Navigating the Sea of Kubernetes Local Clusters

Ara Pulido, Developer Relations at Datadog

Datadog is a monitoring and analytics platform that helps companies improve observability of their infrastructure and applications

Developer Relations at Datadog

Working on Kubernetes projects for 3 years

CKA; part of the team that created CKAD
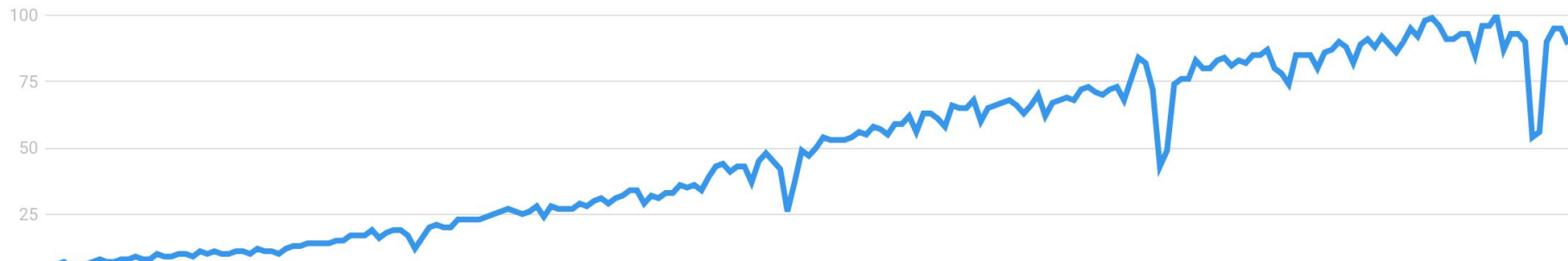
@arapulido
ara.pulido@datadoghq.com

19 major releases since **2015**

+90k commits

+2k contributors

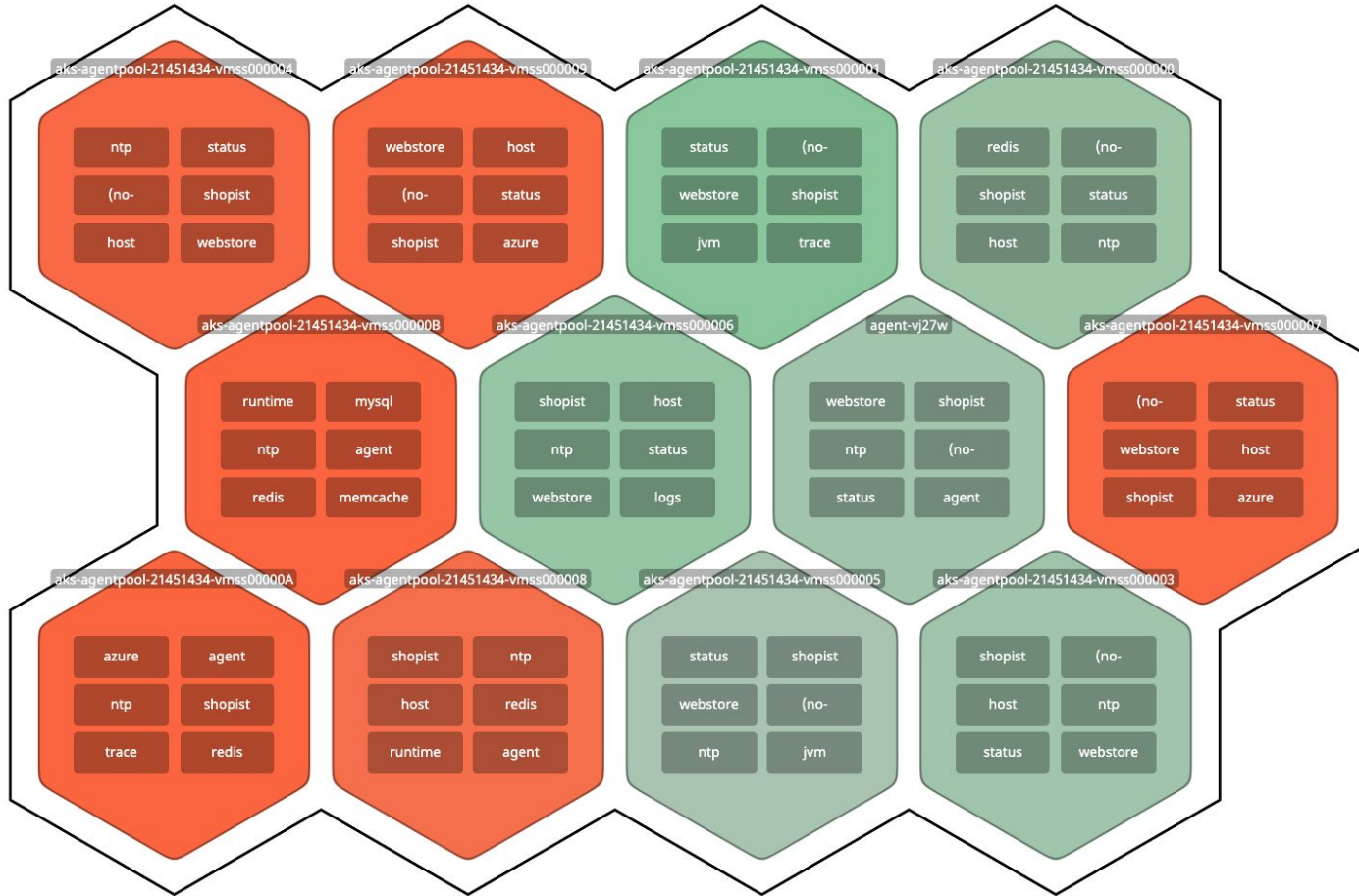# Kubernetes popularity since 2016

Companies are choosing K8s

- KUBERNETES IS EXTENSIBLE AND FLEXIBLE (API DRIVEN)

- IT HAS A LARGE COMMUNITY

- IT HELPS WITH MULTI-CLOUD STRATEGY

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Developer experience

```
minecraftPeServersApp                              1   import React, { Component } from 'react';
  __tests__                                         2   import {
  .git                                              3       TouchableHighlight,
  android                                           4       RefreshControl,
  app                                               5       Platform,
    assets                                          6       AppState
    components                                      7   } from 'react-native';
    config                                          8   import { Toast, Card, CardItem, Containe
    screens                                         9   import { Col, Grid } from 'react-native-
      About.js                                     10   import Icon from 'react-native-vector-ic
      Favorites.js                                 11   var _ = require('lodash');
      FilterServers.js                             12   import firebase from 'react-native-fire
      News.js                                      13
      Server.js                                    14   import ServerComp from '../components/S
      Servers.js                                   15   import Data from '../utilities/Data';
      Submit.js                                    16   import Cache from '../utilities/Cache';
      Tutorial.js                                  17
    utilities                                      18   /* Admob */
    .DS_Store                                      19   const advert = firebase.admob().inters
    index.js                                       20   const AdRequest = firebase.admob.AdReq
  ios                                              21   const request = new AdRequest();
  node_modules                                     22
  PSD                                              23   export default class Servers extends
                                                   24       constructor(props) {
app/screens/Servers.js    9  0 0       18:12                                        LF  UTF-8
```

No :(

Yes!

Why local clusters are useful?

