Kubernetes (k8s)

About me

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TECHSER division

LSEG Technology (Previously MIT)

We do consultancy for

Servers

OS and Containerized platforms

Cloud

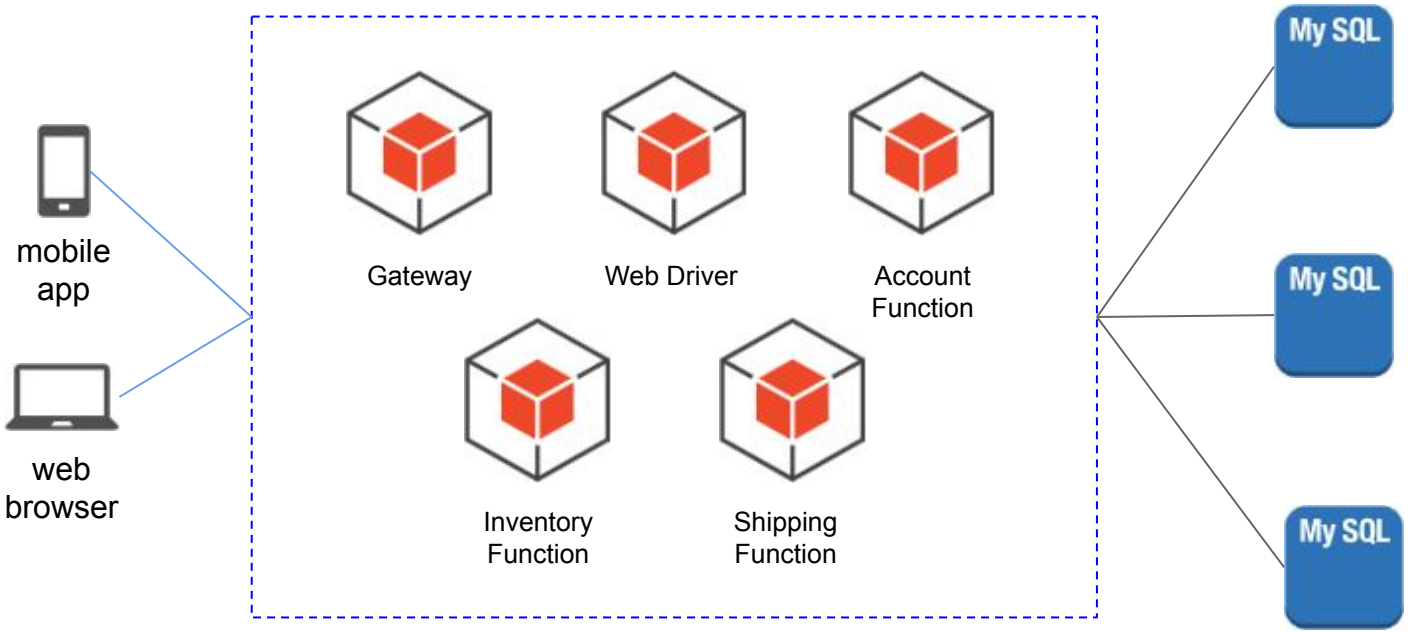
Other system software

