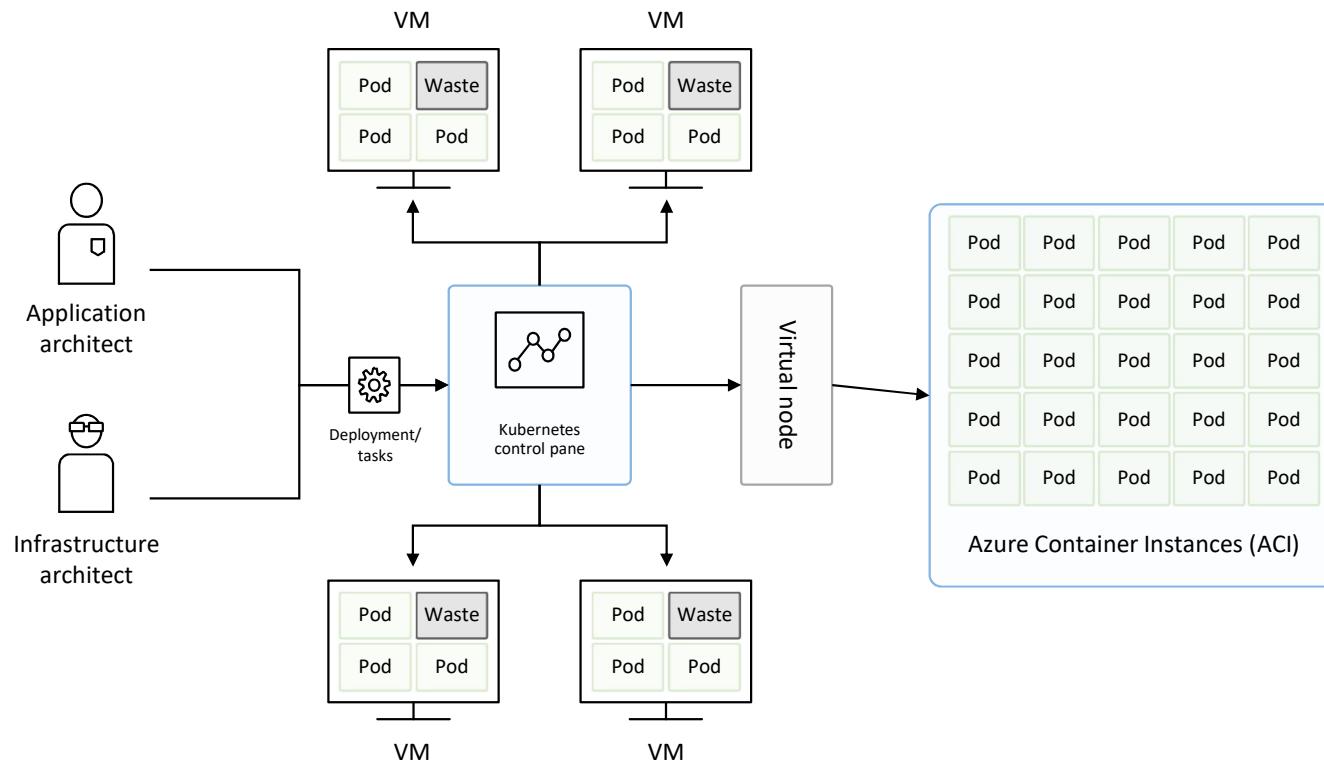


	alibabacloud	Decouple vkubelet/* packages from providers (#626)	3 days ago
	aws	Decouple vkubelet/* packages from providers (#626)	3 days ago
	azure	Decouple vkubelet/* packages from providers (#626)	3 days ago
	azurebatch	Decouple vkubelet/* packages from providers (#626)	3 days ago
	cri	Decouple vkubelet/* packages from providers (#626)	3 days ago
	huawei	Upgrade to Go 1.12 (#630)	4 hours ago
	mock	Decouple vkubelet/* packages from providers (#626)	3 days ago
	nomad	Decouple vkubelet/* packages from providers (#626)	3 days ago
	openstack	Decouple vkubelet/* packages from providers (#626)	3 days ago
	register	Remove VIC provider code.	14 days ago
	web	Decouple vkubelet/* packages from providers (#626)	3 days ago

