



**Virtual
Kubelet**



KubeCon



CloudNativeCon

Europe 2019

Introduction to Virtual Kubelet

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Ria Bhatia

Program Manager, Microsoft
@rbitia
Maintainer of Virtual Kubelet Core





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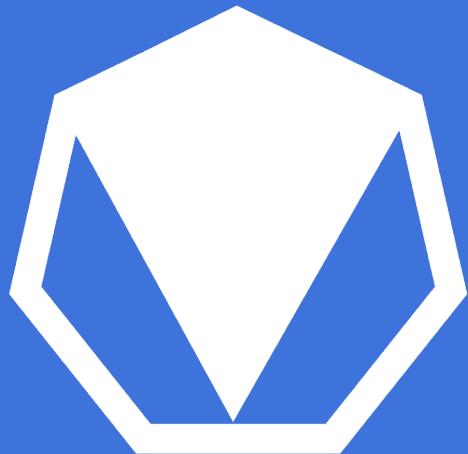
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Anubhav Mishra

Team Lead, Developer Advocacy, HashiCorp
@anubhavm

- Kubernetes Community
- Provider Maintainer, Virtual Kubelet
- Helm, Secret CSI Driver



Virtual Kubelet

Virtual Kubelet



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- Open Sourced by Microsoft in 2017
- Extend the Kubernetes API to serverless container platforms like ACI, Fargate, Google Containers.

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

Replies to @virtualkubelet

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

New to Twitter?