Flow of the presentation

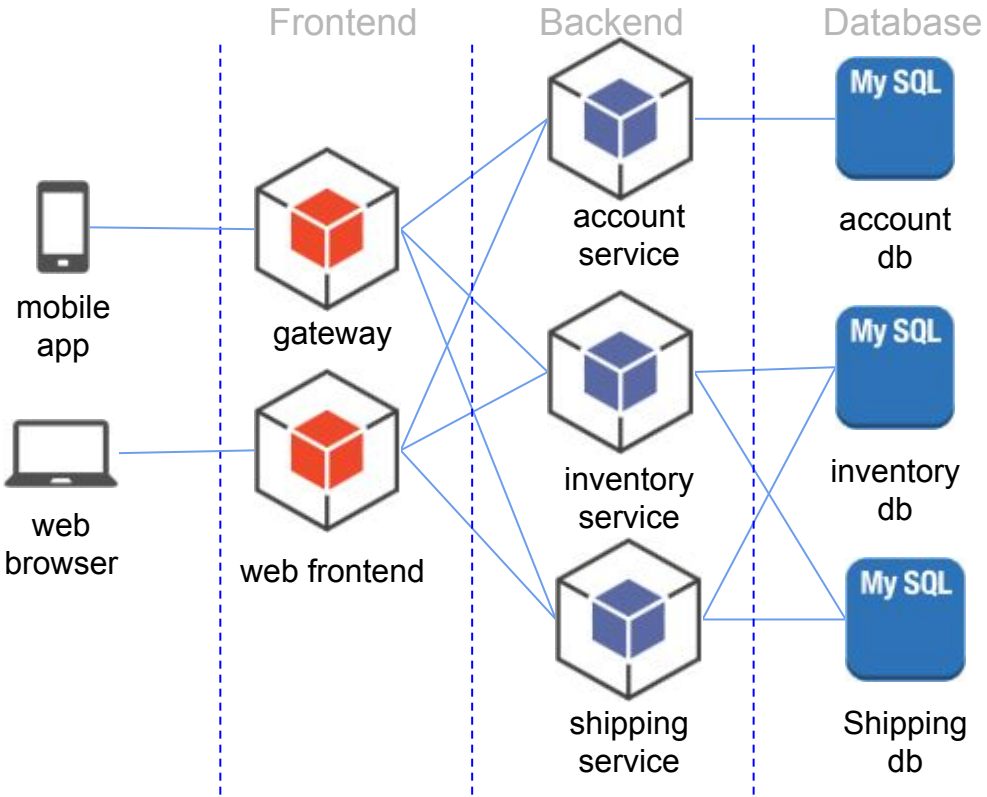
- Microservices architecture
- Microservices with Kubernetes
- Learn by reverse engineering
- First microservice in kubernetes
- Scaling
- High availability and FT
- Rolling upgrades
- CI/CD

