# **Exploring Kubeflow Components**



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#### Kubeflow Overview

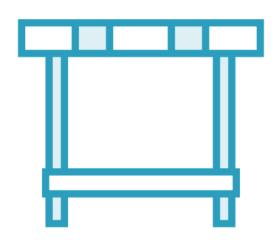
# Kubeflow

Machine learning toolkit for Kubernetes

# Kubernetes

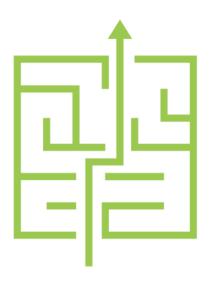
Open source system that runs everywhere (on-premise, public cloud, hybrid)







Allow data scientists to be more productive without deep expertise in containers and Kubernetes

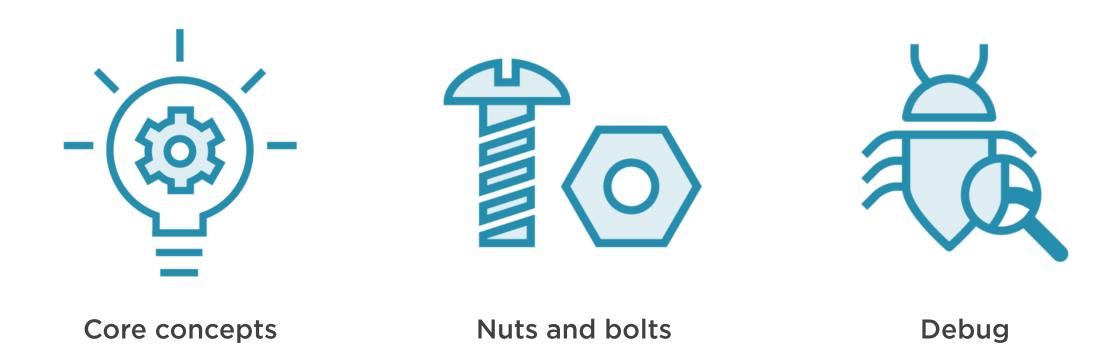


High ceiling

Allow experts to customize based on complex requirement



# Why Kubernetes Basics?



#### Overview



Just enough Docker

**Demo: Docker overview** 

Just enough Kubernetes

**Demo: Kubernetes overview** 

**Kubeflow components overview** 



# Just Enough Docker



# Environment Dependency



import tensorflow as tf
print(tf.\_\_version\_\_)

Python environment

Python 2 or 3

Python package(s)

