



GOLD SPONSORS

TECHNOLOGY
INNOVATION
DATA
KNOWLEDGE



SILVER SPONSORS



BRONZE SPONSOR



STRATEGIC PARTNER



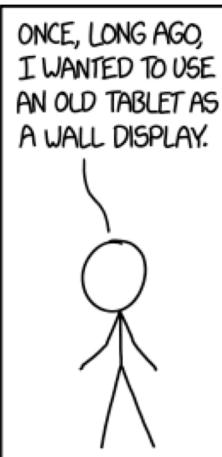
Kubernetes for data scientist

Łukasz Kałużny

MVP: Microsoft Azure

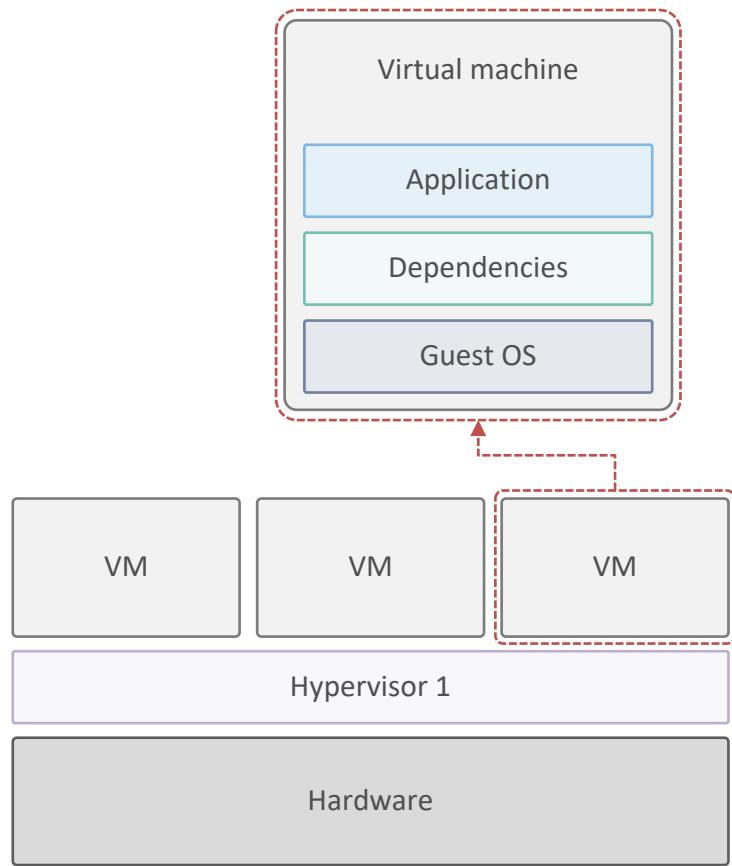
Cloud Technology Leader @ BlueSoft

kaluzny.io | @kaluzaaa

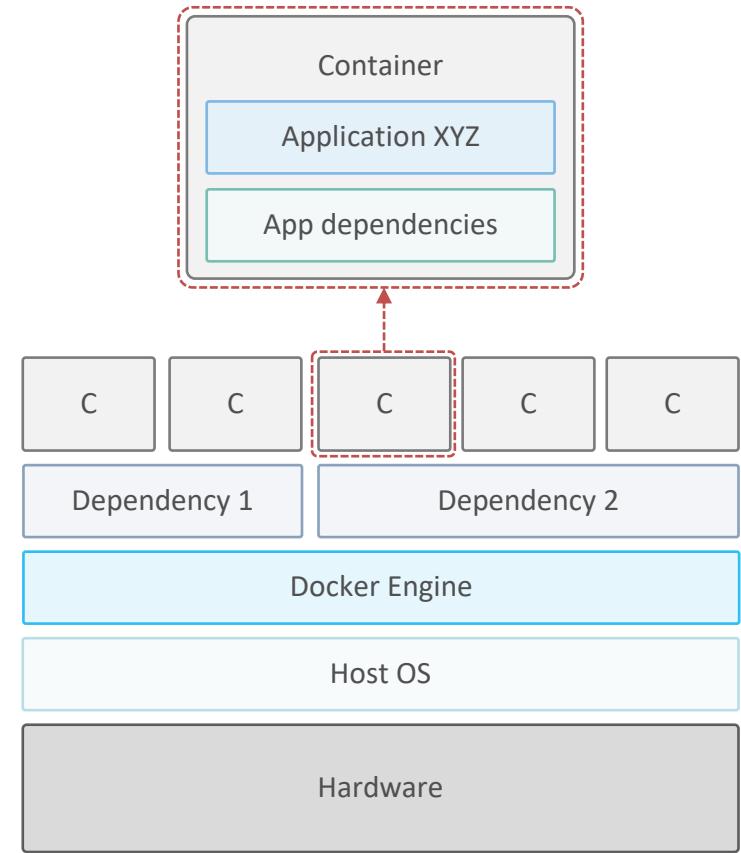


ON THAT DAY, I ACHIEVED SOFTWARE ENLIGHTENMENT.





