

Introduction to Kubernetes





- ▶ “Environment” in a running operating system
- ▶ Not a virtual machine
- ▶ Kernel namespaces
 - ▶ Processes
 - ▶ Network interfaces
 - ▶ Filesystem mount points
 - ▶ ...
- ▶ Docker

DOCKERFILE



```
FROM node:latest as build

RUN yarn global add @quasar/cli
COPY ./frontend/package.json /package.json
WORKDIR /
RUN yarn install
COPY ./frontend /code
RUN mv /node_modules /code/
WORKDIR /code
RUN quasar build
```

```
FROM nginx:alpine

COPY --from=build /code/dist/spa/ /usr/share/nginx/html/
COPY ./k8s/nginx.conf /etc/nginx/nginx.conf

EXPOSE 80
```



- ▶ Container orchestration
- ▶ Originates from Google
- ▶ Kubernetes \rightarrow K + 8 letters + s \rightarrow k8s (“Kates”)



- ▶ `kubectl`
 - ▶ `kubectl help -f ...`
 - ▶ `kubectl apply -f ...`
 - ▶ `kubectl delete -f ...`
 - ▶ `kubectl get ...`
 - ▶ `kubectl describe ...`
- ▶ “Death by YAML”

EXAMPLE



```
apiVersion: v1
kind: Pod
metadata:
  name: menu-frontend
  labels:
    id: menu-frontend

spec:
  containers:
    - name: menu-frontend
      image: scilifelabdatacentre/menu-frontend:latest
      ports:
        - containerPort: 80
```

EXAMPLE



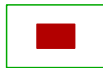
```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: dsw-client
  labels:
    name: dsw-client
    type: prod
  namespace: dc-dsw
spec:
  selector:
    matchLabels:
      name: dsw-client
      type: prod
  replicas: 1
  template:
    metadata:
      labels:
        name: dsw-client
        type: prod
        version: 2.5.0
    spec:
      containers:
        - name: dsw-client
          image: dsw/wizard-client:2.5.0
          resources:
            limits:
              cpu: 600m
              memory: 200Mi
            requests:
              cpu: 200m
              memory: 40Mi
```

```
ports:
  - containerPort: 80
readinessProbe:
  httpGet:
    path: /
    scheme: HTTP
    port: 80
volumeMounts:
  - name: client-conf
    mountPath: /src/scss/_variables.scss
    subPath: _variables.scss
  - name: client-conf
    mountPath: /src/scss/_overrides.scss
    subPath: _overrides.scss
  - name: custom-assets
    mountPath: /usr/share/nginx/html/assets
env:
  - name: API_URL
    valueFrom:
      configMapKeyRef:
        name: prod-client
        key: API_URL
volumes:
  - name: client-conf
    configMap:
      name: prod-client
  - name: custom-assets
    configMap:
      name: custom-assets
```



- ▶ Internal grouping
- ▶ DNS
 - ▶ `<service>.<namespace>.svc.cluster.local`
- ▶ Access/resource control

PODS



Pods



- ▶ “Basic unit”
- ▶ One or more containers in each pod
- ▶ A deleted pod won't restart

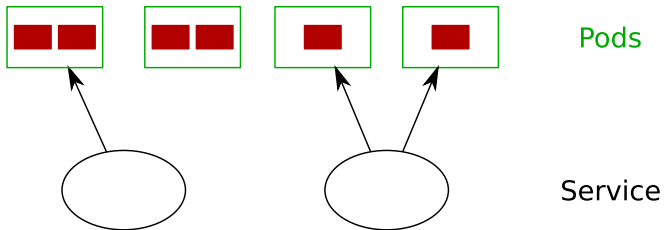


- ▶ Persistent storage
- ▶ `PersistentVolume`
 - ▶ Storage, e.g. a folder on a hd or nfs
 - ▶ Global
- ▶ `StorageClass`
 - ▶ Storage pool
 - ▶ Global
- ▶ `PersistentVolumeClaim`
 - ▶ The “claim” for storage used by the pod.
 - ▶ Namespaced



- ▶ `env:`
- ▶ `ConfigMap`
- ▶ `Secret`
 - ▶ Not encrypted
 - ▶ Base64
- ▶ Use cases:
 - ▶ Environment variables
 - ▶ Arguments
 - ▶ Files