Sign up

Worldwide trends

StudentsSayNo Ontario students to walk out of class in protest education cuts

FansGoFurther

BTSBillboardTopGroup 18M Tweets

KILLTHISLOVEwithBLACKPINK BLACKPINK set to release Kill This Love EP

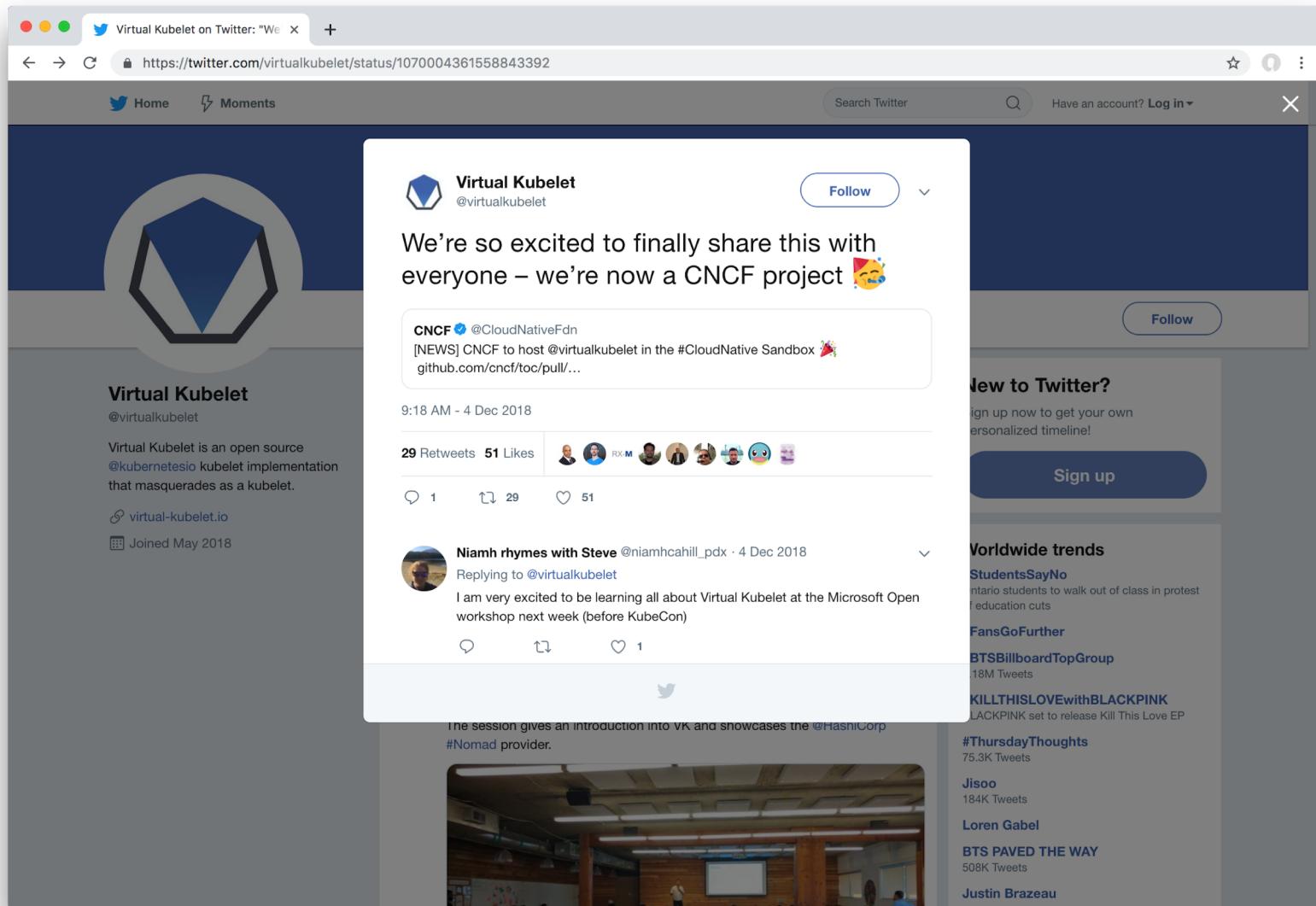
#ThursdayThoughts 75.3K Tweets

Jisoo 184K Tweets

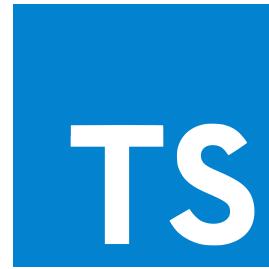
Loren Gabel

BTS PAVED THE WAY 508K Tweets

Justin Brazeau



A Long Time Ago.....





Virtual
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Announcing v1.0!





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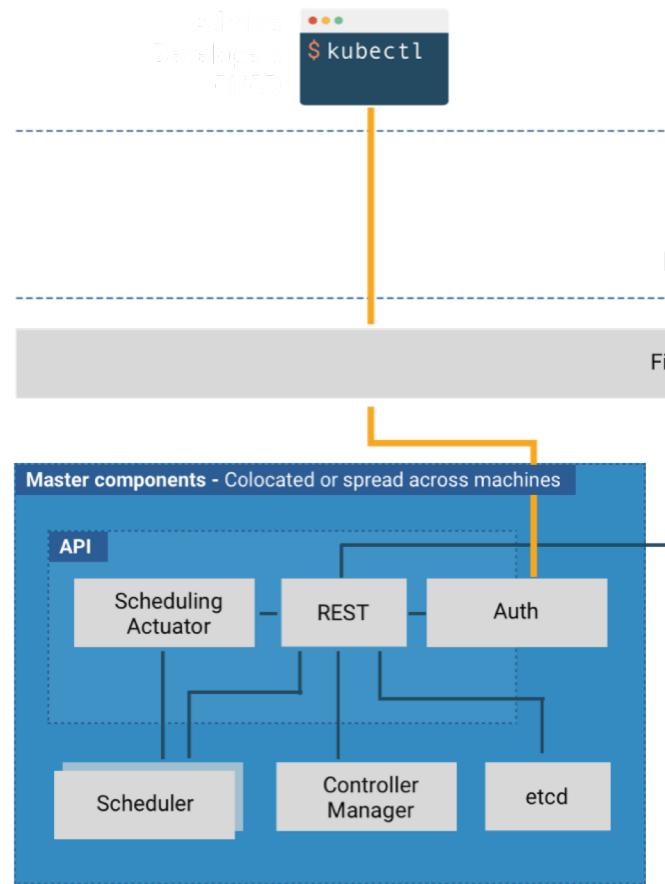