Microservice architecture

One-thing that do everything - Monolithic

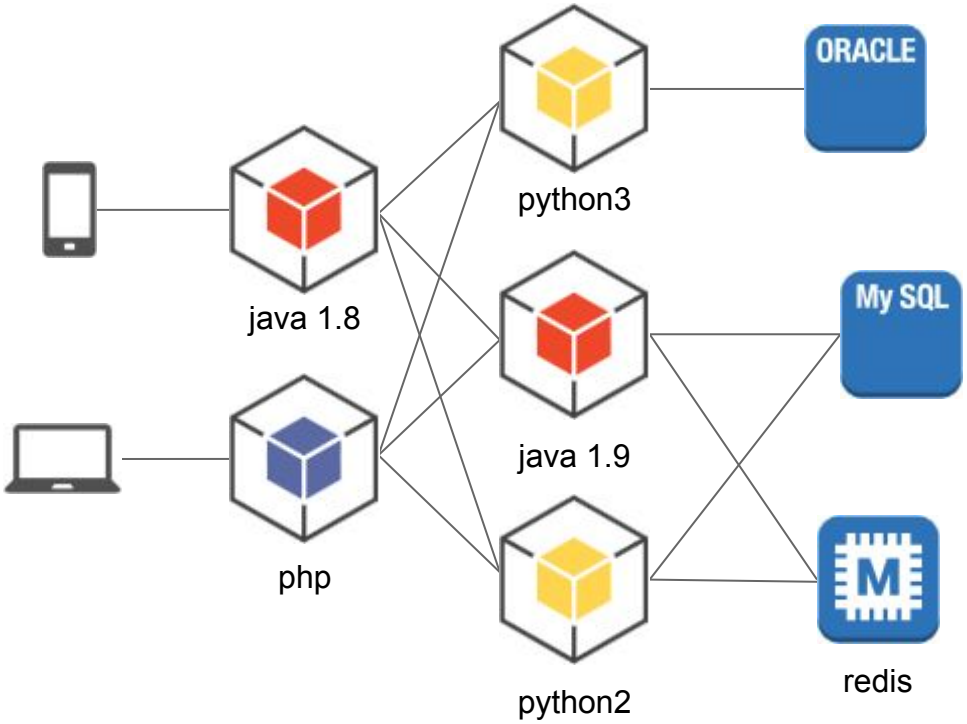


Do one thing and do it right - Microservices