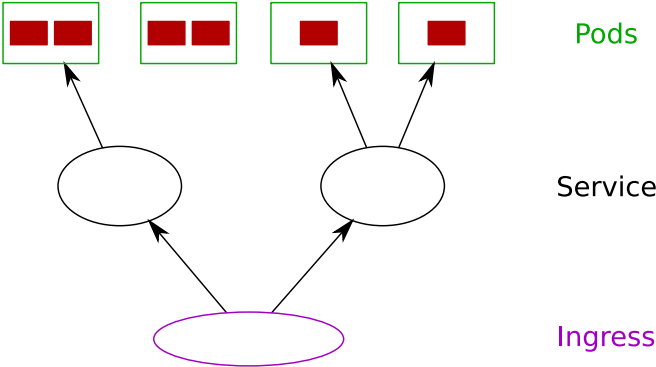
SERVICES





- ▶ Allow easy access (“DNS”) to groups of pods
- ▶ Selecting pods using labels
- ▶ Can be used to expose pods to external access
- ▶ `ClusterIP`, `NodePort`, `LoadBalancer`

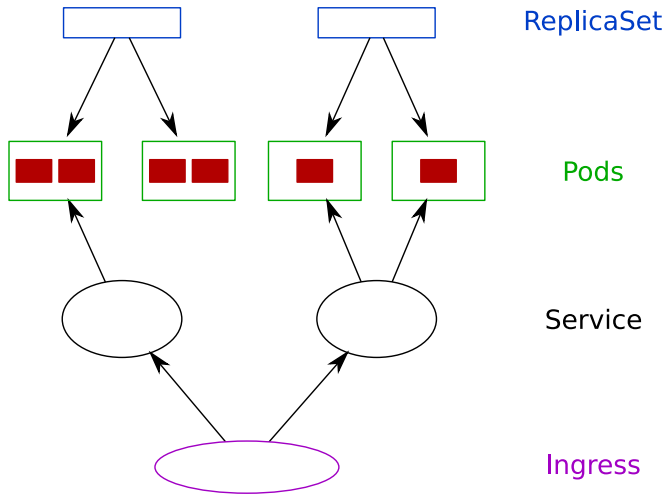
INGRESS





- ▶ Http(s) access to containers
- ▶ Certmanager
 - ▶ Certification management
 - ▶ Integration with Let's Encrypt
- ▶ Interface
 - ▶ No official implementation
- ▶ Multiple available
 - ▶ Nginx
 - ▶ Ingress-GCE
 - ▶ AWS ALB Ingress Controller
 - ▶ Traefik
 - ▶ ...

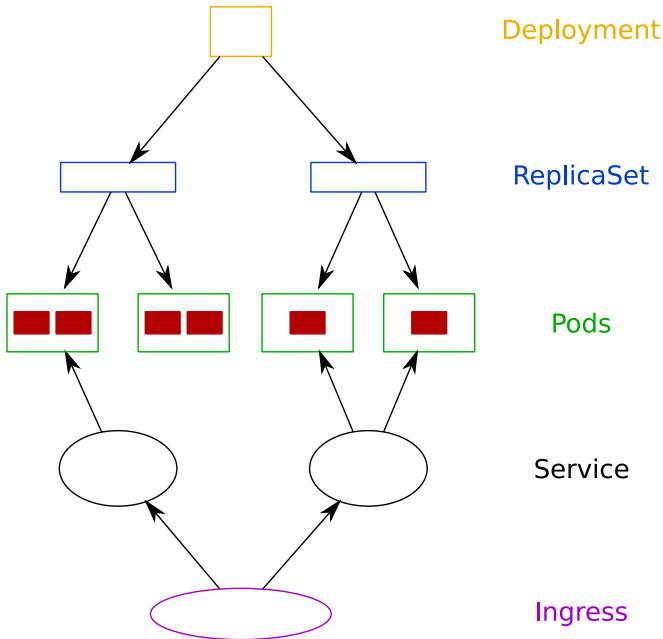
REPLICA SETS





- ▶ Defines replication of pods
- ▶ Will start/stop pods to match the wanted number of replicates

DEPLOYMENTS





- ▶ Deployments of replica sets
- ▶ Allows progressive deployment of new containers

OTHER USEFUL THINGS



- ▶ **Certmanager**
- ▶ `readinessProbe`
- ▶ `kustomization.yml`
- ▶ `StatefulSet`
- ▶ **Helm**



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<https://github.com/talavis/coffee-k8s>