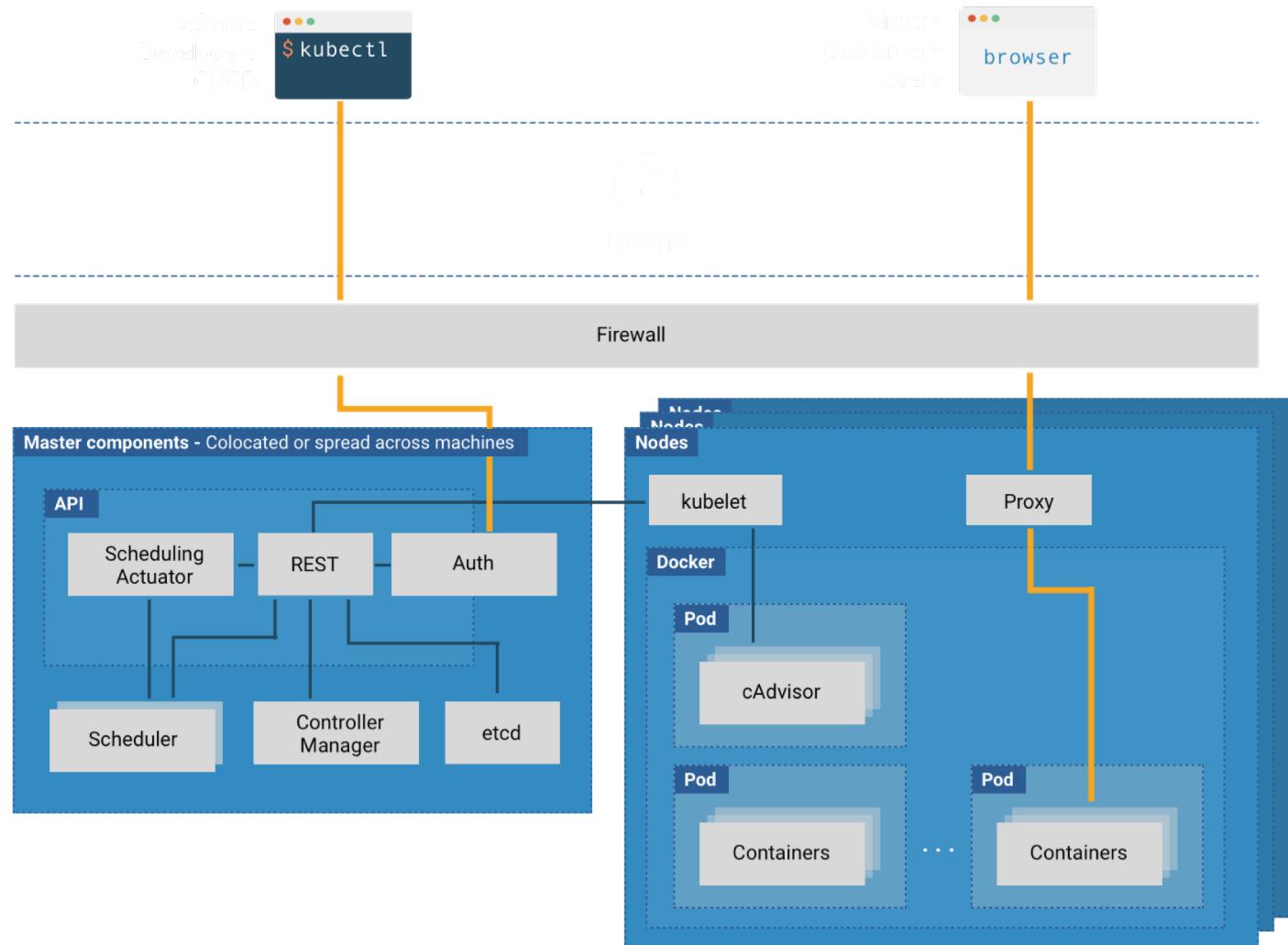
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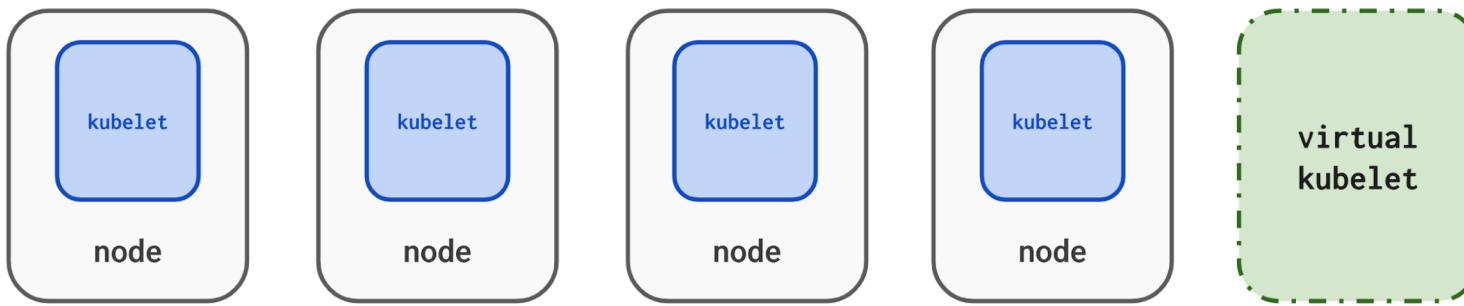
Kubernetes Architecture