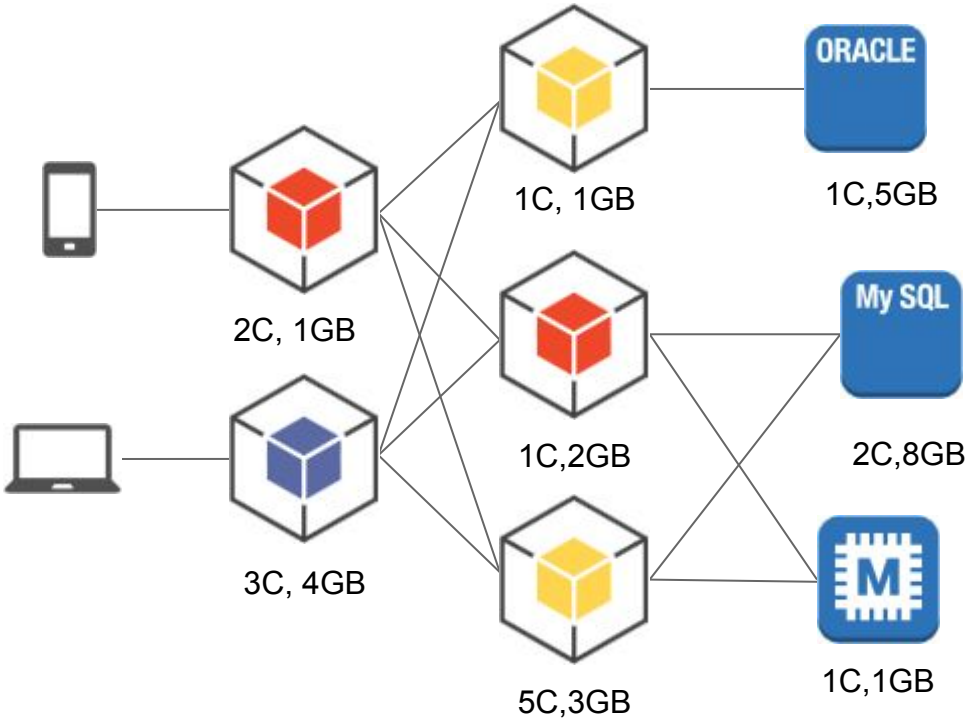


Microservices with Kubernetes

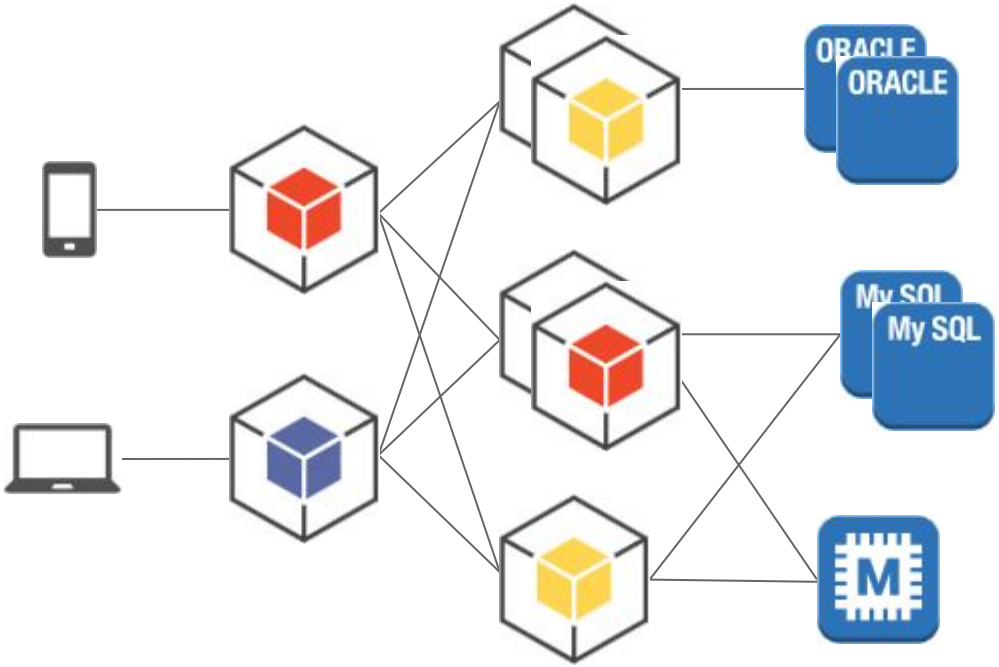
Technologies coexists