- Great Learning Tool

- Quick Feedback Loop

- Good for CI/CD Workflows

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The sea of local Kubernetes clusters

Containers

The sea of local Kubernetes clusters
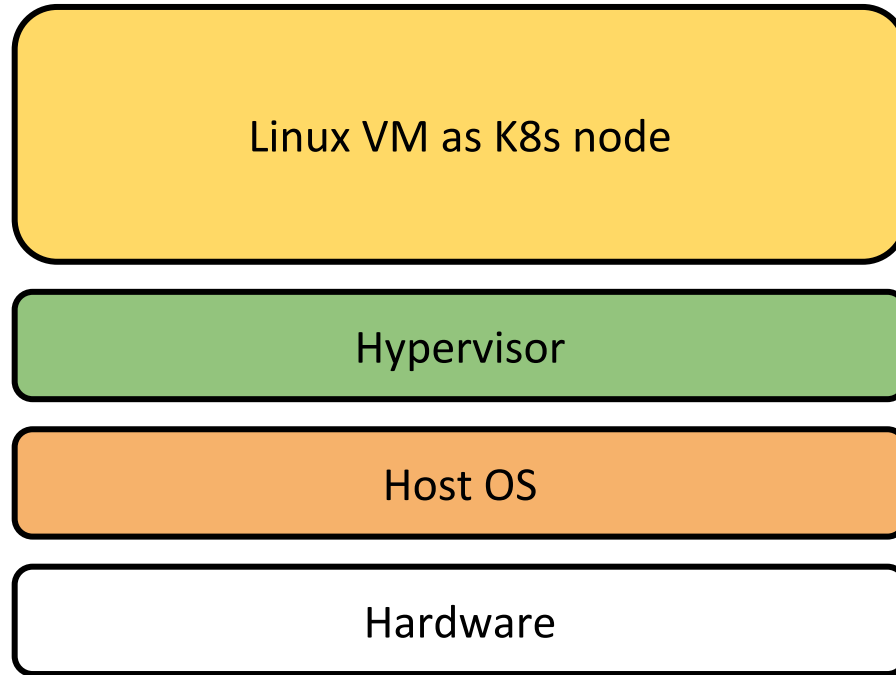
- MINIKUBE

- KIND

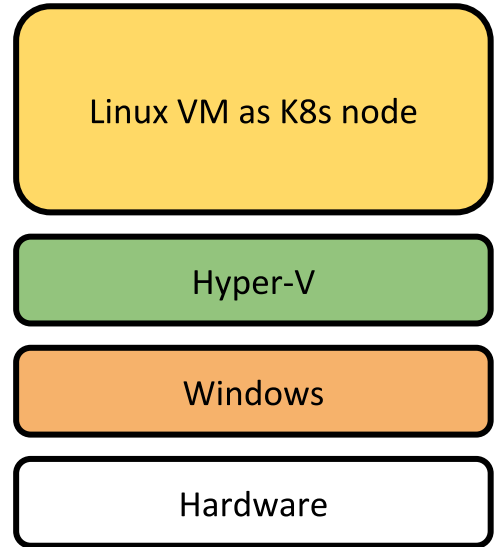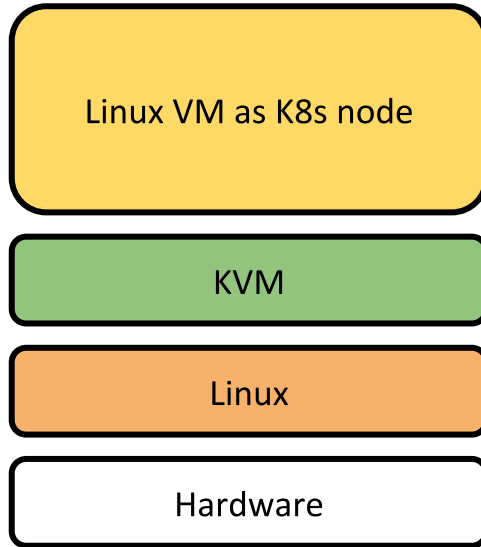- MICROK8S

- K3S / K3D

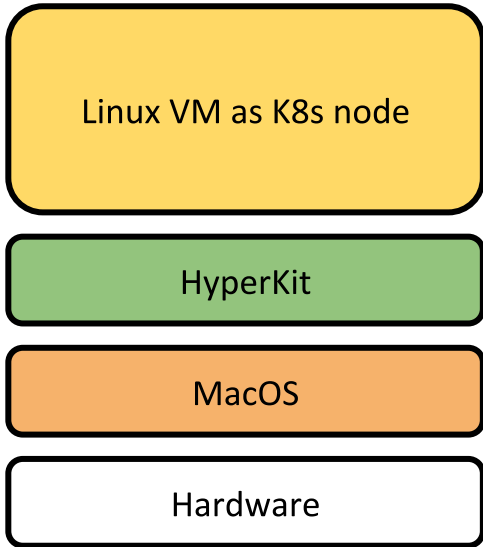- FIREKUBE

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minikube

minikube

- Started in 2016, a year after the first Kubernetes release

- Cross platform (Linux, MacOS, Windows)

- Follows Kubernetes stable releases

- LoadBalancer, NodePort, Ingress, Container Runtimes

- Single Node Cluster

- Add-ons based

minikube

Linux VM as K8s node

Hypervisor

Host OS

Hardware

minikube

Linux VM as K8s node	Linux VM as K8s node	Linux VM as K8s node
HyperKit	KVM	Hyper-V
MacOS	Linux	Windows
Hardware	Hardware	Hardware

```
ara.pulido@COMP-C02YX0HHLVDP:~$ minikube status
🤷  There is no local cluster named "minikube"
👉  To fix this, run: "minikube start"
ara.pulido@COMP-C02YX0HHLVDP:~$ minikube start
😄  minikube v1.9.2 on Darwin 10.14.6
✨  Automatically selected the hyperkit driver. Other choices: docker, virtualbox
👍  Starting control plane node m01 in cluster minikube
🔥  Creating hyperkit VM (CPUs=2, Memory=4000MB, Disk=20000MB) ...
🐳  Preparing Kubernetes v1.18.0 on Docker 19.03.8 ...
🌟  Enabling addons: default-storageclass, storage-provisioner
🎉  Done! kubectl is now configured to use "minikube"
ara.pulido@COMP-C02YX0HHLVDP:~$
```

```
ara.pulido@COMP-C02YX0HHLVDP:~$ minikube status
🤷  There is no local cluster named "minikube"
👉  To fix this, run: "minikube start"
ara.pulido@COMP-C02YX0HHLVDP:~$ minikube start
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🌟  Enabling addons: default-storageclass, storage-provisioner
🎉  Done! kubectl is now configured to use "minikube"
ara.pulido@COMP-C02YX0HHLVDP:~$ kubectl get nodes
NAME       STATUS   ROLES    AGE    VERSION
minikube   Ready    master   81m    v1.18.0
ara.pulido@COMP-C02YX0HHLVDP:~$
```

kind - Kubernetes In Docker

- Started in 2019

- Works anywhere Docker works

- Was designed for automated testing of Kubernetes itself (CI)