In two slides.....





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.

Capacity

OperatingSystem

CreatePod

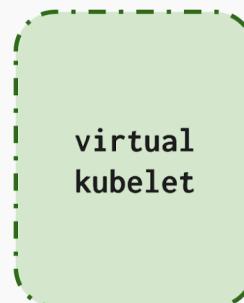
UpdatePod

NodeConditions

GetPods

GetPodStatus

GetPod



Anatomy of a Node



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- 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

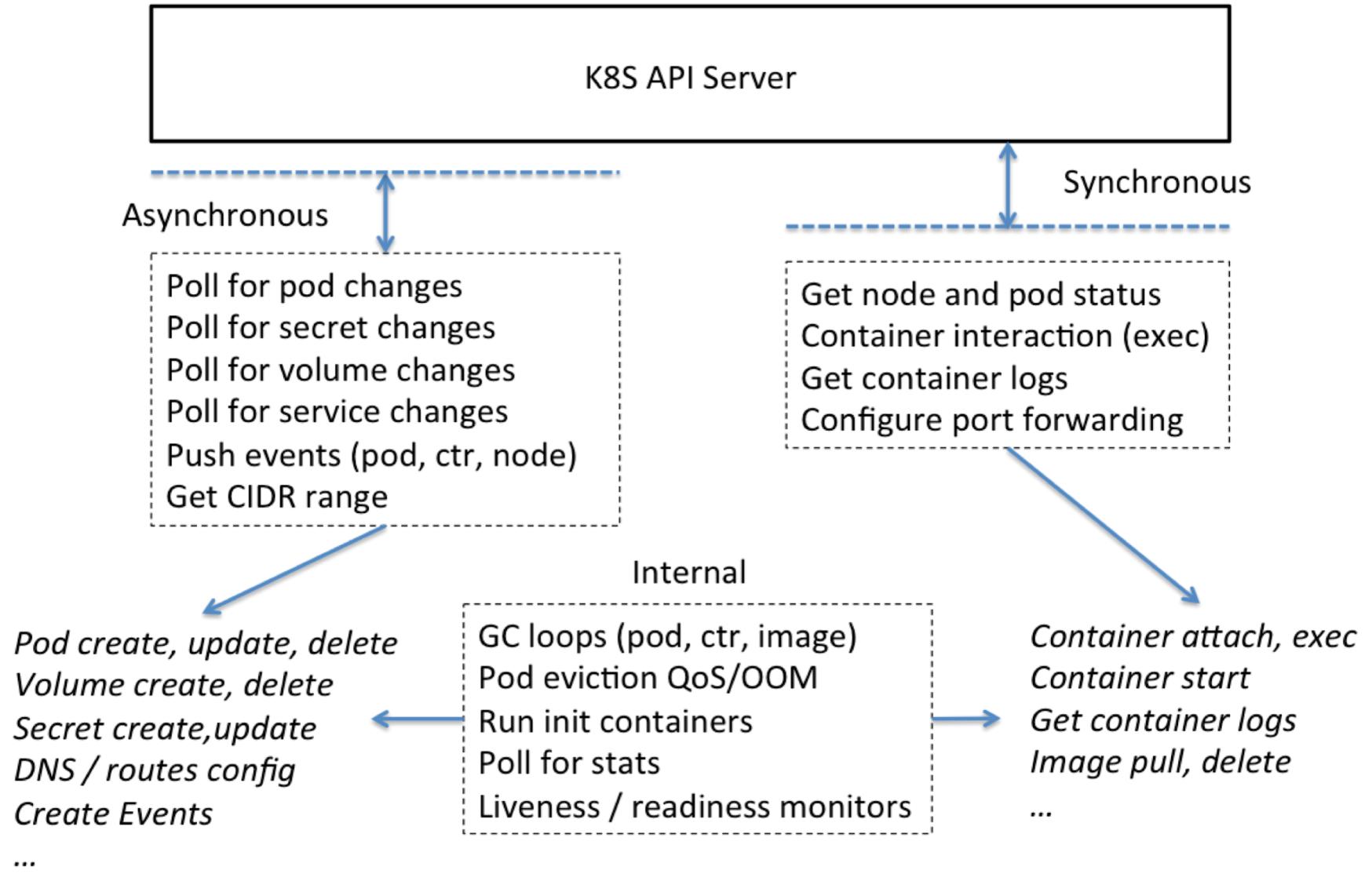
Anatomy of a Node: Node Agent



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- 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?



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- 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



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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)