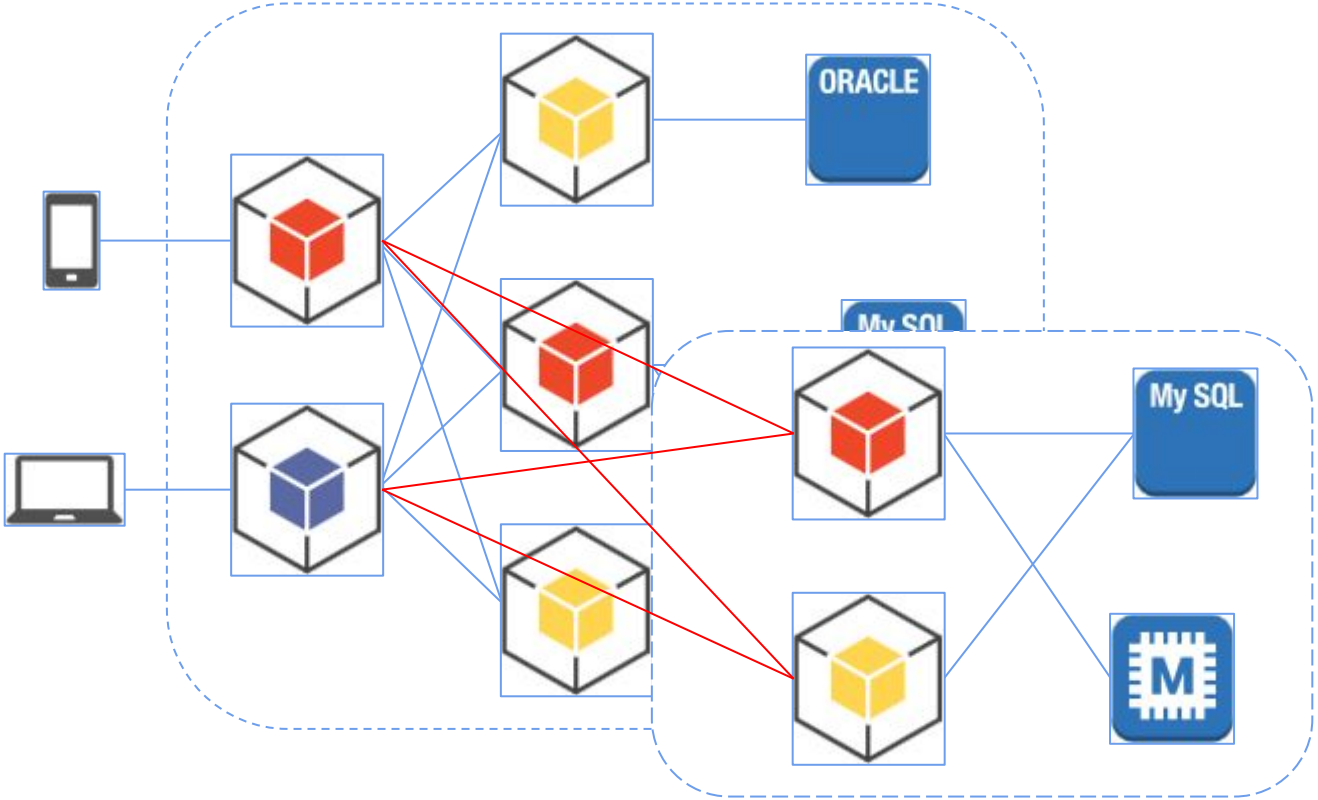
No resource overprovisioned



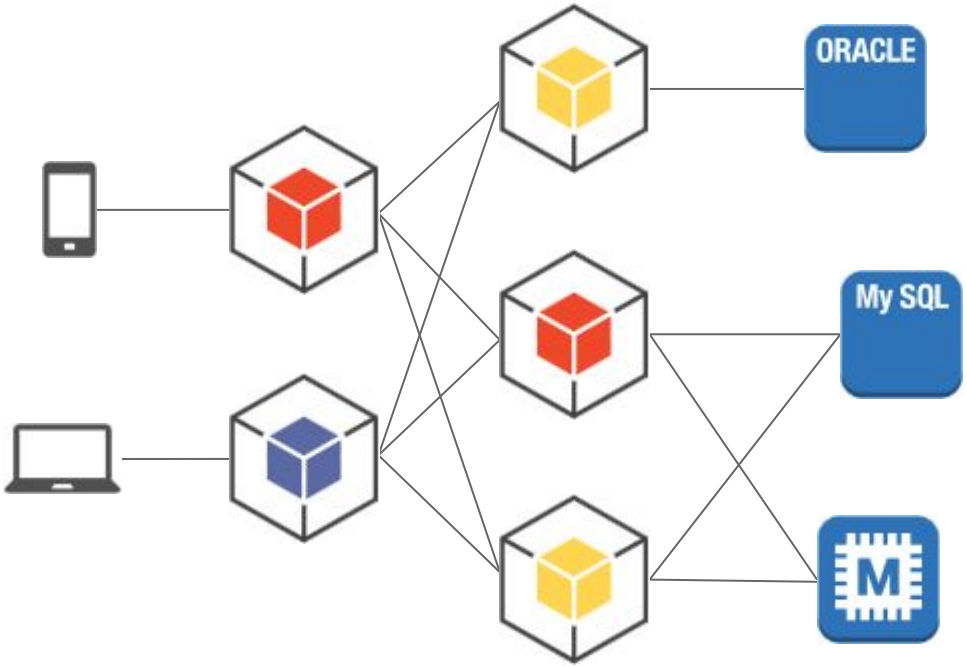
Scalable



Scalable ctd.