- Uses "container nodes" with systemd, a CRI, Kubernetes

- Multi-node cluster

DATADOG

kind

Container Node

Docker

Container Node

Docker

Docker

Host OS

Hardware

DATADOG

kind

Container Node
Docker

Container Node
Docker

Docker
Linux

Hardware

LinuxKit VM
Node — CRI
Node — CRI
Docker

HyperKit
MacOS
Hardware

LinuxKit VM
Node — CRI
Node — CRI
Docker

Hyper-V
Windows
Hardware

DATADOG
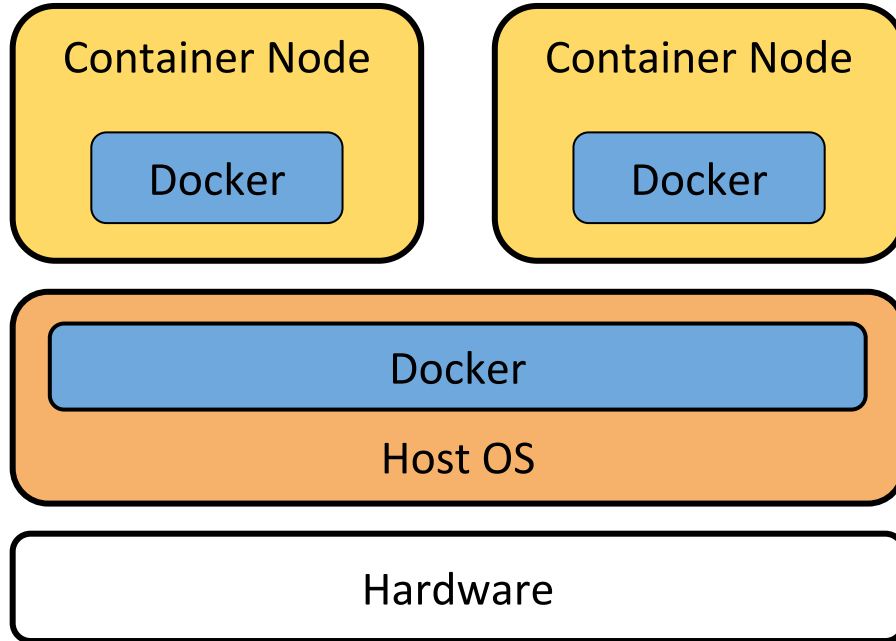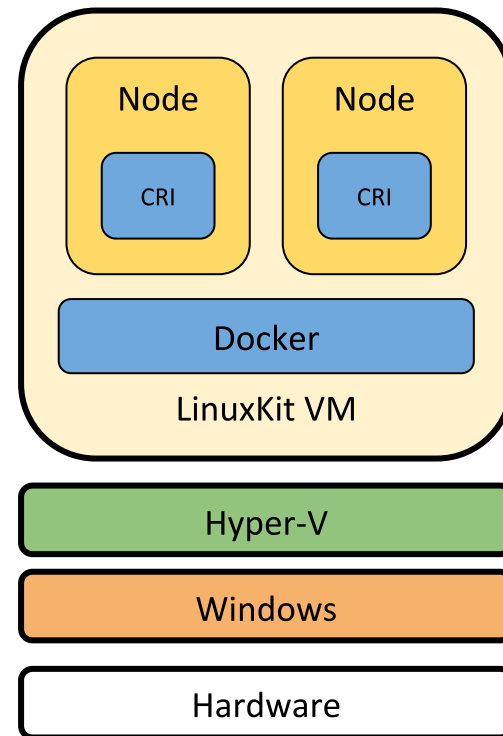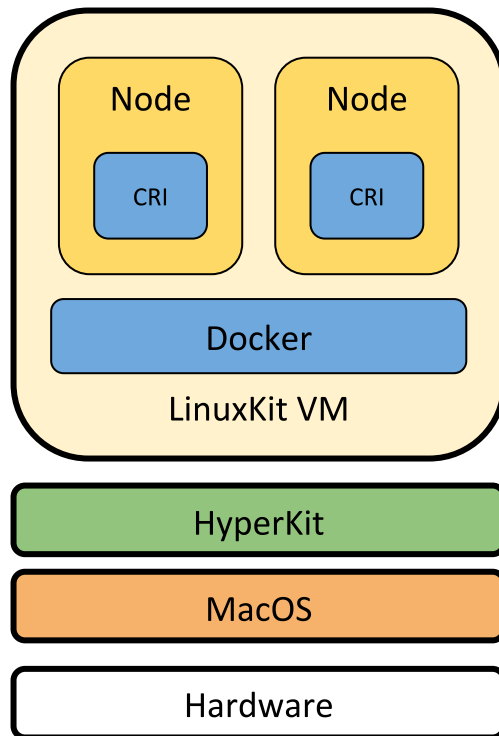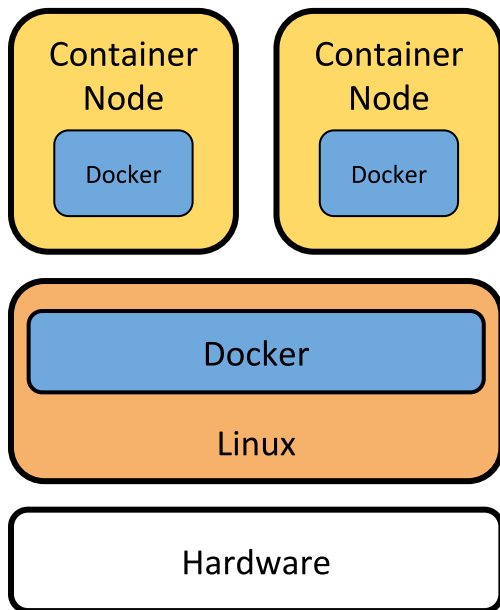
kind

```
kind: Cluster
apiVersion: kind.x-k8s.io/v1alpha4
nodes:
- role: control-plane
  image: kindest/node:v1.18.0
- role: worker
  image: kindest/node:v1.18.0
```

```
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/kind$ kubectl get nodes
NAME                 STATUS   ROLES    AGE   VERSION
kind-control-plane   Ready    master   81m   v1.18.0
kind-worker          Ready    <none>   80m   v1.18.0
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/kind$
```

```
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/kind$ kubectl get nodes
NAME                  STATUS   ROLES    AGE   VERSION
kind-control-plane    Ready    master   81m   v1.18.0
kind-worker           Ready    <none>   80m   v1.18.0
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/kind$ docker ps
CONTAINER ID        IMAGE                   COMMAND                CREATED            STATUS
    PORTS                        NAMES
49c35555d26a        kindest/node:v1.18.0    "/usr/local/bin/entr…"  About an hour ago   Up About an hour
    127.0.0.1:32768->6443/tcp    kind-control-plane
8a2ad04669f8        kindest/node:v1.18.0    "/usr/local/bin/entr…"  About an hour ago   Up About an hour
                                 kind-worker
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/kind$
```

```
  Normal    NodeHasSufficientMemory    12m (x5 over 12m)    kubelet, kind-control-plane    Node kind-control-plane sta
tus is now: NodeHasSufficientMemory
  Normal    NodeHasNoDiskPressure      12m (x5 over 12m)    kubelet, kind-control-plane    Node kind-control-plane sta
tus is now: NodeHasNoDiskPressure
  Normal    NodeHasSufficientPID       12m (x5 over 12m)    kubelet, kind-control-plane    Node kind-control-plane sta
tus is now: NodeHasSufficientPID
  Normal    Starting                   12m                  kubelet, kind-control-plane    Starting kubelet.
  Normal    NodeHasSufficientMemory    12m                  kubelet, kind-control-plane    Node kind-control-plane sta
tus is now: NodeHasSufficientMemory
  Normal    NodeHasNoDiskPressure      12m                  kubelet, kind-control-plane    Node kind-control-plane sta
tus is now: NodeHasNoDiskPressure
  Normal    NodeHasSufficientPID       12m                  kubelet, kind-control-plane    Node kind-control-plane sta
tus is now: NodeHasSufficientPID
  Normal    NodeAllocatableEnforced    12m                  kubelet, kind-control-plane    Updated Node Allocatable li
mit across pods
  Warning   readOnlySysFS              11m                  kube-proxy, kind-control-plane  CRI error: /sys is read-onl
y: cannot modify conntrack limits, problems may arise later (If running Docker, see docker issue #24000)
  Normal    Starting                   11m                  kube-proxy, kind-control-plane  Starting kube-proxy.
  Normal    NodeReady                  11m                  kubelet, kind-control-plane    Node kind-control-plane sta
tus is now: NodeReady
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/kind$ kubectl get pods
NAME                              READY    STATUS    RESTARTS    AGE
advertisements-655d5d4cdc-pg4w9   1/1      Running   0           10m
db-6ddf48c95-c6g2r                1/1      Running   0           10m
discounts-dfd9bbdbb-hrknm         1/1      Running   0           10m
frontend-8695cb4c7c-zfvs4         1/1      Running   0           10m
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/kind$
```

5429.8 ms

storedog

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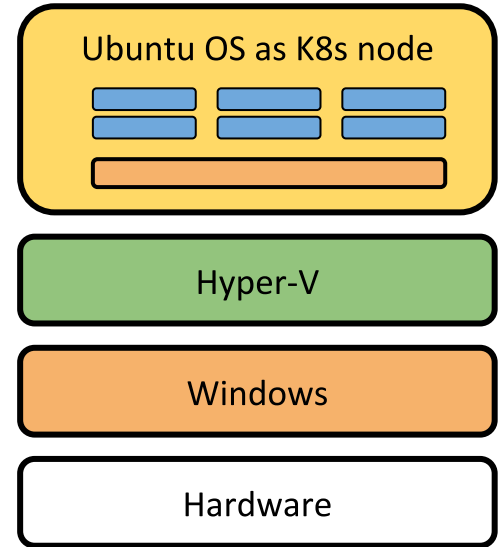
Datadog Jr. Spaghetti
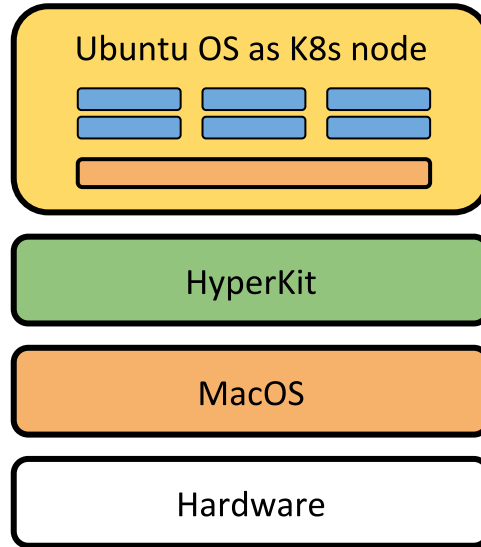
$19.99