Type 1
Virtualization



Containers

The container advantage

For developers

Fast iteration

Agile delivery

Immutability

For IT

Cost savings

Efficient deployment

Elastic bursting

Dockerfile

```
FROM node:9.4.0-alpine
```

```
WORKDIR /usr/src/app
```

```
COPY package*.json ./
```

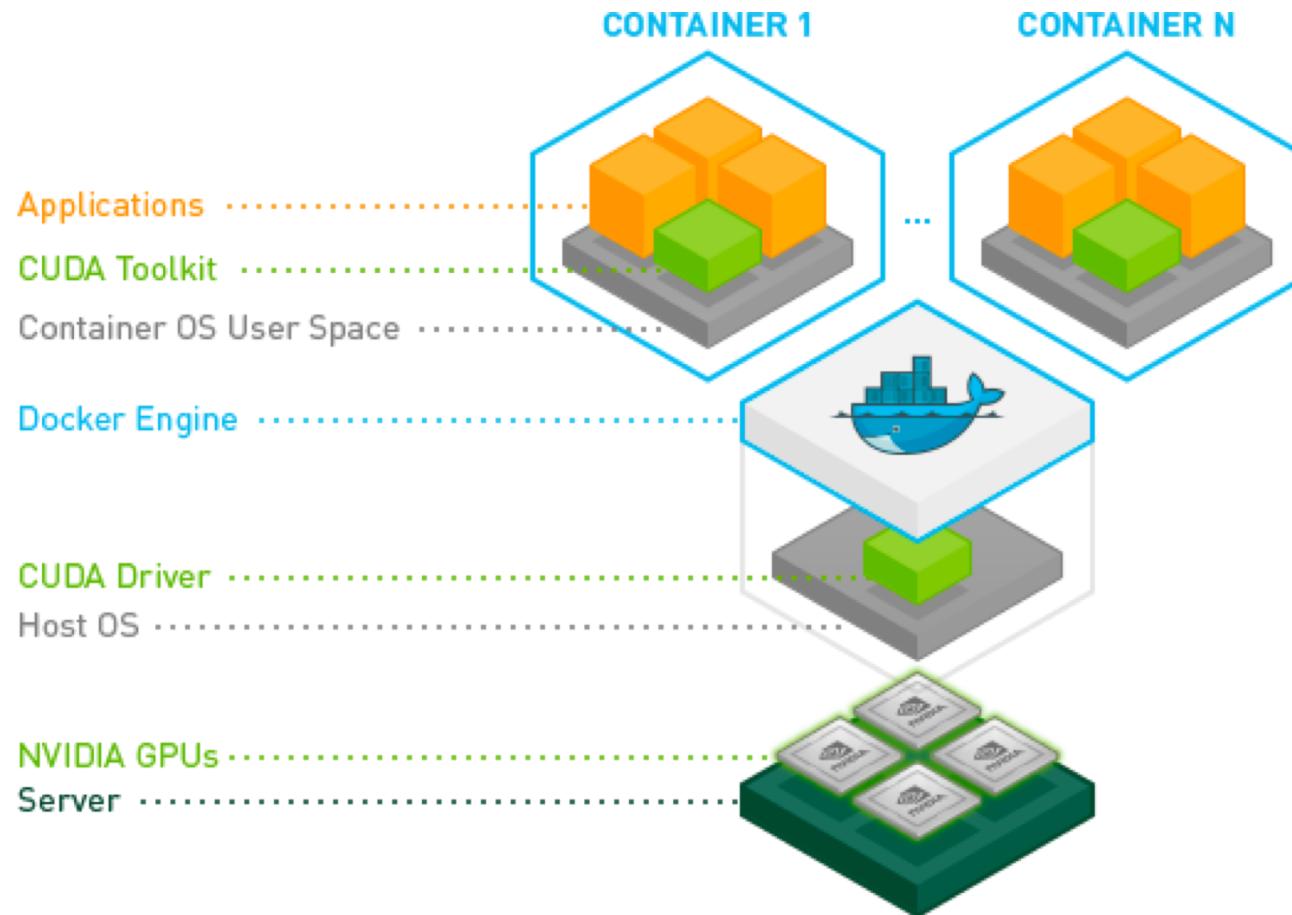
```
RUN npm install
```

```
COPY ..
```

```
EXPOSE 3000
```

```
CMD [ "npm", "run", "container" ]
```

GPU and Docker



<https://devblogs.nvidia.com/nvidia-docker-gpu-server-application-deployment-made-easy/>