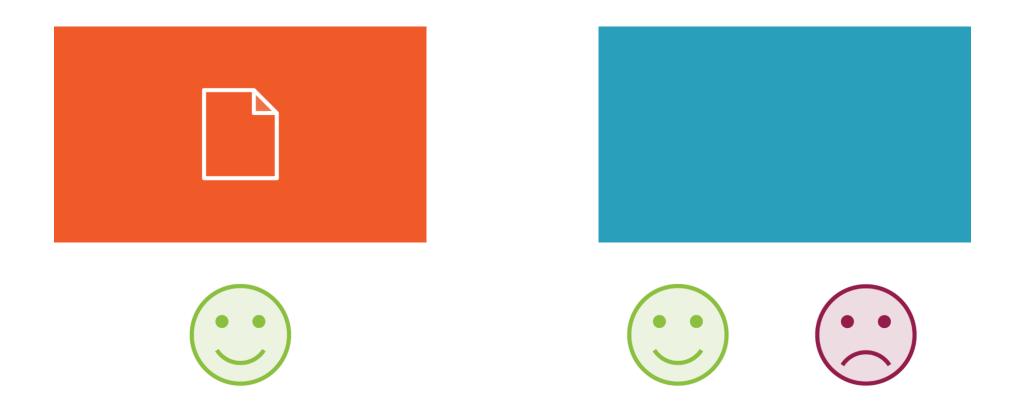
TensorFlow with specific version

**Operating system** 

Linux/macOS/Windows

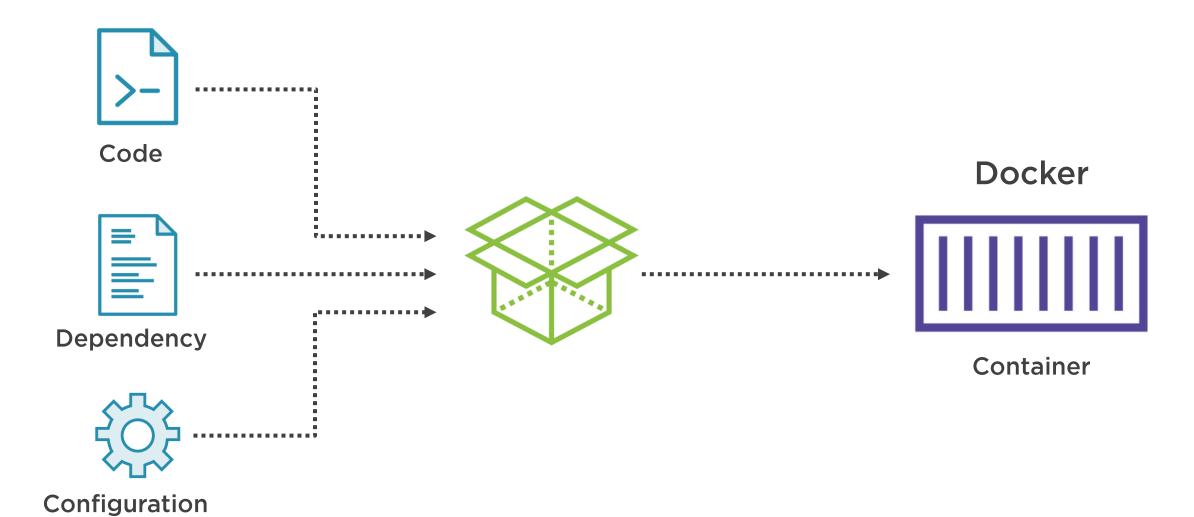


# Environment Dependency





#### Containers





#### Docker Container



Linux



macOS

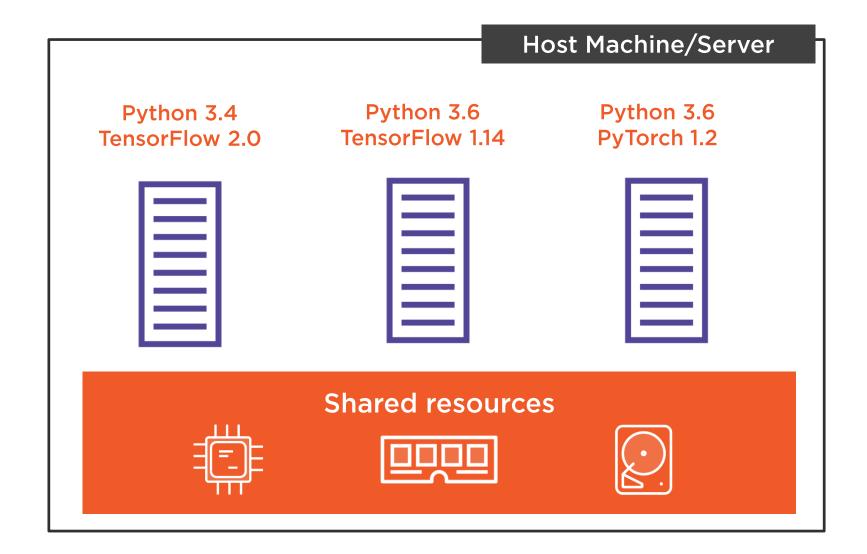


Windows

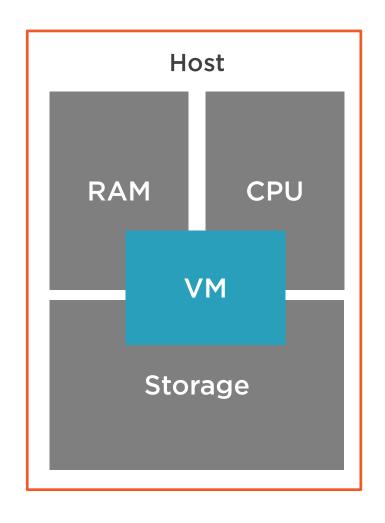


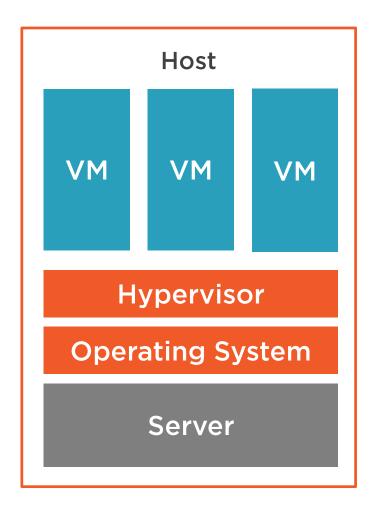