microK8s

microk8s

- K8s distribution aimed for developers & IoT devices

- Made by Canonical and packaged as a snap

- Better tested in Ubuntu than other distributions

- flanneld CNI by default

- Multi-node clusters

- Add-ons based

microk8s
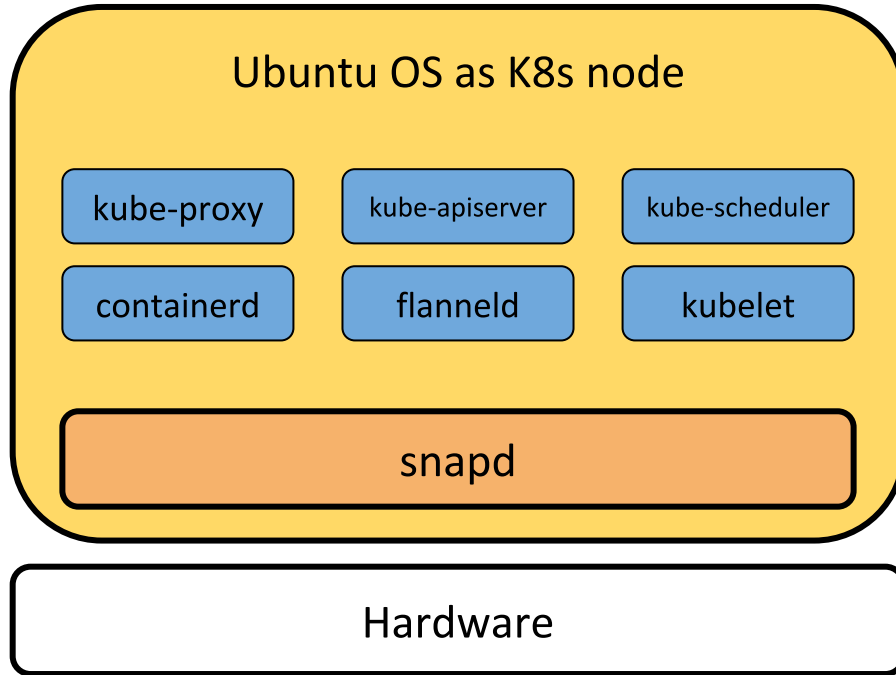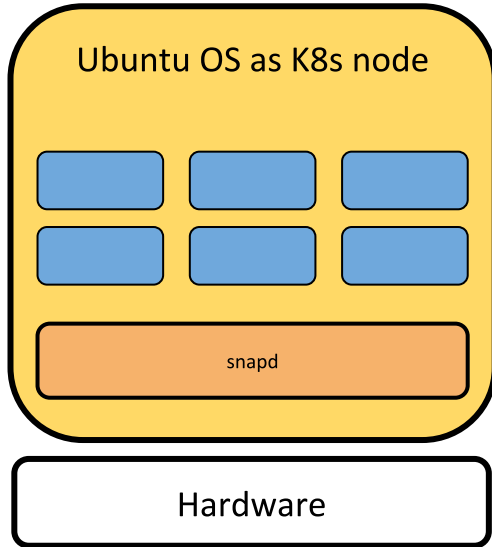
Ubuntu OS as K8s node

- kube-proxy
- kube-apiserver
- kube-scheduler
- containerd
- flanneld
- kubelet

snapd

Hardware

DATADOG

microK8s

Ubuntu OS as K8s node	Ubuntu OS as K8s node	Ubuntu OS as K8s node
	HyperKit	Hyper-V
snapd	MacOS	Windows
Hardware	Hardware	Hardware