MANUAL ENCAPSULATION

1. STOW CONTROL COLUMN
2. RELEASE SEAT AND ROCK BACK
3. RELEASE FEET FROM FLOOR

POWERED ENCAPSULATION TO EJECT

1. RAISE HANDGRIPS OR D-RINGS
2. PLACE FEET ON CAPSULE FLOOR
3. EJECTION TRIGGERS OR CENTERED ON D-RINGS

CTN SELECT

24441

TAR SYSTEM

FREE

GYRO

OFF

LOG CAMR

CREW WARNING LIGHTS

ON

RESET ENCAPSULATE

ARMED

VIB HI

VIB LO

VIB MED

VIB LOW

VIB OFF

VIB TEST

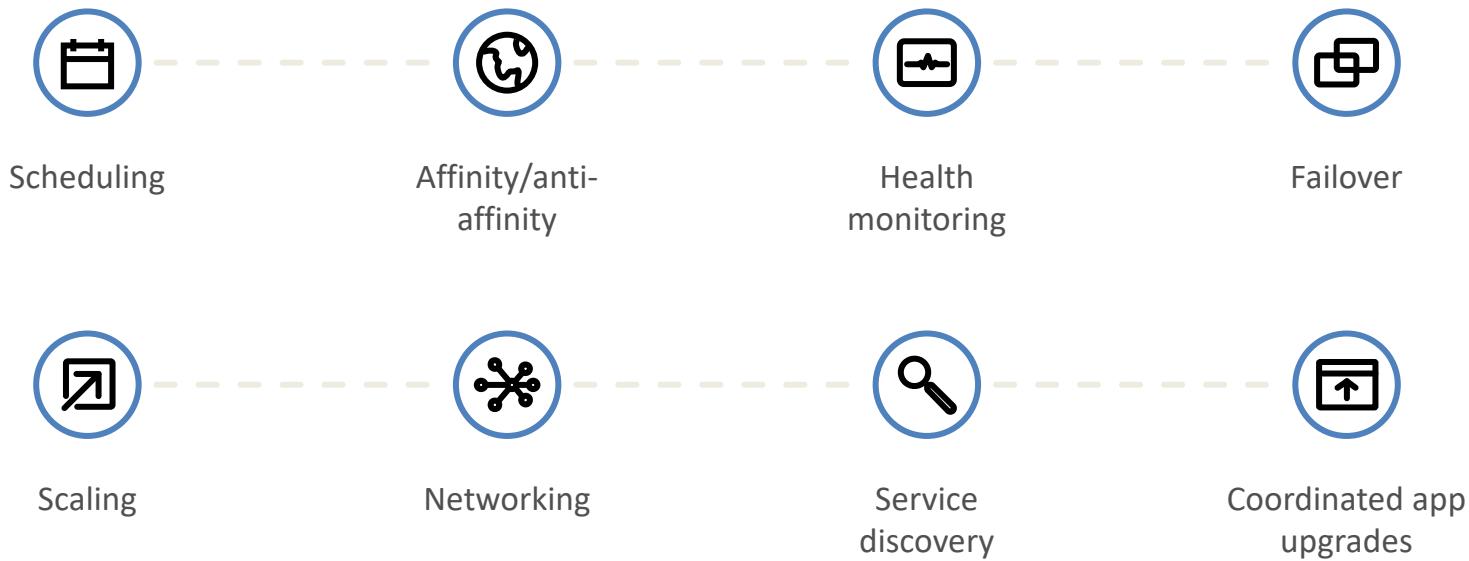