#### Docker Container



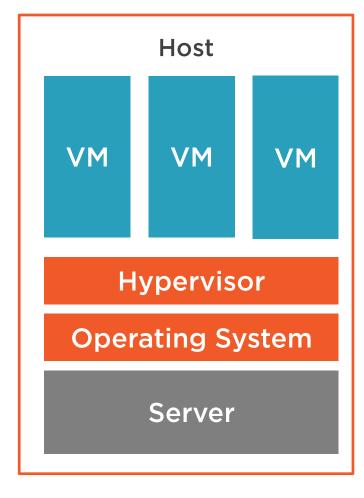
#### Virtual Machine



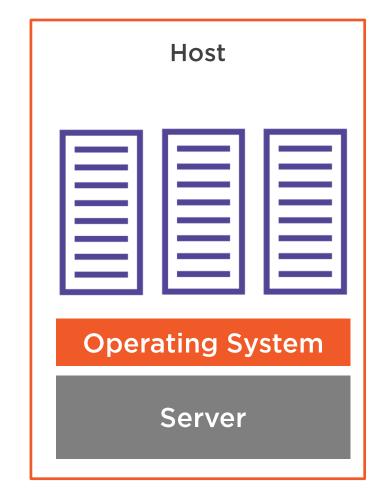




## Hypervisor vs. Container







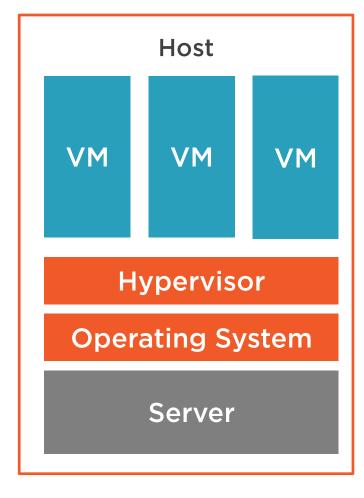
**Container Architecture** 



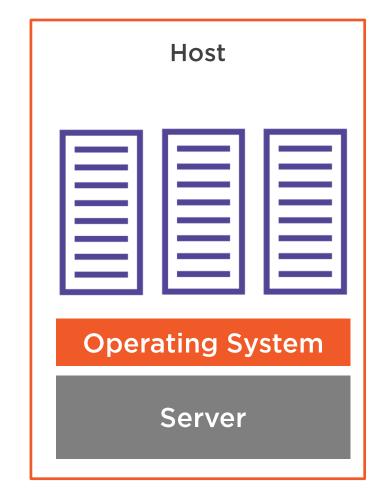
# Containers are lightweight and can be created or destroyed quickly.