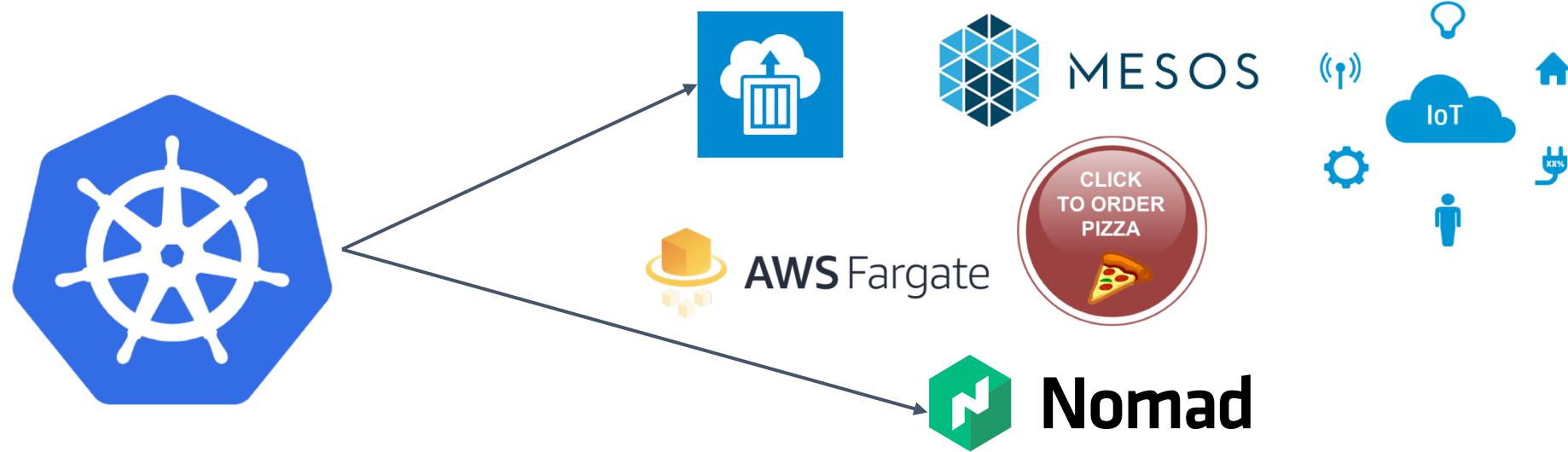
    ....
```

Provider Definition



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- 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



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 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

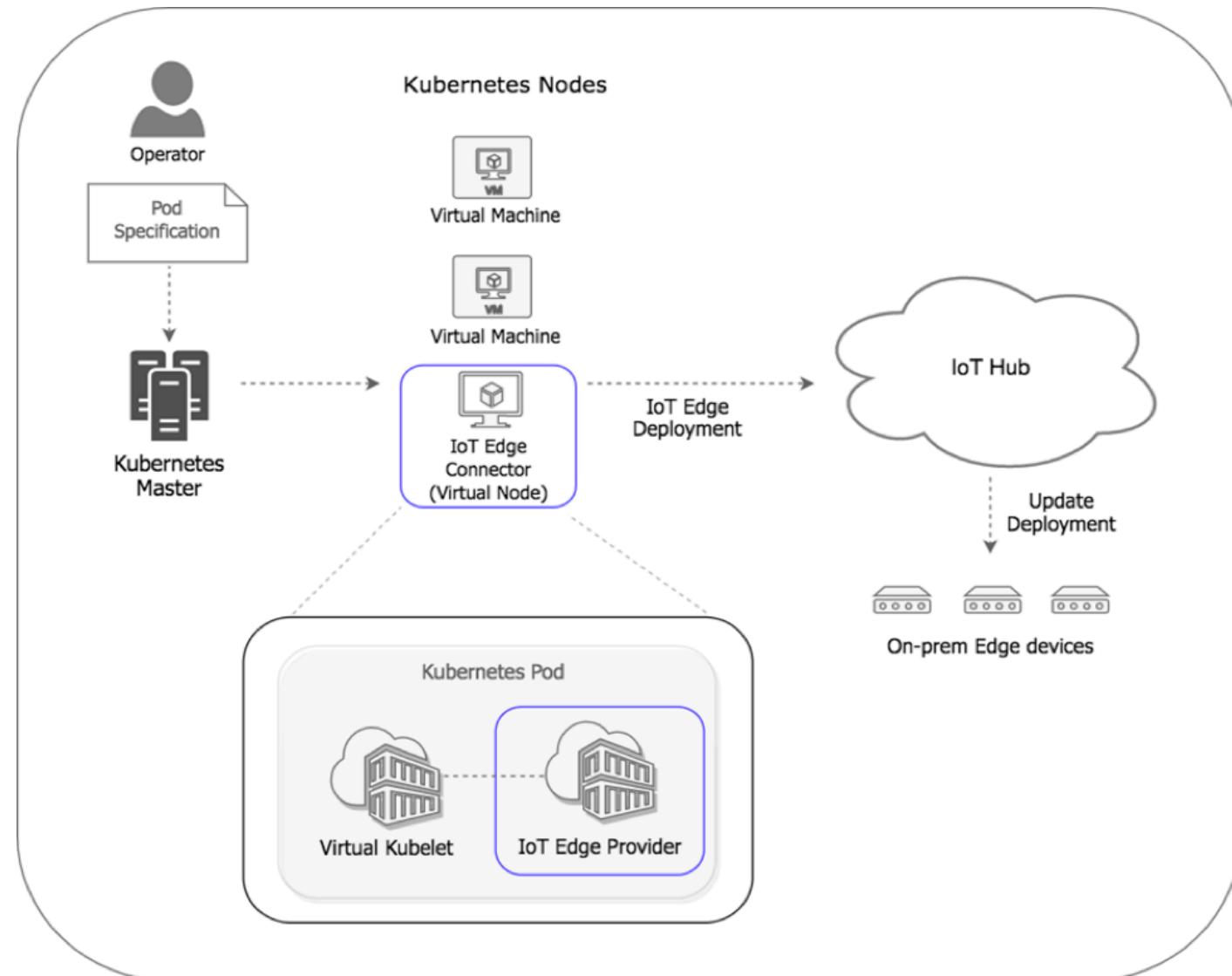
IoT Edge with Virtual Kubelet