microK8s

DATADOG

```
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/microk8s$ multipass launch -n control-plane --mem 4G --disk 40G
Launched: control-plane
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/microk8s$ multipass shell control-plane
Welcome to Ubuntu 18.04.4 LTS (GNU/Linux 4.15.0-96-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

  System information as of Mon Apr 20 13:09:05 CEST 2020

  System load:  0.48              Processes:               114
  Usage of /:   2.5% of 38.60GB   Users logged in:         0
  Memory usage: 3%                IP address for enp0s2: 192.168.64.19
  Swap usage:   0%


0 packages can be updated.
0 updates are security updates.


To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@control-plane:~$ █
```

```
Launched: control-plane
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/microk8s$ multipass shell control-plane
Welcome to Ubuntu 18.04.4 LTS (GNU/Linux 4.15.0-96-generic x86_64)

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   Memory usage: 3%                 IP address for enp0s2: 192.168.64.19
   Swap usage:   0%


0 packages can be updated.
0 updates are security updates.


To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@control-plane:~$ sudo snap install microk8s --classic
2020-04-20T13:09:33+02:00 INFO Waiting for restart...
microk8s v1.18.1 from Canonical✓ installed
ubuntu@control-plane:~$
```

```
microk8s v1.18.1 from Canonical✔ installed
ubuntu@control-plane:~$ sudo microk8s status --wait-ready
microk8s is running
addons:
cilium: disabled
dashboard: disabled
dns: disabled
fluentd: disabled
gpu: disabled
helm: disabled
helm3: disabled
ingress: disabled
istio: disabled
jaeger: disabled
knative: disabled
kubeflow: disabled
linkerd: disabled
metallb: disabled
metrics-server: disabled
prometheus: disabled
rbac: disabled
registry: disabled
storage: disabled
ubuntu@control-plane:~$ sudo microk8s.kubectl get nodes
NAME            STATUS    ROLES     AGE    VERSION
control-plane   Ready     <none>    11s    v1.18.1
ubuntu@control-plane:~$
```

```
ubuntu@control-plane:~$ exit
logout
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/microk8s$ multipass transfer --help
Usage: multipass transfer [options] <source> [<source> ...] <destination>
Copy files between the host and instances.

Options:
  -h, --help      Display this help
  -v, --verbose   Increase logging verbosity, repeat up to three times for more
                  detail

Arguments:
  source          One or more paths to transfer, prefixed with <name:> for paths
                  inside the instance, or '-' for stdin
  destination     The destination path, prefixed with <name:> for a path inside
                  the instance, or '-' for stdout
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/microk8s$ multipass transfer control-plane:/tmp/config .
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/microk8s$ ls -la
total 4
drwxr-xr-x 3 ara.pulido staff   96 Apr 20 16:31 .
drwxr-xr-x 5 ara.pulido staff  160 Apr 17 16:53 ..
-rw-r--r-- 1 ara.pulido staff 1869 Apr 20 16:31 config
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/microk8s$ KUBECONFIG=./config
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/microk8s$ kubectl get nodes
NAME            STATUS   ROLES    AGE      VERSION
control-plane   Ready    <none>   3h20m    v1.18.1
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/microk8s$
```

```
ubuntu@control-plane:~$ exit
logout
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/microk8s$ multipass transfer --help
Usage: multipass transfer [options] <source> [<source> ...] <destination>
Copy files between the host and instances.


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                  the instance, or '-' for stdout
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/microk8s$ multipass transfer control-plane:/tmp/config .
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/microk8s$ ls -la
total 4
drwxr-xr-x 3 ara.pulido staff   96 Apr 20 16:31 .
drwxr-xr-x 5 ara.pulido staff  160 Apr 17 16:53 ..
-rw-r--r-- 1 ara.pulido staff 1869 Apr 20 16:31 config
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/microk8s$ KUBECONFIG=./config
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/microk8s$ kubectl get nodes
NAME            STATUS   ROLES     AGE       VERSION
control-plane   Ready    <none>    3h20m     v1.18.1
ara.pulido@COMP-C02YX0HHLVDP:~/sea_local_clusters/microk8s$
```

```
ubuntu@control-plane:~$ sudo microk8s enable storage metrics-server
Enabling default storage class
deployment.apps/hostpath-provisioner created
storageclass.storage.k8s.io/microk8s-hostpath created
serviceaccount/microk8s-hostpath created
clusterrole.rbac.authorization.k8s.io/microk8s-hostpath created
clusterrolebinding.rbac.authorization.k8s.io/microk8s-hostpath created
Storage will be available soon
Enabling metrics-server
clusterrolebinding.rbac.authorization.k8s.io/metrics-server:system:auth-delegator created
rolebinding.rbac.authorization.k8s.io/metrics-server-auth-reader created
apiservice.apiregistration.k8s.io/v1beta1.metrics.k8s.io created
serviceaccount/metrics-server created
configmap/metrics-server-config created
deployment.apps/metrics-server-v0.2.1 created
service/metrics-server created
clusterrole.rbac.authorization.k8s.io/system:metrics-server created
clusterrolebinding.rbac.authorization.k8s.io/system:metrics-server created
clusterrole.rbac.authorization.k8s.io/system:aggregated-metrics-reader created
clusterrolebinding.rbac.authorization.k8s.io/microk8s-admin created
metrics-server enabled
ubuntu@control-plane:~$ sudo microk8s.kubectl get pods -n kube-system
NAME                                      READY   STATUS    RESTARTS   AGE
coredns-588fd544bf-swmqf                  1/1     Running   0          2d2h
hostpath-provisioner-75fdc8fccd-f7fsq     1/1     Running   0          23s
metrics-server-v0.2.1-95c9bd697-prlhg     2/2     Running   0          20s
ubuntu@control-plane:~$
```
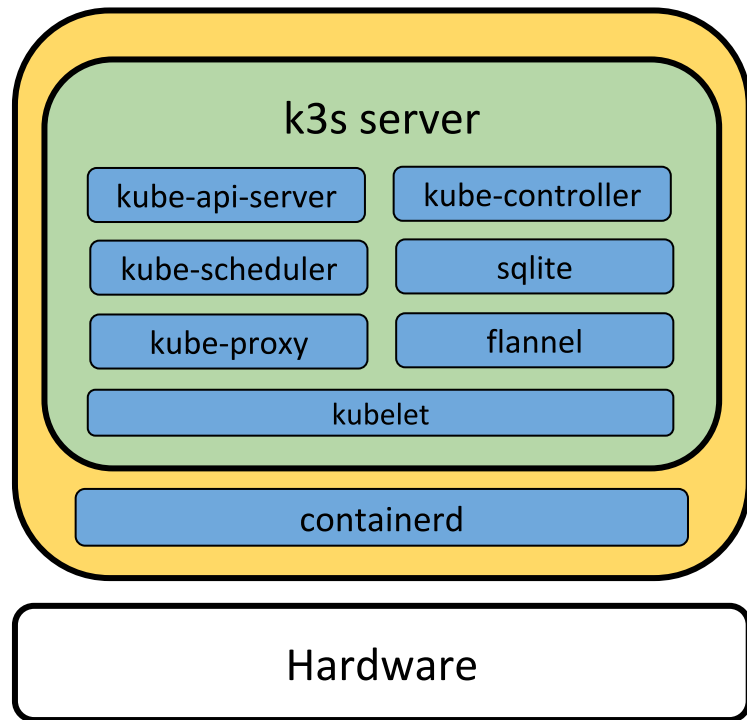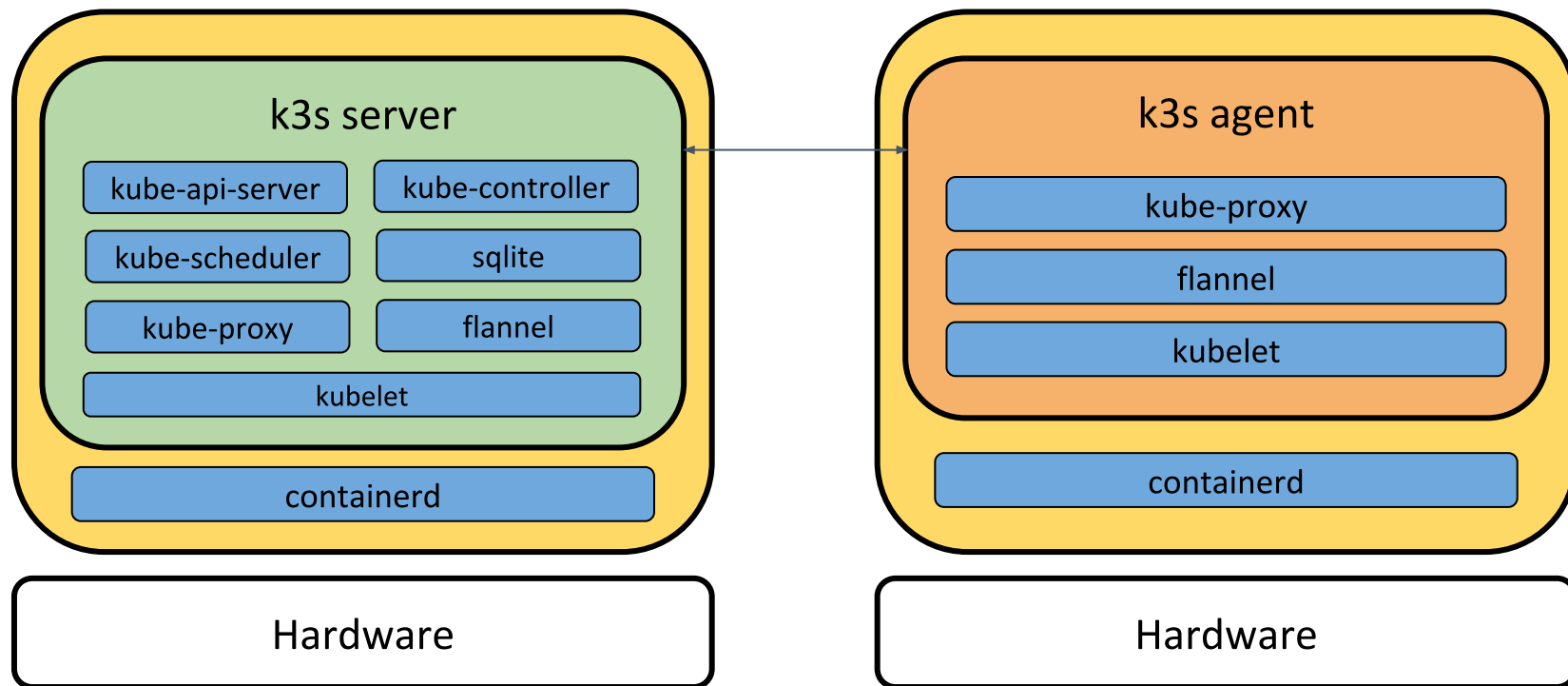
k3s / k3d

k3s

- Lightweight K8s distro aimed for developers & IoT devices

- Made by Rancher and packaged as a single binary

- flanneld CNI by default

- Multi-node clusters

- Experimental k3d for container nodes

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k3s

DATADOG

k3s

k3s server
- kube-api-server
- kube-controller
- kube-scheduler
- sqlite
- kube-proxy
- flannel
- kubelet
- containerd