## Hypervisor vs. Container



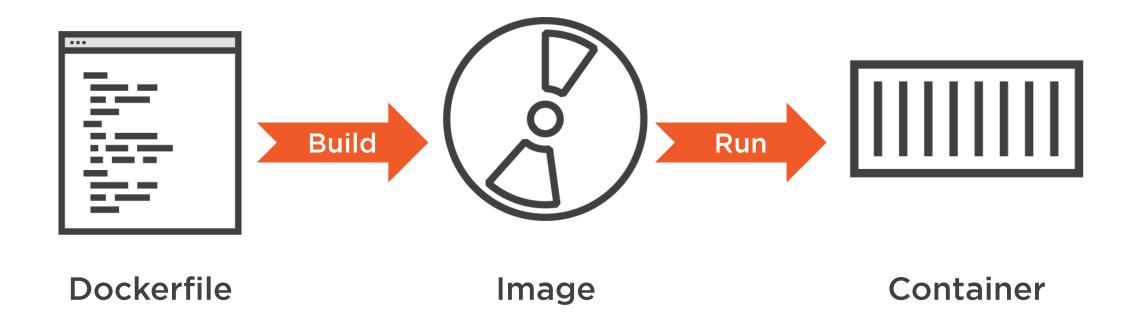




**Container Architecture** 



#### Docker Process





## Environment Dependency



print(tf.\_\_version\_\_)

Python environment<br/>
Python 2 or 3

Python package(s)

TensorFlow with specific version

**TensorFlow 2.1.0** 

Operating system

Linux/macOS/Windows



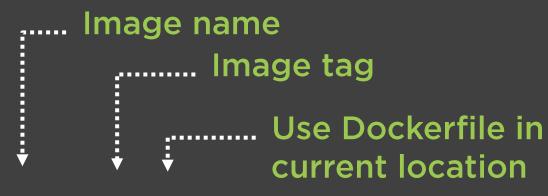
#### Dockerfile

dockerhub.com

```
FROM ubuntu:16.04
                                                Base image
                                  •........
RUN apt-get update && \
                                                Ubuntu linux
    apt-get install -y python3-pip python3-dev
&& \
    cd /usr/local/bin && \
                                           E..... Python environment
    ln -s /usr/bin/python3 python && \
    pip3 install --upgrade pip
                                                Python 3
RUN pip3 install tensorflow==2.1.0
                                        :..... Python package(s)
WORKDIR /app
                                                TensorFlow with
COPY app.py .
                                                specific version
ENTRYPOINT ["python3", "app.py"]
```



# Docker Image and Container





docker build -t myimage:v1 .

|||||||||| docker run myimage:v1

Create Docker container from image and run



#### **Docker overview**

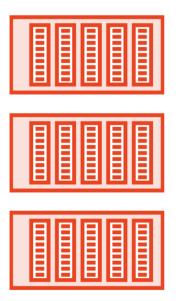
- Build Docker image
- Create and run Docker container