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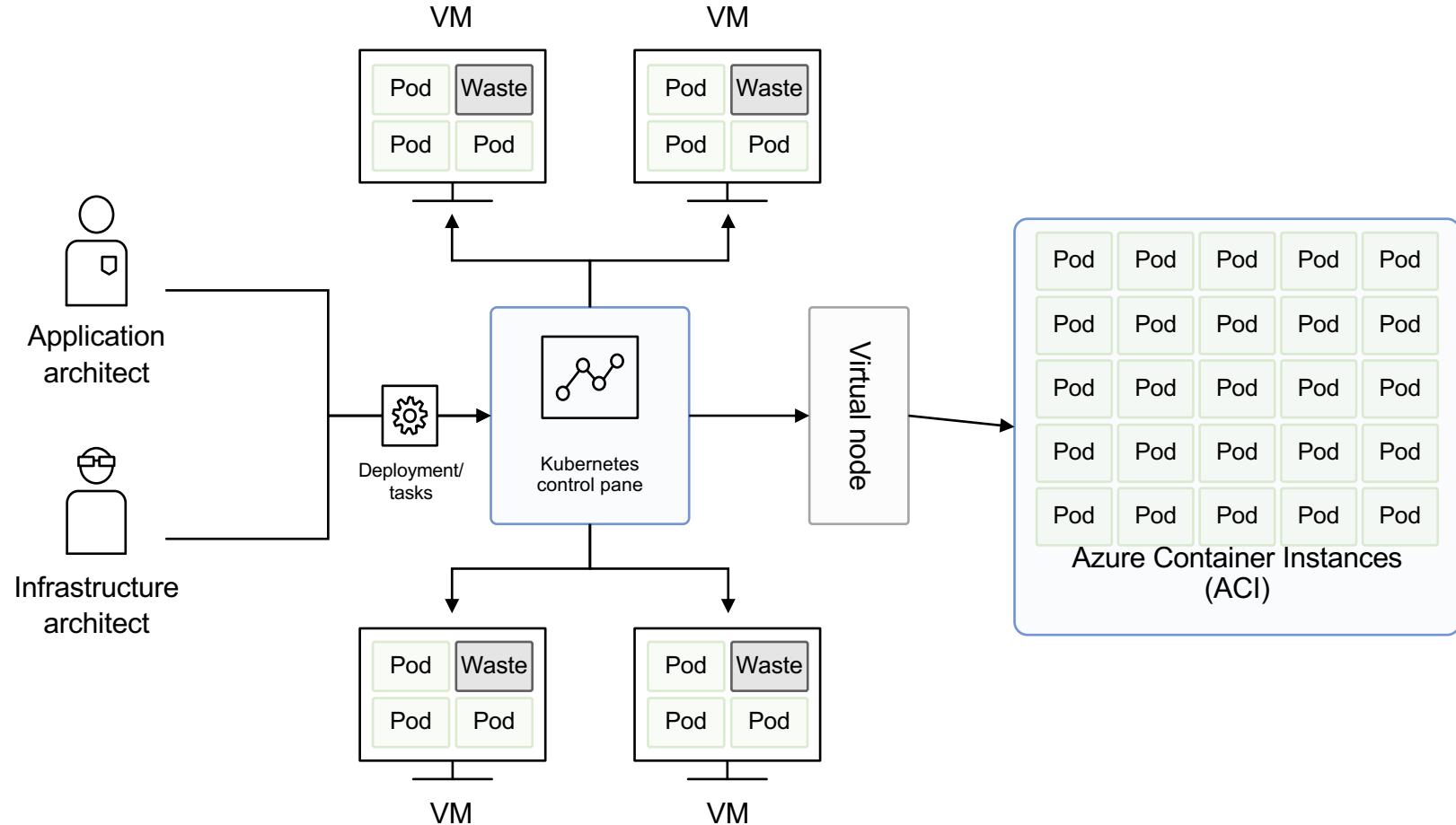
Virtual Node architecture in AKS



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Tolerance to Pod Spec



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

Affinities to Burst Out to ACI



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



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Demo – AKS and ACI