k3s agent
- kube-proxy
- flannel
- kubelet
- containerd

Hardware

Hardware

```
Connecting to github-production-release-asset-2e65be.s3.amazonaws.com (github-production-release-asset-2
e65be.s3.amazonaws.com)|52.216.132.67|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 52359168 (50M) [application/octet-stream]
Saving to: 'k3s'

k3s                      100%[===================================>]  49.93M  8.98MB/s    in 9.2s

2020-04-24 14:21:41 (5.42 MB/s) - 'k3s' saved [52359168/52359168]

vagrant@controlplane:~$ ls -la
total 51168
drwxr-xr-x 5 vagrant vagrant      4096 Apr 24 14:21 .
drwxr-xr-x 4 root    root         4096 Apr 24 14:20 ..
-rw-r--r-- 1 vagrant vagrant       220 Aug 13  2019 .bash_logout
-rw-r--r-- 1 vagrant vagrant      3771 Aug 13  2019 .bashrc
drwx------ 2 vagrant vagrant      4096 Apr 24 14:20 .cache
drwx------ 3 vagrant vagrant      4096 Apr 24 14:20 .gnupg
-rw-rw-r-- 1 vagrant vagrant 52359168 Mar 25 16:15 k3s
-rw-r--r-- 1 vagrant vagrant       807 Aug 13  2019 .profile
drwx------ 2 vagrant vagrant      4096 Apr 24 14:20 .ssh
-rw-rw-r-- 1 vagrant vagrant       165 Apr 24 14:21 .wget-hsts
vagrant@controlplane:~$ chmod a+x k3s
vagrant@controlplane:~$ sudo mv k3s /usr/local/bin/
vagrant@controlplane:~$
```

```
        TX packets 6765  bytes 505356 (505.3 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

enp0s8: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.28.128.8  netmask 255.255.255.0  broadcast 172.28.128.255
        inet6 fe80::a00:27ff:fedc:265a  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:dc:26:5a  txqueuelen 1000  (Ethernet)
        RX packets 12  bytes 3544 (3.5 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 13  bytes 1550 (1.5 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 32  bytes 2870 (2.8 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 32  bytes 2870 (2.8 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

vagrant@controlplane:~$ sudo k3s server --flannel-iface enp0s8
INFO[0000] Preparing data dir /var/lib/rancher/k3s/data/6a3098e6644f5f0dbfe14e5efa99bb8fdf60d63cae89fdff
d71b7de11a1f1430
```

```
r") pod "metrics-server-6d684c7b5-4dkhx" (UID: "f80cce98-4f15-4ac4-9d8c-87c9cd88b3ec")
W0424 14:24:36.337804    2139 watcher.go:87] Error while processing event ("/sys/fs/cgroup/cpu,cpuacct/s
ystem.slice/run-r668747636c394d37a6d3db78b65ecf2b.scope": 0x40000100 == IN_CREATE|IN_ISDIR): inotify_add
_watch /sys/fs/cgroup/cpu,cpuacct/system.slice/run-r668747636c394d37a6d3db78b65ecf2b.scope: no such file
 or directory
W0424 14:24:36.338860    2139 watcher.go:87] Error while processing event ("/sys/fs/cgroup/blkio/system.
slice/run-r668747636c394d37a6d3db78b65ecf2b.scope": 0x40000100 == IN_CREATE|IN_ISDIR): inotify_add_watch
 /sys/fs/cgroup/blkio/system.slice/run-r668747636c394d37a6d3db78b65ecf2b.scope: no such file or director
y
W0424 14:24:36.338972    2139 watcher.go:87] Error while processing event ("/sys/fs/cgroup/memory/system
.slice/run-r668747636c394d37a6d3db78b65ecf2b.scope": 0x40000100 == IN_CREATE|IN_ISDIR): inotify_add_watc
h /sys/fs/cgroup/memory/system.slice/run-r668747636c394d37a6d3db78b65ecf2b.scope: no such file or direct
ory
W0424 14:24:36.338987    2139 watcher.go:87] Error while processing event ("/sys/fs/cgroup/devices/syste
m.slice/run-r668747636c394d37a6d3db78b65ecf2b.scope": 0x40000100 == IN_CREATE|IN_ISDIR): inotify_add_wat
ch /sys/fs/cgroup/devices/system.slice/run-r668747636c394d37a6d3db78b65ecf2b.scope: no such file or dire
ctory
W0424 14:24:36.339006    2139 watcher.go:87] Error while processing event ("/sys/fs/cgroup/pids/system.s
lice/run-r668747636c394d37a6d3db78b65ecf2b.scope": 0x40000100 == IN_CREATE|IN_ISDIR): inotify_add_watch
/sys/fs/cgroup/pids/system.slice/run-r668747636c394d37a6d3db78b65ecf2b.scope: no such file or directory
W0424 14:24:37.281723    2139 garbagecollector.go:639] failed to discover some groups: map[metrics.k8s.i
o/v1beta1:the server is currently unable to handle the request]
I0424 14:24:37.281940    2139 shared_informer.go:197] Waiting for caches to sync for garbage collector
I0424 14:24:37.282032    2139 shared_informer.go:204] Caches are synced for garbage collector
```
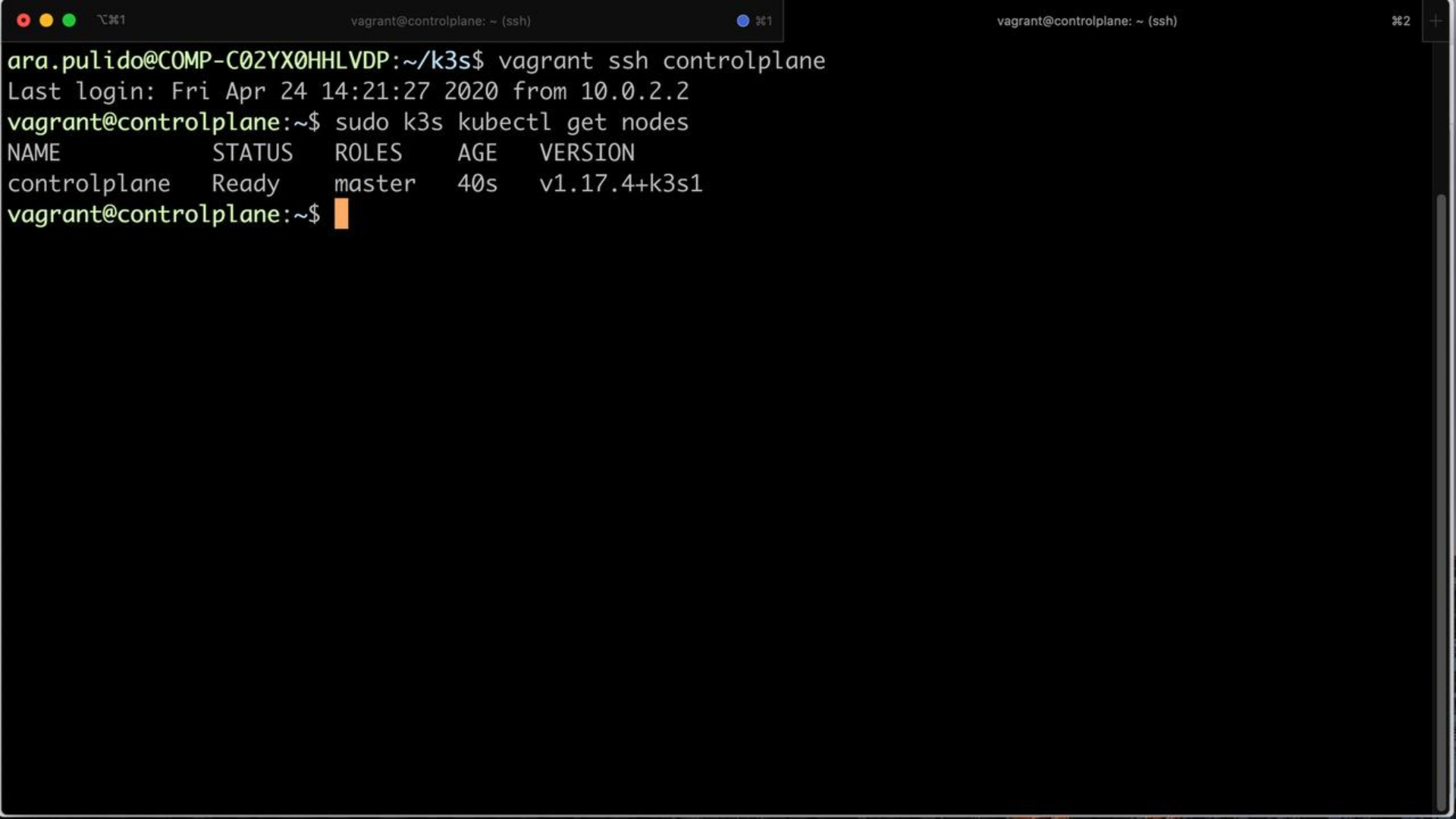
```
ara.pulido@COMP-C02YX0HHLVDP:~/k3s$ vagrant ssh controlplane
Last login: Fri Apr 24 14:21:27 2020 from 10.0.2.2
vagrant@controlplane:~$ sudo k3s kubectl get nodes
NAME            STATUS    ROLES    AGE    VERSION
controlplane    Ready     master   40s    v1.17.4+k3s1
vagrant@controlplane:~$
```

```
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 478  bytes 112765 (112.7 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

vetha40ba89c: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1450
        inet6 fe80::ec18:59ff:fe3a:b4fc  prefixlen 64  scopeid 0x20<link>
        ether ee:18:59:3a:b4:fc  txqueuelen 0  (Ethernet)
        RX packets 12  bytes 908 (908.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 42  bytes 3284 (3.2 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

vethd1126fb7: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1450
        inet6 fe80::582d:83ff:fe60:536f  prefixlen 64  scopeid 0x20<link>
        ether 5a:2d:83:60:53:6f  txqueuelen 0  (Ethernet)
        RX packets 570  bytes 447364 (447.3 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 523  bytes 219885 (219.8 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

vagrant@controlplane:~$ sudo k3s kubectl get nodes
NAME            STATUS   ROLES    AGE     VERSION
node            Ready    <none>   38s     v1.17.4+k3s1
controlplane    Ready    master   6m6s    v1.17.4+k3s1
vagrant@controlplane:~$
```