# Why Kubernetes?



Machine learning prediction API





















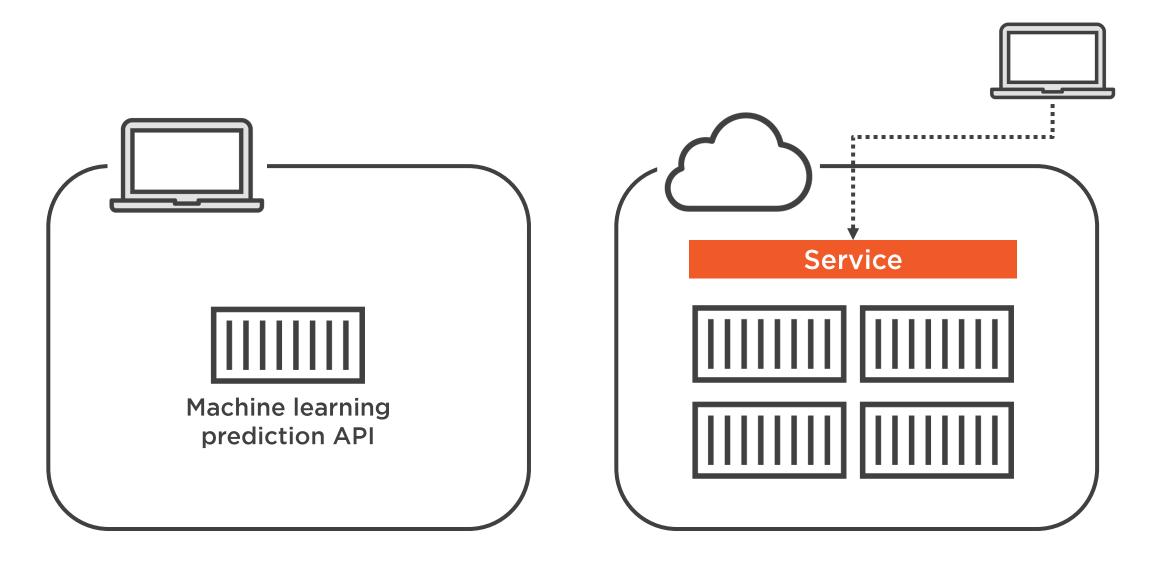




# Just Enough Kubernetes



# Taking Containers to Real World





# Why Kubernetes?







Scale
Automated scaling

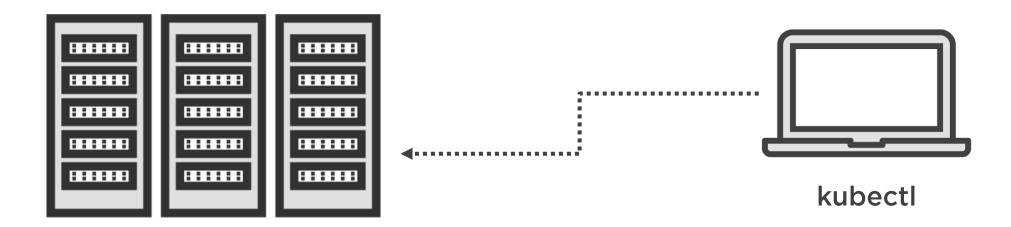


Monitor

Monitor performance,
recovery



#### Kubernetes Cluster

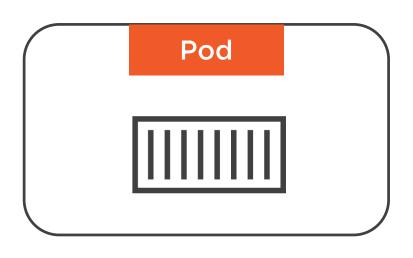


On-premise setup

Google Kubernetes Engine (GKE)
Azure Kubernetes Service (AKS)
Amazon Elastic Kubernetes Service (EKS)