VIB CANCEL

VIB HOLD

FACB

LPCB

The elements of orchestration



Kubernetes: the de-facto orchestrator



Portable

Public, private, hybrid,
multi-cloud

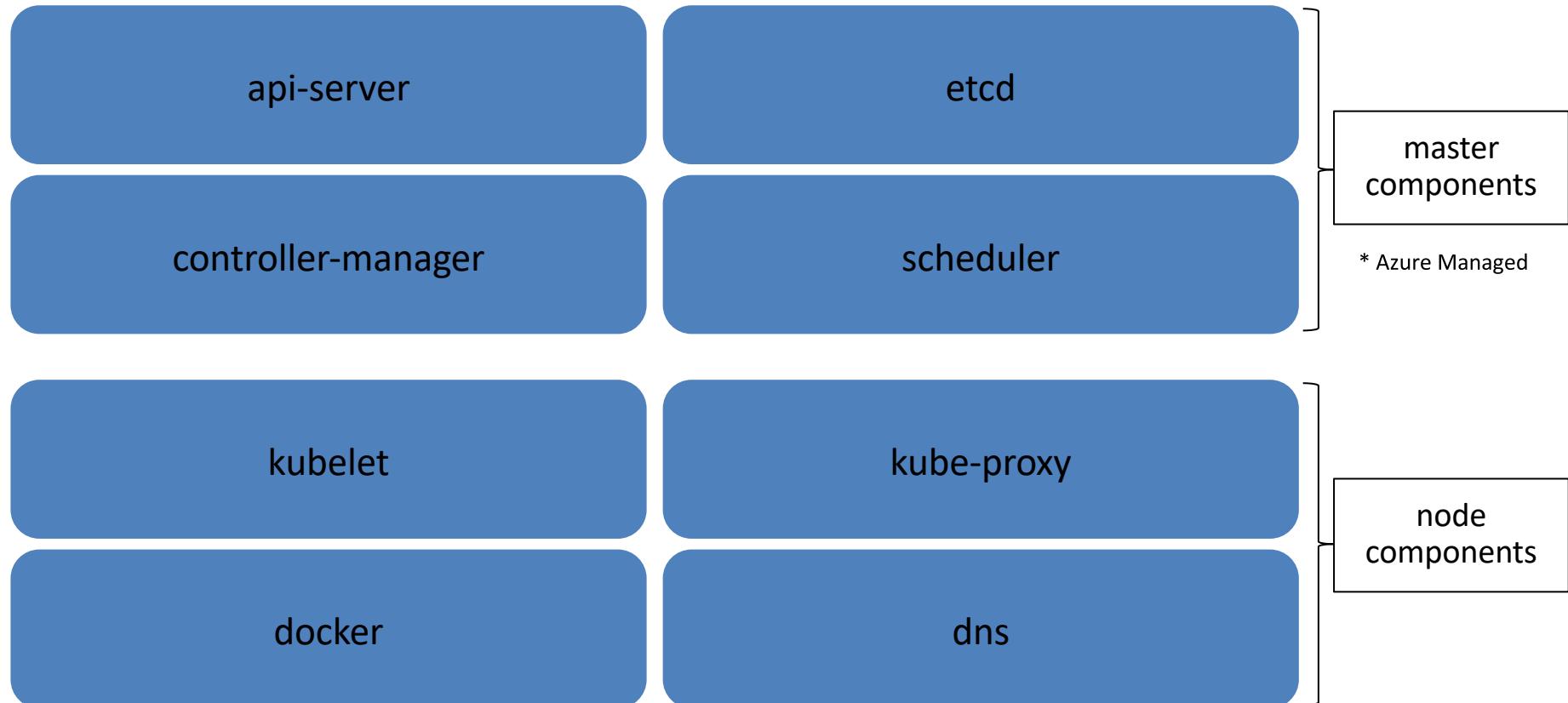
Extensible

Modular, pluggable,
hookable, composable

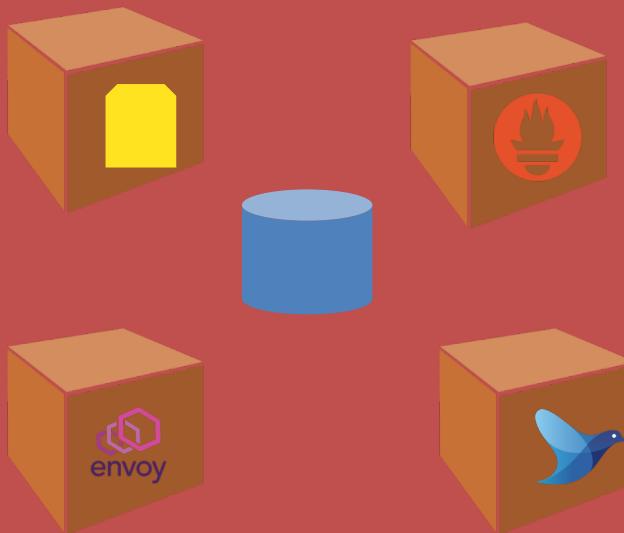
Self-healing

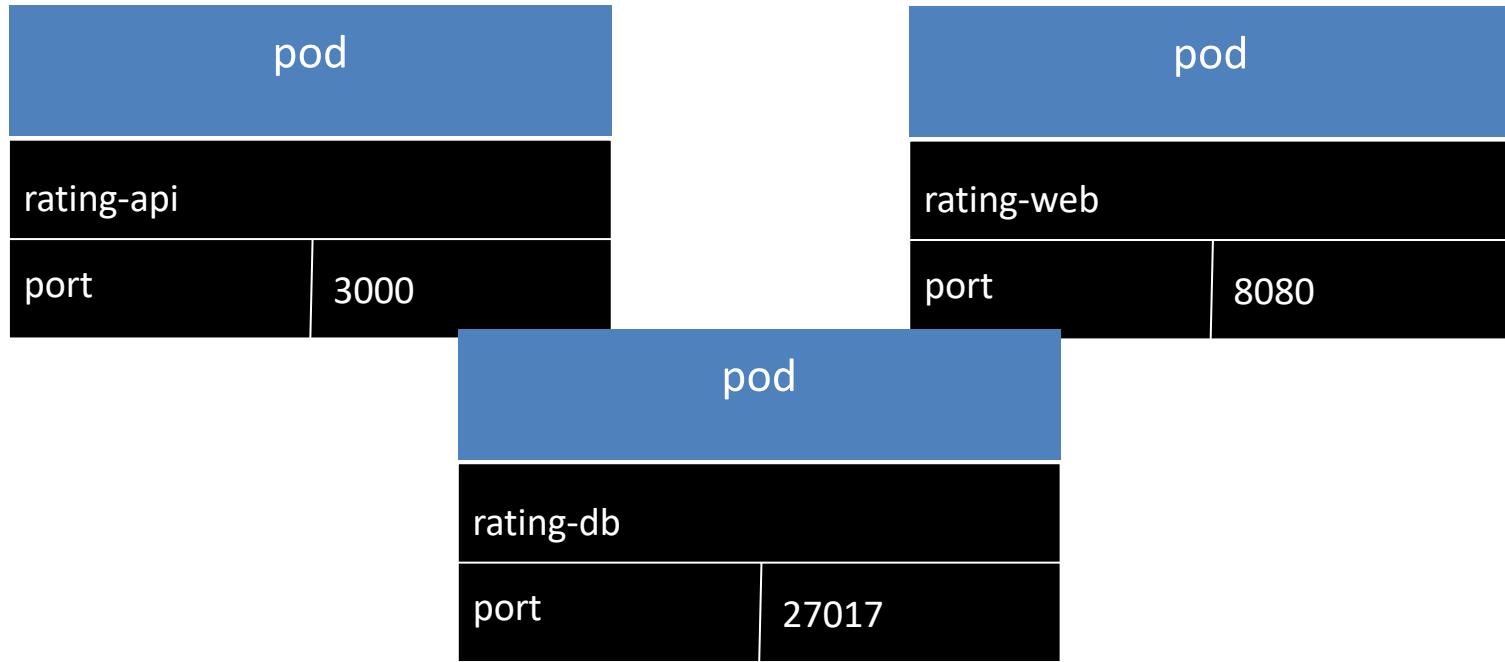
Auto-placement, auto-restart,
auto-replication, auto-scaling