k3d

- Easy for devs wrapper to launch k3s clusters in Docker

- Nodes will be run as docker containers

- Installation script detects your OS and installs a k3d binary

```
ara.pulido@COMP-C02YX0HHLVDP:~/k3s$ curl -s https://raw.githubusercontent.com/rancher/k3d/master/install
.sh | bash
Preparing to install k3d into /usr/local/bin
Password:
k3d installed into /usr/local/bin/k3d
Run 'k3d --help' to see what you can do with it.
ara.pulido@COMP-C02YX0HHLVDP:~/k3s$
```

```
kubectl cluster-info
ara.pulido@COMP-C02YX0HHLVDP:~/k3s$ k3d list
+------------+--------------------------------------+---------+---------+
|    NAME    |              IMAGE                   | STATUS  | WORKERS |
+------------+--------------------------------------+---------+---------+
| k3s-default | docker.io/rancher/k3s:v1.17.3-k3s1 | running |   0/0   |
+------------+--------------------------------------+---------+---------+
ara.pulido@COMP-C02YX0HHLVDP:~/k3s$ docker ps
CONTAINER ID         IMAGE                      COMMAND                CREATED            STATUS
        PORTS                    NAMES
92096295d0db        rancher/k3s:v1.17.3-k3s1    "/bin/k3s server --h…"   16 seconds ago     Up 15 second
s        0.0.0.0:6443->6443/tcp   k3d-k3s-default-server
ara.pulido@COMP-C02YX0HHLVDP:~/k3s$ export KUBECONFIG="$(k3d get-kubeconfig --name='k3s-default')"
ara.pulido@COMP-C02YX0HHLVDP:~/k3s$ k get nodes
NAME                   STATUS   ROLES    AGE   VERSION
k3d-k3s-default-server Ready    master   28s   v1.17.3+k3s1
ara.pulido@COMP-C02YX0HHLVDP:~/k3s$ k get pods -n kube-system
NAME                                  READY   STATUS             RESTARTS   AGE
local-path-provisioner-58fb86bdfd-5mnk5   1/1     Running            0          22s
metrics-server-6d684c7b5-rt776        1/1     Running            0          22s
coredns-d798c9dd-pfgxg                0/1     Running            0          22s
traefik-6787cddb4b-w8pq9              0/1     ContainerCreating  0          2s
svclb-traefik-w6b6z                   0/2     ContainerCreating  0          2s
helm-install-traefik-hk49z           0/1     Completed          0          22s
ara.pulido@COMP-C02YX0HHLVDP:~/k3s$
```

```
 per variable)
   --volume source:destination, -v source:destination  Mount one or more volumes into every created node
 (Docker notation: source:destination)
   --k3s https://<host>:<port>                          Add a k3d node to a non-k3d k3s cluster (specify
 k3s server URL like this https://<host>:<port>) [requires k3s-secret or k3s-token]
   --k3s-secret value, -s value                         Specify k3s cluster secret (or use --k3s-token to
 use a node token)
   --k3s-token value, -t value                          Specify k3s node token (or use --k3s-secret to us
 e a cluster secret)[overrides k3s-secret]

ara.pulido@COMP-C02YX0HHLVDP:~/k3s$ k3d add-node -n k3s-default
INFO[0000] Adding 1 agent-nodes to k3d cluster k3s-default...
INFO[0000] Created agent-node with ID 4fbe10471cde29c0854f812d47de38307cc3ed5985d26f3f68598b8e9394d4e8
ara.pulido@COMP-C02YX0HHLVDP:~/k3s$ k get nodes
NAME                        STATUS      ROLES      AGE      VERSION
k3d-k3s-default-server      Ready       master     14m      v1.17.3+k3s1
k3d-k3s-default-worker-1    NotReady    <none>     6s       v1.17.3+k3s1
ara.pulido@COMP-C02YX0HHLVDP:~/k3s$ docker ps
CONTAINER ID        IMAGE                        COMMAND                CREATED              STATUS
        PORTS                     NAMES
4fbe10471cde        rancher/k3s:v1.17.3-k3s1     "/bin/k3s agent"       14 seconds ago       Up 14 second
s                                 k3d-k3s-default-worker-1
92096295d0db        rancher/k3s:v1.17.3-k3s1     "/bin/k3s server --h…" 15 minutes ago       Up 15 minute
s       0.0.0.0:6443->6443/tcp    k3d-k3s-default-server
ara.pulido@COMP-C02YX0HHLVDP:~/k3s$
```
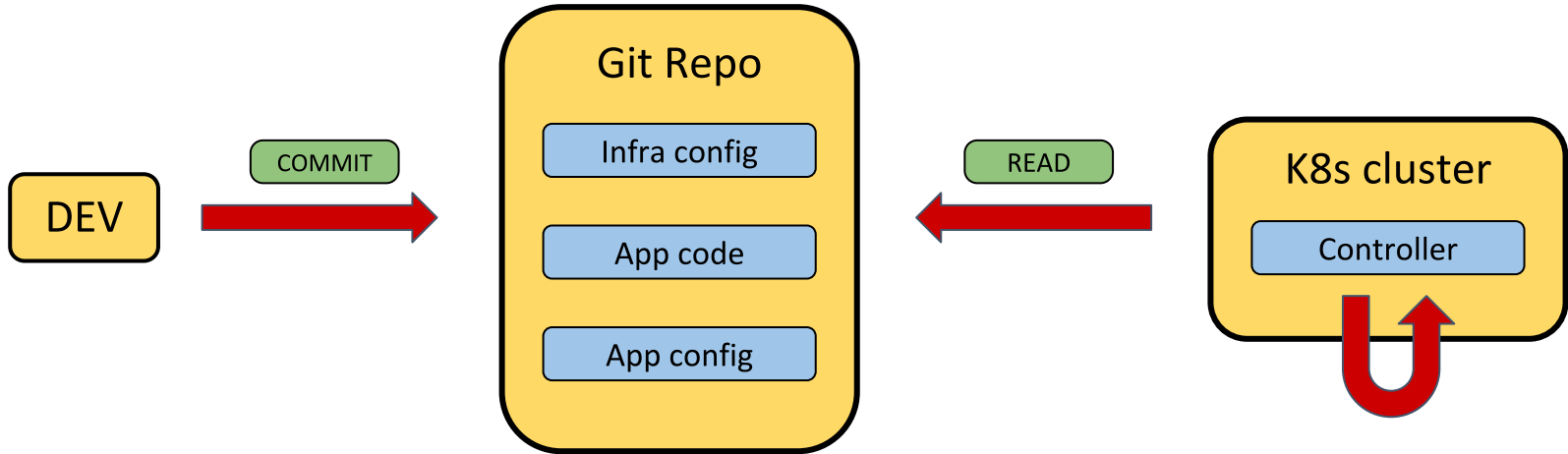
GitOps

DEV — COMMIT → Git Repo

Git Repo
- Infra config
- App code
- App config

READ ← K8s cluster

K8s cluster
- Controller

DATADOG

firekube

- GitOps ready Kubernetes cluster

- Using ignite and firecraker for lightweight VMs (only Linux)

- Using docker in docker (footloose) if not in Linux

- Based on kubeadm

📄 setup.js	use preloaded image	7 months ago
📄 setup.sh	setup.sh: fix wksctl apply flag handling	7 months ago
📄 wks-controller.yaml	Set the default namespace for the wks-controller manifest to "weavek8...	7 months ago

📖 README.md ✏️

Firekube

Firekube is a Kubernetes cluster working on top of ignite and firecracker. Firekube clusters are operated with GitOps.

ignite and firecracker only work on Linux as they need KVM. Fortunately we will also work on macOS using footloose: the Kubernetes nodes are then running inside containers.

Creating a Firekube cluster

Prerequisites: docker, git, kubectl 1.14+.