#### Pod



Atomic unit in Kubernetes

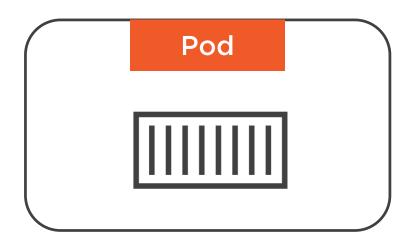




Horizontal scale by creating Pod replicas

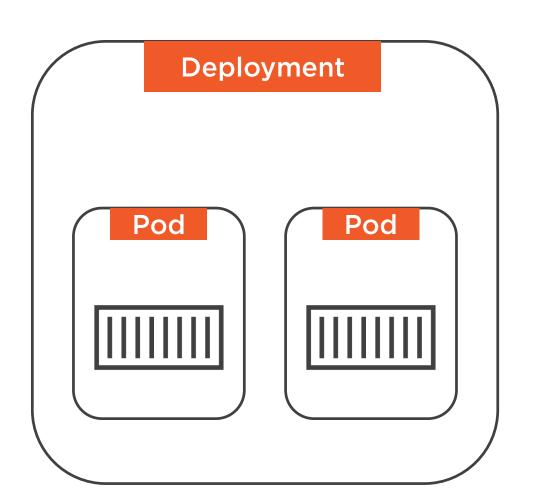


#### Pod



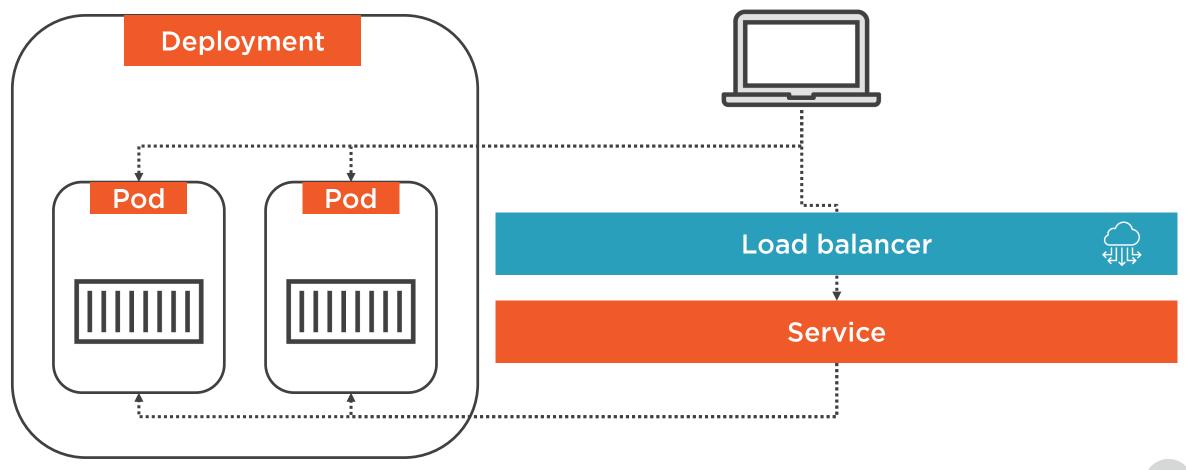
#### YAML

# Deployment



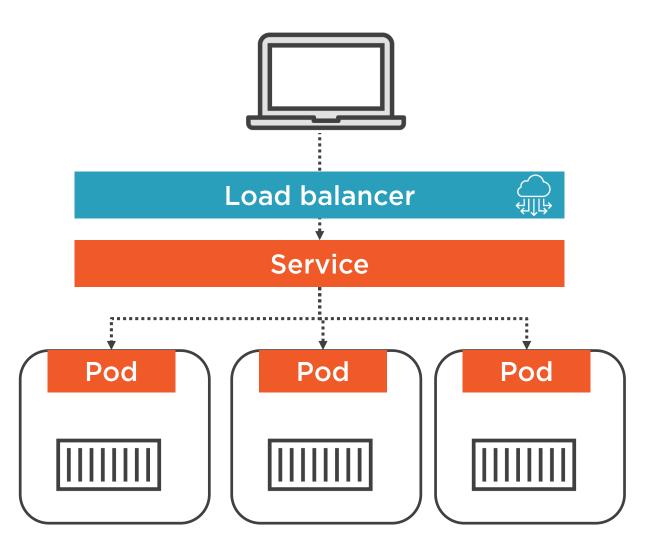
```
YAML
apiVersion: apps/v1
kind: Deployment
metadata:
   name: nginx-deployment
spec:
replicas: 2
selector:
    matchLabels:
        app: my-nginx
template:
    metadata:
        labels:
        app: my-nginx
   spec:
       containers:
           - name: nginx
             image: nginx:1.7.9
```