Kubernetes Architecture Components

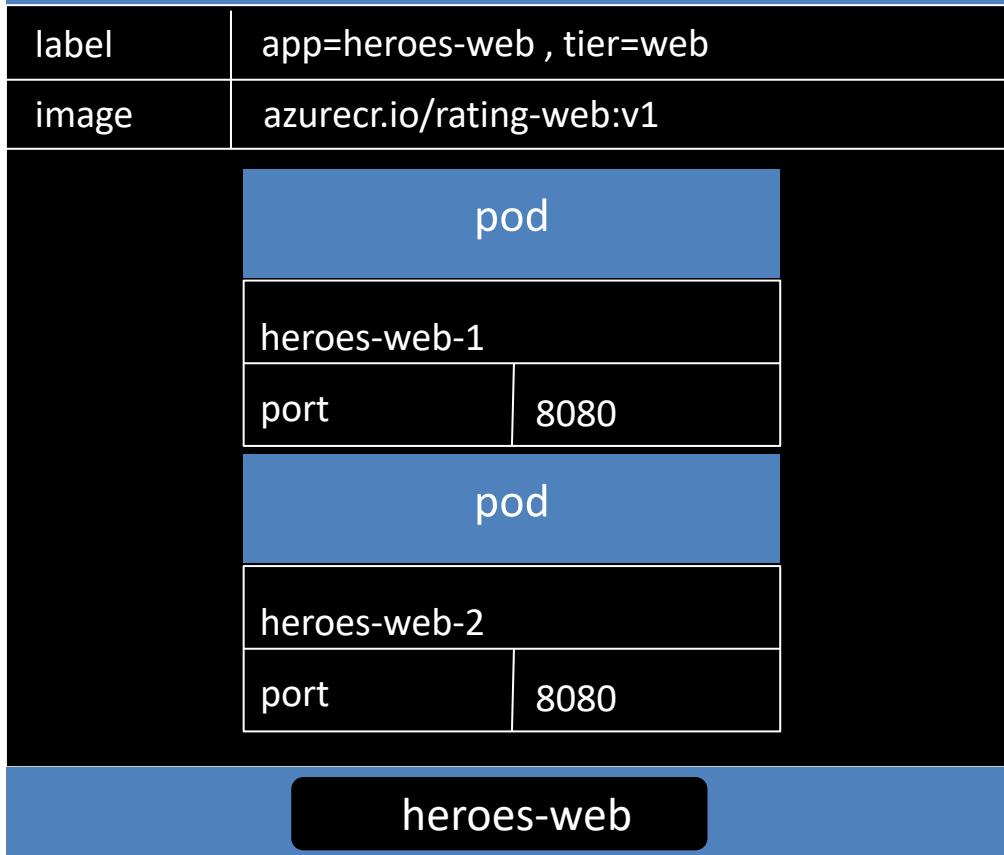


Pod

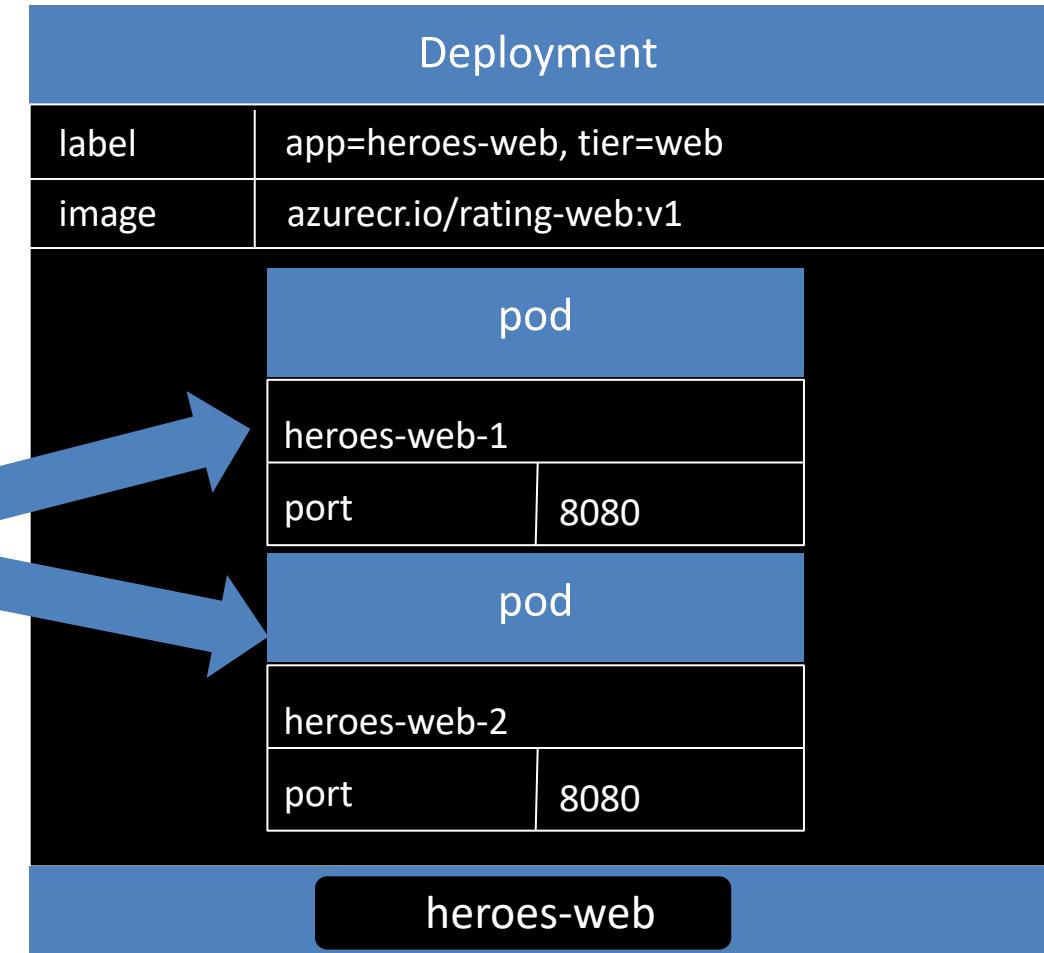


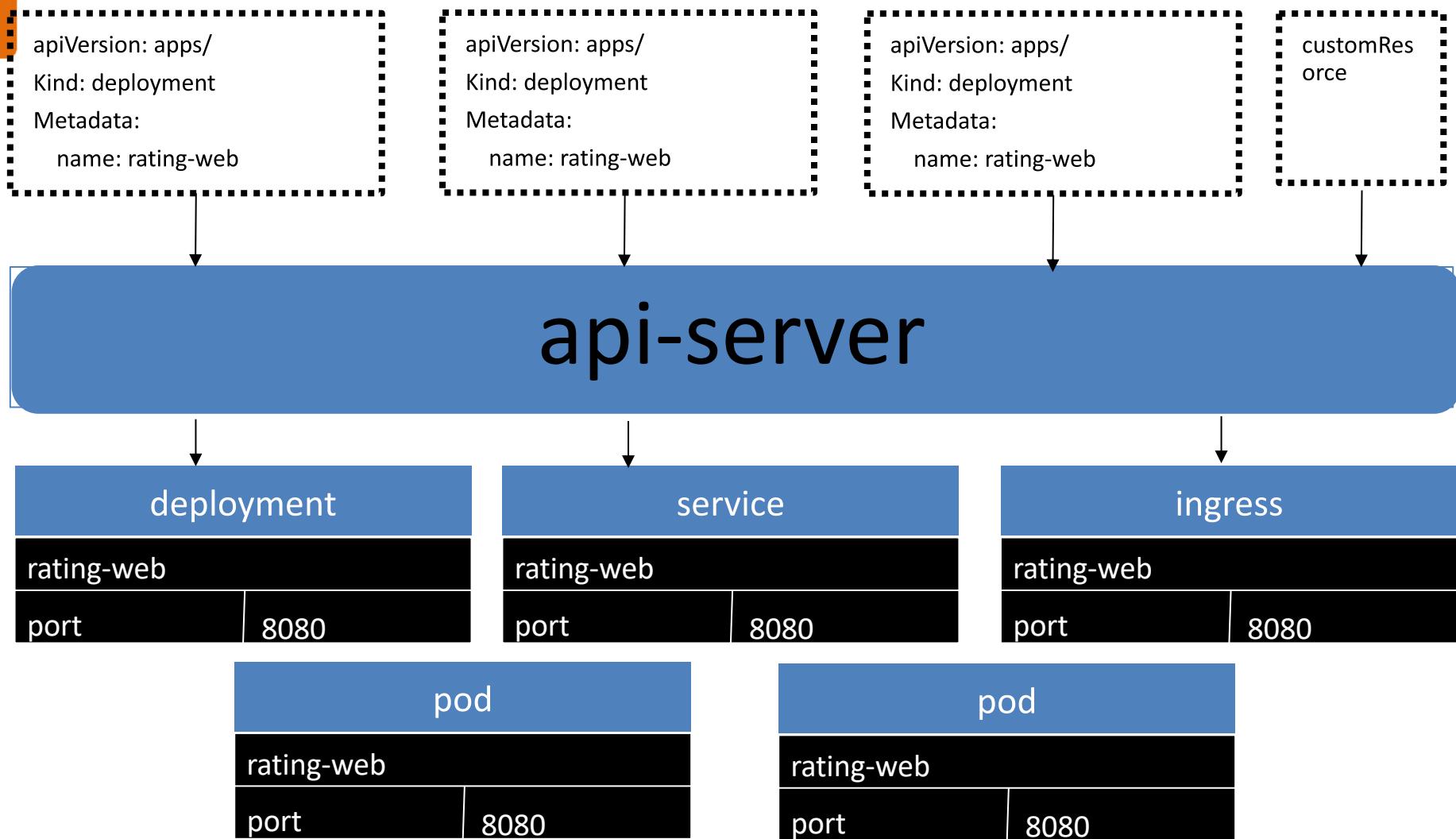


Deployment



Service	
Heroes-web	
selector	app=heroes-web
port	8080:8080
IP	10.0.2.20





k8s objects - computing

- Cron Jobs
- Daemon Sets
- Deployments
- Jobs
- Pods
- Stateful Sets

k8s objects - network

- Ingresses
- Services

k8s objects - config

- Config Map
- Secrets

YAML - Deployment

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: my-nginx
spec:
  selector:
    matchLabels:
      run: my-nginx
  replicas: 2
  template:
    metadata:
      labels:
        run: my-nginx
    spec:
      containers:
        - name: my-nginx
          image: nginx
          ports:
            - containerPort: 80
```

<https://kubernetes.io/docs/concepts/services-networking/connect-applications-service/#exposing-pods-to-the-cluster>

YAML - Services

```
apiVersion: v1
kind: Service
metadata:
  name: my-nginx
  labels:
    run: my-nginx
spec:
  ports:
  - port: 80
    protocol: TCP
  selector:
    run: my-nginx
```

<https://kubernetes.io/docs/concepts/services-networking/connect-applications-service/#creating-a-service>

nginx

DEMO

How to deploy k8s in Azure

Azure Container Services

acs-engine

Azure Kubernetes Services

AKS i GPU – How to start?