# IoT Edge with Virtual Kubelet



# Virtual Node architecture in AKS



# Tolerance to Pod Spec

```
spec:  
  tolerations:  
    - key: virtual-kubelet.io/provider  
      operator: Exists  
    - effect: NoSchedule  
      key: azure.com/aci
```

# Affinities to Burst Out to ACI

```
spec:  
  affinity:  
    nodeAffinity:  
      preferredDuringSchedulingIgnoredDuringExecution:  
        - preference:  
            matchExpressions:  
              - key: type  
                operator: NotIn  
                values:  
                  - virtual-kubelet
```



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# Demo – AKS and ACI



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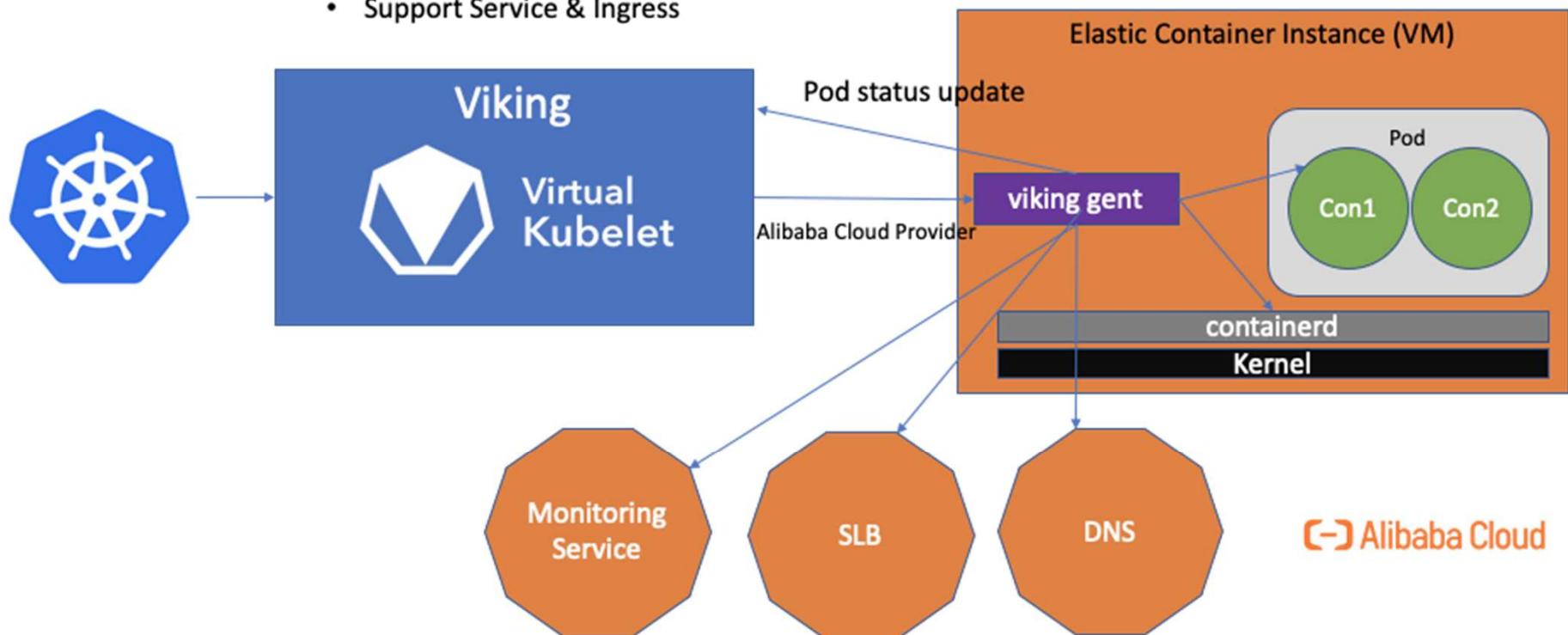
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Video goes here

# Extend Kubernetes to Alibaba

- Viking: Pod lifecycle, networking, service discovery
  - kubelet + kube-proxy + kube-dns
  - Support Service & Ingress



As cloud provider, we offer public cloud product: **Serverless Kubernetes**



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# Thank you!!





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