## Service



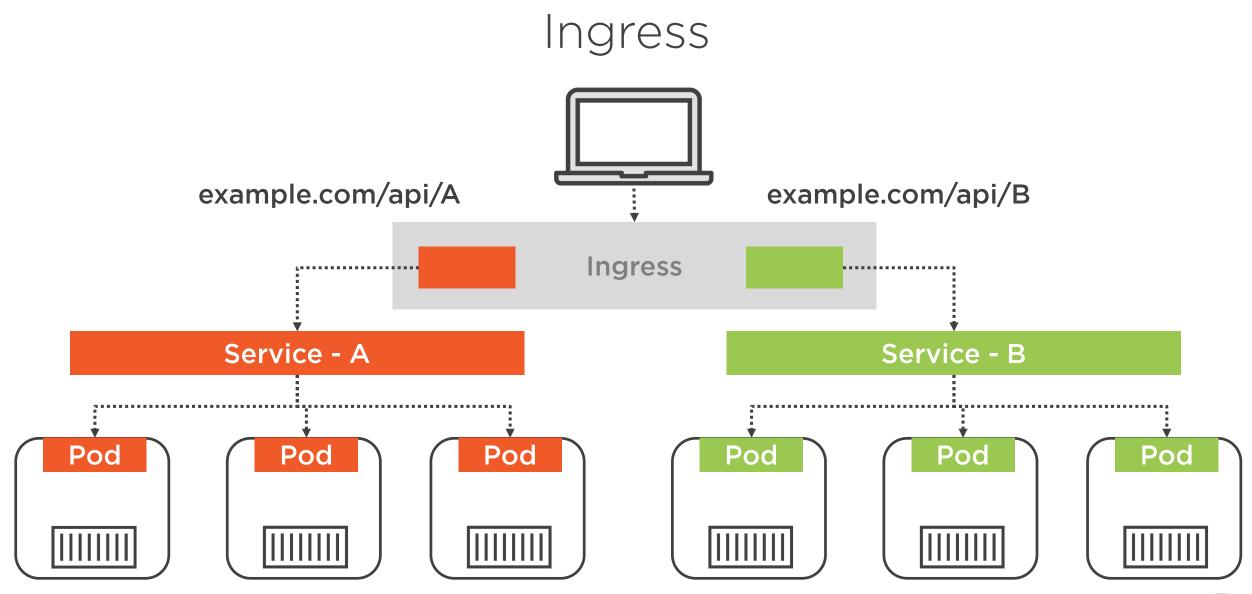


#### Service



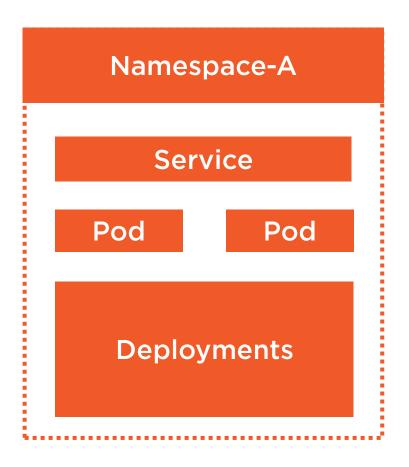
```
YAML
apiVersion: v1
kind: Service
metadata:
name: nginx-service
spec:
type : LoadBalancer
                         ClusterIP
selector:
 app: my-nginx
ports:
 - port : 80
   targetPort: 80
```

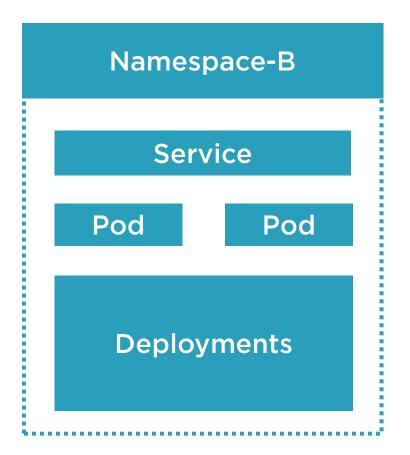






# Namespace







# Namespace

Environment QA Dev Prod



### Play with Kubernetes

#### Kubeflow

https://www.kubeflow.org/docs/started/

#### Minikube

https://github.com/kubern etes/minikube

# Docker Desktop

https://www.docker.com/products/docker-desktop





#### **Kubernetes overview**

- Create pod
- Create deployment
- Create service
- Kubectl commands





#### **Kubeflow overview**

- Kubectl commands
- Kubernetes concepts





Kubeflow central dashboard overview



# Summary



#### **Docker overview**

#### Kubernetes overview and key concepts

- Pod
- Deployment
- Service
- Ingress
- Namespace

Kubeflow central dashboard



# Next up: Building Machine Learning Model on Kubeflow