```
az group create --name myGPUCluster --location eastus
```

```
az aks create --resource-group myGPUCluster --name myGPUCluster  
--node-vm-size Standard_NC6
```

```
az aks get-credentials --resource-group myGPUCluster --name  
myGPUCluster
```

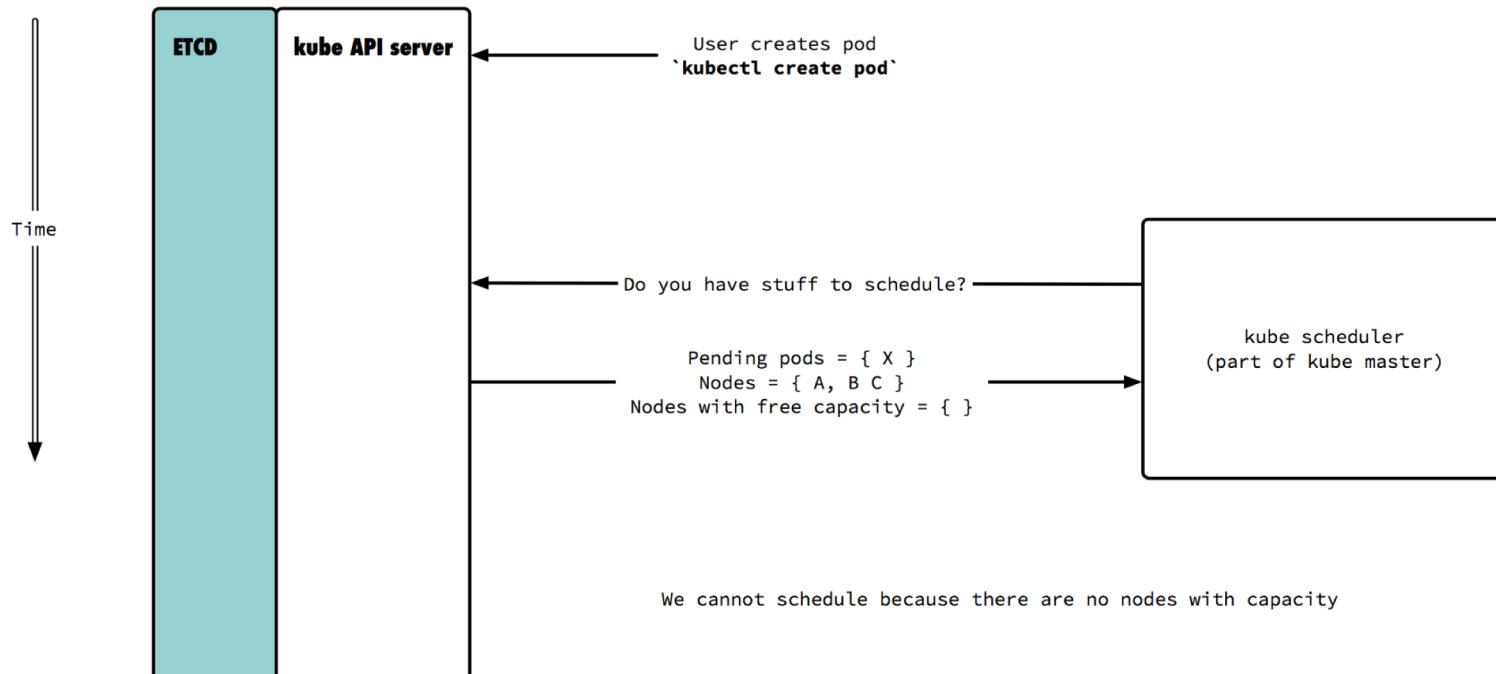
<https://docs.microsoft.com/en-us/azure/aks/gpu-cluster>

Sample job