1. Fork this repository.

2. Clone your fork and `cd` into it. Use the `SSH` git URL as the script will push an initial commit to your fork:

```
export user="" # Your GitHub handle or org

git clone git@github.com:$user/wks-quickstart-firekube.git
cd wks-quickstart-firekube
```

```
● Creating SSH key
● Creating virtual machines
INFO[0000] Docker Image: quay.io/footloose/centos7:0.6.0 present locally
INFO[0000] Creating machine: firekube-node0 ...
INFO[0000] Creating machine: firekube-node1 ...
● Creating Cluster API manifests
● Updating container images and git parameters
INFO[0000] wksctl version 0.8.2-beta.1 is available; please update at https://github.com/weaveworks/wksc
tl/releases/tag/v0.8.2-beta.1
● Pushing initial cluster configuration
[master 66cbcb7] Initial cluster configuration
 5 files changed, 69 insertions(+), 3 deletions(-)
 create mode 100644 footloose.yaml
 create mode 100644 machines.yaml
Enumerating objects: 11, done.
Counting objects: 100% (11/11), done.
Delta compression using up to 8 threads
Compressing objects: 100% (7/7), done.
Writing objects: 100% (7/7), 1.06 KiB | 1.06 MiB/s, done.
Total 7 (delta 4), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (4/4), completed with 4 local objects.
To github.com:arapulido/wks-quickstart-firekube.git
   2628729..66cbcb7  HEAD -> master
● Installing Kubernetes cluster
```

```
INFO[2020-04-28T14:43:33+02:00] Finishing                                resource="install:wks"
INFO[2020-04-28T14:43:33+02:00] Starting                                 resource="install:flux:mai
n"
INFO[2020-04-28T14:43:33+02:00] Finishing                                resource="install:flux:mai
n"
INFO[0000] wksctl version 0.8.2-beta.1 is available; please update at https://github.com/weaveworks/wksc
tl/releases/tag/v0.8.2-beta.1
To use kubectl with the example cluster, enter:
$ export KUBECONFIG=/Users/ara.pulido/.wks/weavek8sops/example/kubeconfig
ara.pulido@COMP-C02YX0HHLVDP:~/firekube/wks-quickstart-firekube$ export KUBECONFIG=/Users/ara.pulido/.wk
s/weavek8sops/example/kubeconfig
ara.pulido@COMP-C02YX0HHLVDP:~/firekube/wks-quickstart-firekube$ kubectl get nodes
NAME     STATUS   ROLES    AGE     VERSION
node0    Ready    master   40s     v1.14.1
ara.pulido@COMP-C02YX0HHLVDP:~/firekube/wks-quickstart-firekube$ docker ps
CONTAINER ID        IMAGE                           COMMAND              CREATED             STATUS
         PORTS
     NAMES
016676f7865e        quay.io/footloose/centos7:0.6.0   "/sbin/init"         3 minutes ago       Up 3 minut
es         0.0.0.0:2223->22/tcp, 0.0.0.0:6444->6443/tcp, 0.0.0.0:30081->30080/tcp, 0.0.0.0:30444->30443/t
cp    firekube-node1
d5acfc8b9a1d        quay.io/footloose/centos7:0.6.0   "/sbin/init"         3 minutes ago       Up 3 minut
es         0.0.0.0:6443->6443/tcp, 0.0.0.0:30080->30080/tcp, 0.0.0.0:30443->30443/tcp, 0.0.0.0:2222->22/t
cp    firekube-node0
ara.pulido@COMP-C02YX0HHLVDP:~/firekube/wks-quickstart-firekube$
```

```
Total 8 (delta 2), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (2/2), completed with 1 local object.
To github.com:arapulido/wks-quickstart-firekube.git
   66cbcb7..ae96e77  master -> master
ara.pulido@COMP-C02YX0HHLVDP:~/firekube/wks-quickstart-firekube$ kubectl get pods -w
NAME                                 AGE
advertisements-6fcd6f64d8-2hk9v      0s
db-8695997f44-d62rn                  0s
advertisements-6fcd6f64d8-2hk9v      0s
db-8695997f44-d62rn                  0s
advertisements-6fcd6f64d8-2hk9v      0s
discounts-6fc486b985-mm2jh           0s
discounts-6fc486b985-mm2jh           0s
frontend-796fc5b5bb-rlxlv            0s
db-8695997f44-d62rn                  0s
frontend-796fc5b5bb-rlxlv            0s
discounts-6fc486b985-mm2jh           0s
frontend-796fc5b5bb-rlxlv            0s
^Cara.pulido@COMP-C02YX0HHLVDP:~/firekube/wks-quickstart-firekube$ kubectl get pods
NAME                                 READY   STATUS             RESTARTS   AGE
advertisements-6fcd6f64d8-2hk9v      0/1     ContainerCreating  0          9s
db-8695997f44-d62rn                  0/1     ContainerCreating  0          9s
discounts-6fc486b985-mm2jh           0/1     ContainerCreating  0          9s
frontend-796fc5b5bb-rlxlv            0/1     ContainerCreating  0          9s
ara.pulido@COMP-C02YX0HHLVDP:~/firekube/wks-quickstart-firekube$
```

firekube

Host Map   Infrastructure List   **Containers**   Processes   Serverless   Network

🔍 Search container | kube_namespace:weavek8sops ✖   ▾ | | Group by tag   ▾ | 📈 🔒 ⚙

| ❯ CORE |
| ❯ INFRASTRUCTURE |
| ⌄ CONTAINERS |

▣ **Hide Controls**   Showing **1–7** of **7** matching containers   🕒 Last updated: **Tue, Apr 28, 3:06:58 pm**   🕒

	NAME	CPU %	RSS MEMORY↓	TX	RX	STATUS	START
❯ 🐳 **Container Image** Group	☸ weave_weave-net-6fqvf	**0** %	**28** MB	**80.8** KB	**68.1** KB	up	21 minutes ago
❯ **Image Tag** Group	☸ weave_weave-net-zfm6z	**< 1** %	**27** MB	**22.9** KB	**17.0** KB	up	23 minutes ago
❯ **Docker Image** Group	☸ weave-npc_weave-net-6fqvf	**0** %	**23** MB	**80.8** KB	**68.1** KB	up	21 minutes ago
❯ **Short Image** Group	☸ weave-npc_weave-net-zfm6z	**0** %	**23** MB	**22.9** KB	**17.0** KB	up	23 minutes ago
❯ ☸ **Pod** Group	☸ flux_flux-7c659bdf8b-56mls	**0** %	**22** MB	**0** B	**0** B	up	23 minutes ago
❯ ☸ **Deployment** Group	☸ controller_wks-controller-5bbc574659-6hzv	**< 1** %	**6** MB	**0** B	**0** B	up	23 minutes ago
❯ ☸ **Service** Group	☸ memcached_memcached-6bc6886f9f-hvkp	**0** %	**4** MB	**2.40** KB	**494** B	up	23 minutes ago
⌄ ☸ **Namespace** Group							
☑ weavek8sops							

DATADOG

firekube

firekube

Log Explorer Save As

container_id:e49a3311f3c52ed216de05ce2a0ea37e3ddc6dab2

10	
0	

:15 11:30 11:45 12:00 12:15

∨ CORE

> Source
> Host
∨ Service
☑ flux   16

∨ Status
☑ ▌Error   16
☑ ▌Warn   0
☑ ▌Info   0

∨ NETWORK
> Client Name
> Destination MAC
> Destination Name

Apr 28 15:09:04.
Apr 28 15:09:03.
Apr 28 15:03:53.
Apr 28 15:03:52.
Apr 28 15:03:51.
Apr 28 15:03:51.
Apr 28 15:03:51.
Apr 28 15:03:51.
Apr 28 15:03:51.
Apr 28 15:03:51.
Apr 28 15:03:51.
Apr 28 15:03:51.

ERROR Apr 28, 2020 at 15:03:51.088 (11 minutes ago)   View in Context ⊕

HOST   SERVICE   SOURCE ❶
⌂ node0   flux   flux

```
ts=2020-04-28T12:50:03.268273054Z caller=sync.go:545 method=Sync cmd="kubectl apply -
f -" took=721.293998ms err=null output="namespace/fake-traffic created
namespace/weavek8sops unchanged
service/advertisements created
service/db created
service/discounts created
clusterrole.rbac.authorization.k8s.io/flux unchanged
serviceaccount/flux unchanged
service/frontend created
service/memcached unchanged
serviceaccount/postgres created
persistentvolume/task-pv-volume created
secret/db-password created
configmap/docker unchanged
clusterrolebinding.rbac.authorization.k8s.io/flux unchanged
configmap/repo unchanged
persistentvolumeclaim/task-pvc-volume created
```

configmap/docker unchanged
clusterrolebinding.rbac.authorization.k8s.io/flux unchanged

Use ↑ / ↓ to view previous/next log

DATADOG

Takeaways

- LOCAL CLUSTERS ARE NOT PRODUCTION

- KNOW HOW YOUR LOCAL CLUSTER WORKS

- DOCKER IN DOCKER IS A GOOD COMPROMISE

Thank you!

Questions?

DATADOG