Azure-Samples/virtual-node-a | Grafana - RPS Demo | Scale - Microsoft Azure

https://8291c2e89d7f4beeb03e.westus2.aksapp.io

Apps Bing Outlook VSTS for ACI aci-connector-k8 ... Azure Azure Docs GitHub Helm Connec2Cluster ACI-Talk Mail MS prom ACI rest-api

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RECOMMENDED



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Another demo.

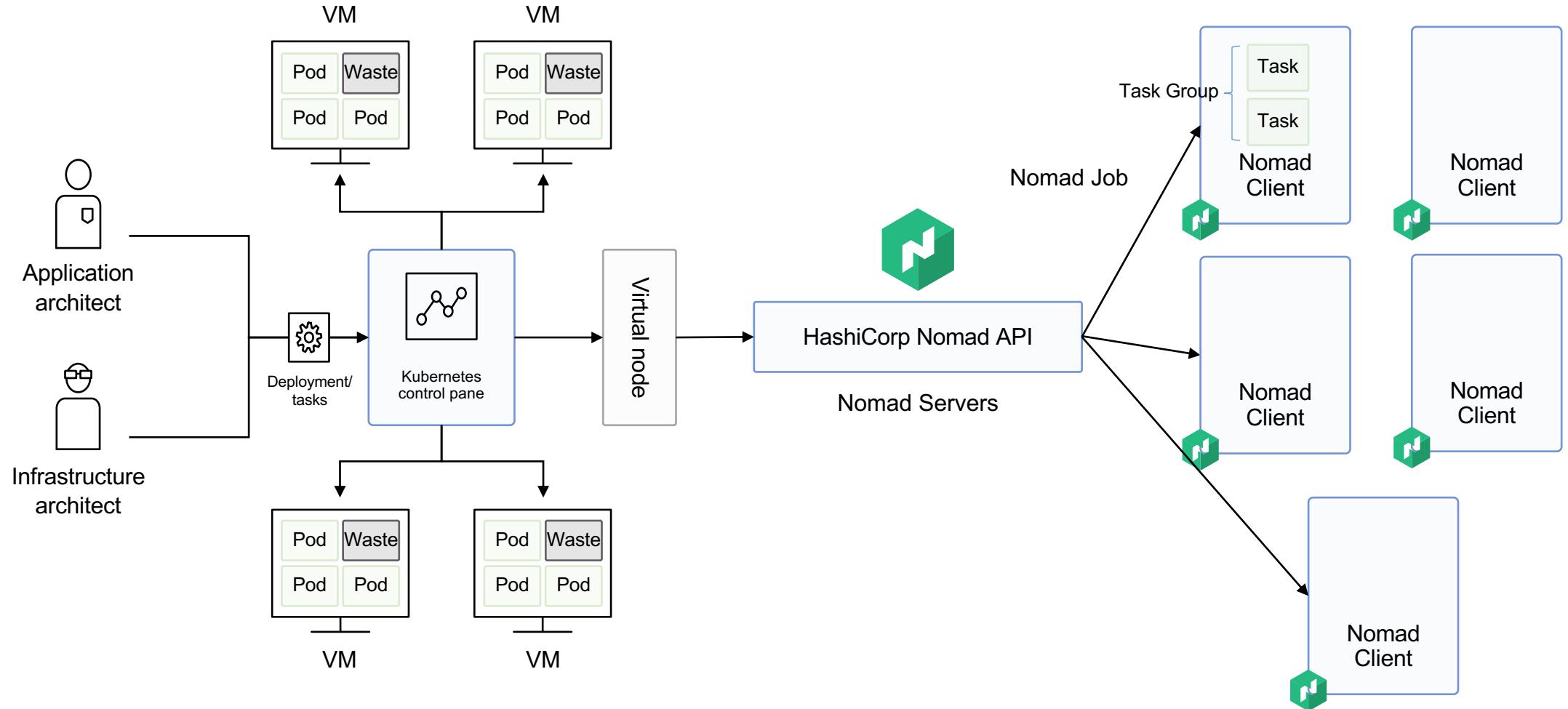
Extend Kubernetes to Nomad



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Demo – Nomad



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Thanks! Questions?

Deep Dive: Virtual Kubelet

by Jeremy Rickard, Microsoft & Lei Zhang, Alibaba Cloud

Wednesday, May 22 • 14:00 - 14:35

Hall 8.0 E1