```
apiVersion: batch/v1
kind: Job
metadata:
  labels:
    app: samples-tf-mnist-demo
    name: samples-tf-mnist-demo
spec:
  template:
    metadata:
      labels:
        app: samples-tf-mnist-demo
    spec:
      containers:
        - name: samples-tf-mnist-demo
          image: microsoft/samples-tf-mnist-demo:gpu
          args: [--max_steps, "500"]
          imagePullPolicy: IfNotPresent
      resources:
        limits:
          alpha.kubernetes.io/nvidia-gpu: 1
      volumeMounts:
        - name: nvidia
          mountPath: /usr/local/nvidia
      restartPolicy: OnFailure
      volumes:
        - name: nvidia
          hostPath:
            path: /usr/local/nvidia
```

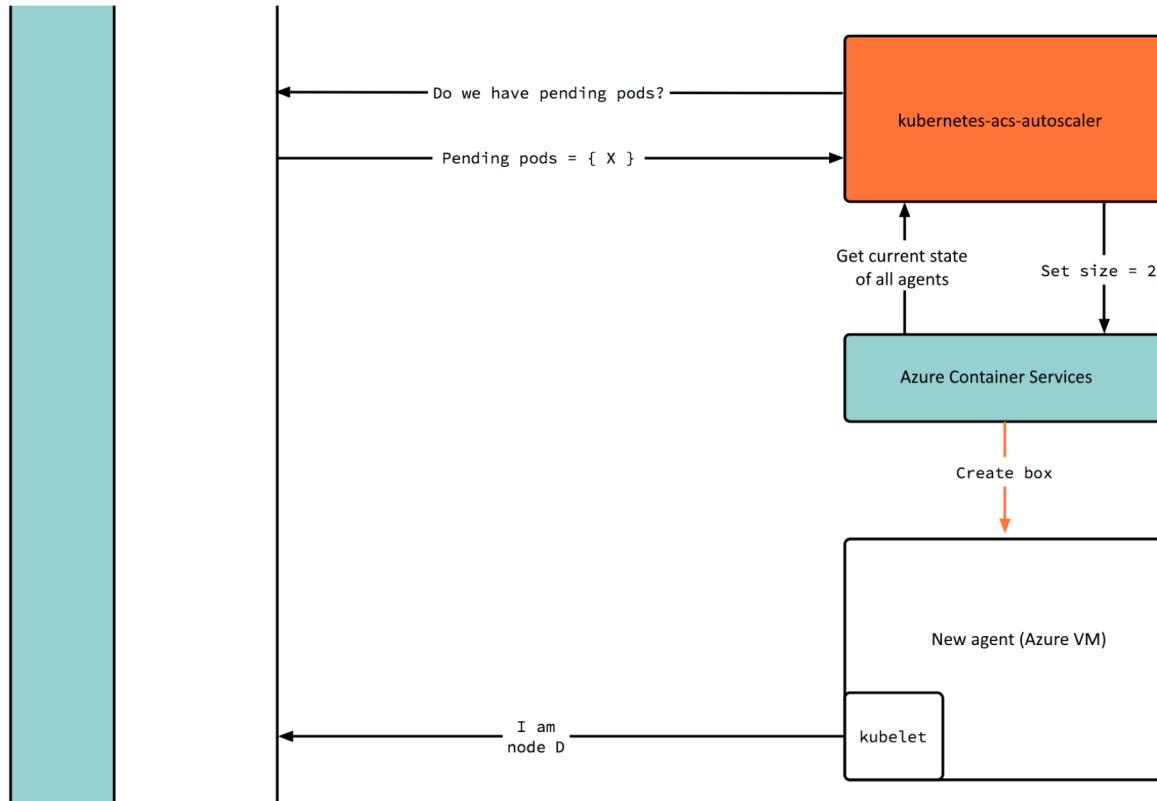
<https://docs.microsoft.com/en-us/azure/aks/gpu-cluster>

Autoscaling in Kubernetes



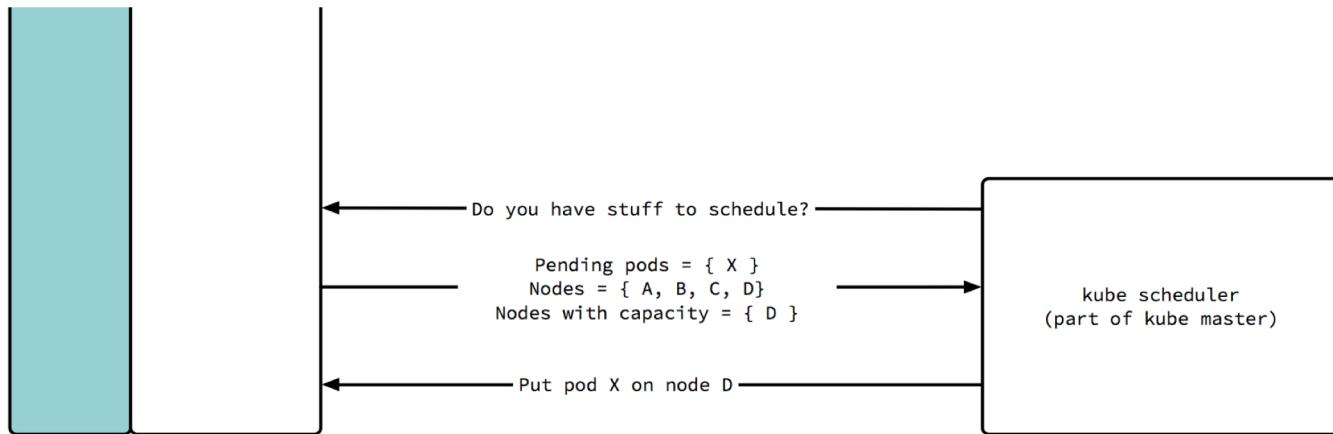
<https://medium.com/@wbuchwalter/autoscaling-a-kubernetes-cluster-created-with-acs-engine-on-azure-5e24ddc6402e>

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kubeflow

„The Kubeflow project is dedicated to making deployments of machine learning (ML) workflows on Kubernetes simple, portable and scalable. Our goal is not to recreate other services, but to provide a straightforward way to deploy best-of-breed open-source systems for ML to diverse infrastructures. Anywhere you are running Kubernetes, you should be able to run Kubeflow.”

kubeflow

JupyterHub to create and manage interactive Jupyter notebooks. Project Jupyter is a non-profit, open-source project to support interactive data science and scientific computing across all programming languages.

TensorFlow Training Controller that can be configured to use either CPUs or GPUs and dynamically adjusted to the size of a cluster with a single setting

TensorFlow Serving container to export trained TensorFlow models to Kubernetes

JupyterHub

- A single hub & proxy for managing interactive sessions
- Can run entirely within Kubernetes - notebooks are backed by Kubernetes pods
- Can request required resources - CPUs, GPUs, etc
- Has pluggable authentication (oauth, kdc, etc)

Made possible by: <https://github.com/jupyterhub/kubespawner>

Tensorflow Training Controller

- A Kubernetes “operator” to help run distributed/non-distributed TF training.
- Exposes an API through a CustomResourceDefinition
- Controller manages complexity of distributed training using Tensorflow.

Made possible by: <https://github.com/tensorflow/k8s>

Tensorflow Serving

- A Kubernetes Deployment that can serve saved models
- Deployment - replicas can be scaled.

JupyterHub

DEMO

Autoscaling in Kubernetes

DEMO

THANKS!



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