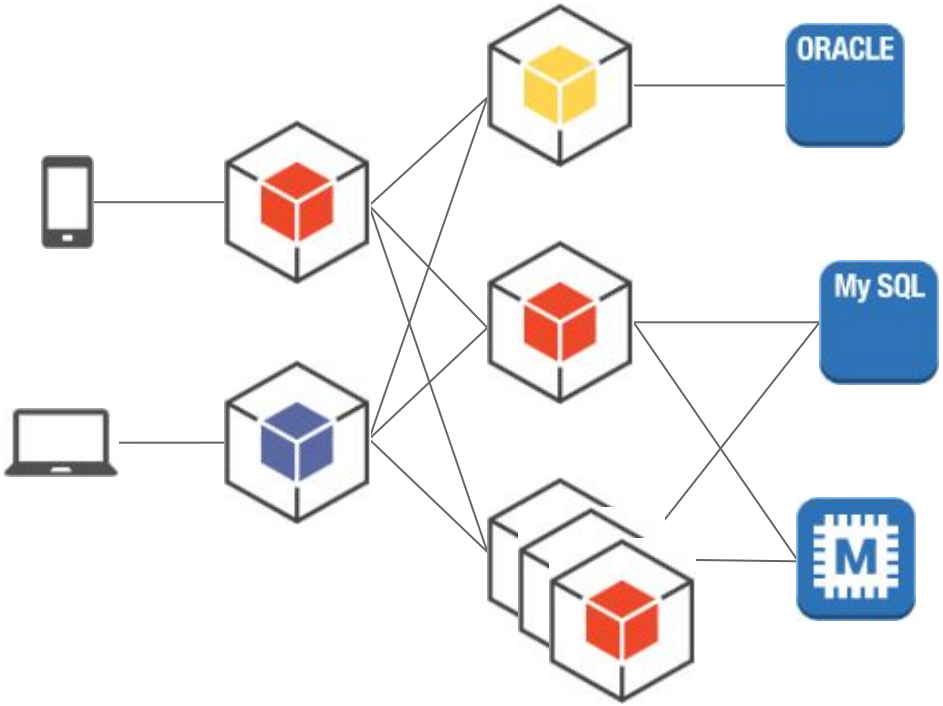


Rolling upgrade



v1.0.0

Highly available and Fault tolerant



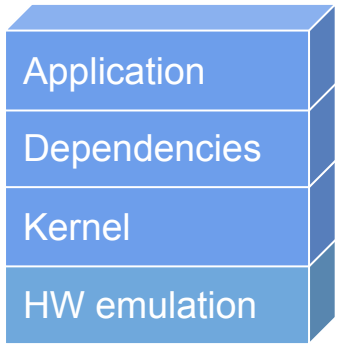
Kubernetes

- Kubernetes being the state-of-the-art platform for microservices that support above traits
- It is called the orchestration platform

What is running

- These are called pods
- It’s a stripped-down version of VM

```
kshithija-hq@kshithijahq-ThinkPad-X230:~$ kubectl get pods
NAME                              READY   STATUS    RESTARTS   AGE
maeno-frontend-8f4cd9f-5rvcf      1/1     Running   2          2d17h
maeno-frontend-8f4cd9f-jxw2c      1/1     Running   2          2d17h
kshithija-hq@kshithijahq-ThinkPad-X230:~$
```



Learn by reverse engineering

Let's install kubernetes

Minikube

Get Started: https://minikube.sigs.k8s.io/docs/start/

Kubeadm

Install Docker: https://docs.docker.com/engine/install/

Install Kubeadm:
https://kubernetes.io/docs/setup/production-environment/tools/kubeadm/install-kubeadm/

Use a cloud service

Lab Environment: http://labs.play-with-k8s.com/

Minikube

- Easiest way to run Kubernetes locally
- Its a single-node Virtual Machine

```
PS C:\Windows\system32> minikube status
minikube
type: Control Plane
host: Running
kubelet: Running
apiserver: Running
kubeconfig: Configured

PS C:\Windows\system32>
```

```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Windows\system32> minikube start
* minikube v1.23.2 on Microsoft Windows 10 Pro 10.0.19043 Build 19043
* minikube 1.24.0 is available! Download it: https://github.com/kubernetes/minikube/releases/tag/v1.24.0
* To disable this notice, run: 'minikube config set WantUpdateNotification false'

* Using the hyperv driver based on existing profile
* Starting control plane node minikube in cluster minikube
* Restarting existing hyperv VM for "minikube" ...
* Preparing Kubernetes v1.22.2 on Docker 20.10.8 ...
* Verifying Kubernetes components...
  - Using image gcr.io/k8s-minikube/storage-provisioner:v5
* Enabled addons: default-storageclass, storage-provisioner
* Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
PS C:\Windows\system32>
```

Lets install kubectl

Linux:

Install Kubectl: https://kubernetes.io/docs/tasks/tools/install-kubectl-linux/

Windows:

Install Kubectl: https://kubernetes.io/docs/tasks/tools/install-kubectl-windows/

Helloworld to kubernetes

Install Frontend:

- kubectl run maeno-frontend --image=kshithija/maeno-fe:v1.0.0 --requests=cpu=200m

Install Backend:

- kubectl run maeno-backend --image=kshithija/maeno-be:v1.0.0 --requests=cpu=100m

This is called imperative method

Deploy backend using a config files

kubectl run maeno-backend --image=kshithija/maeno-be:v1.0.0

=

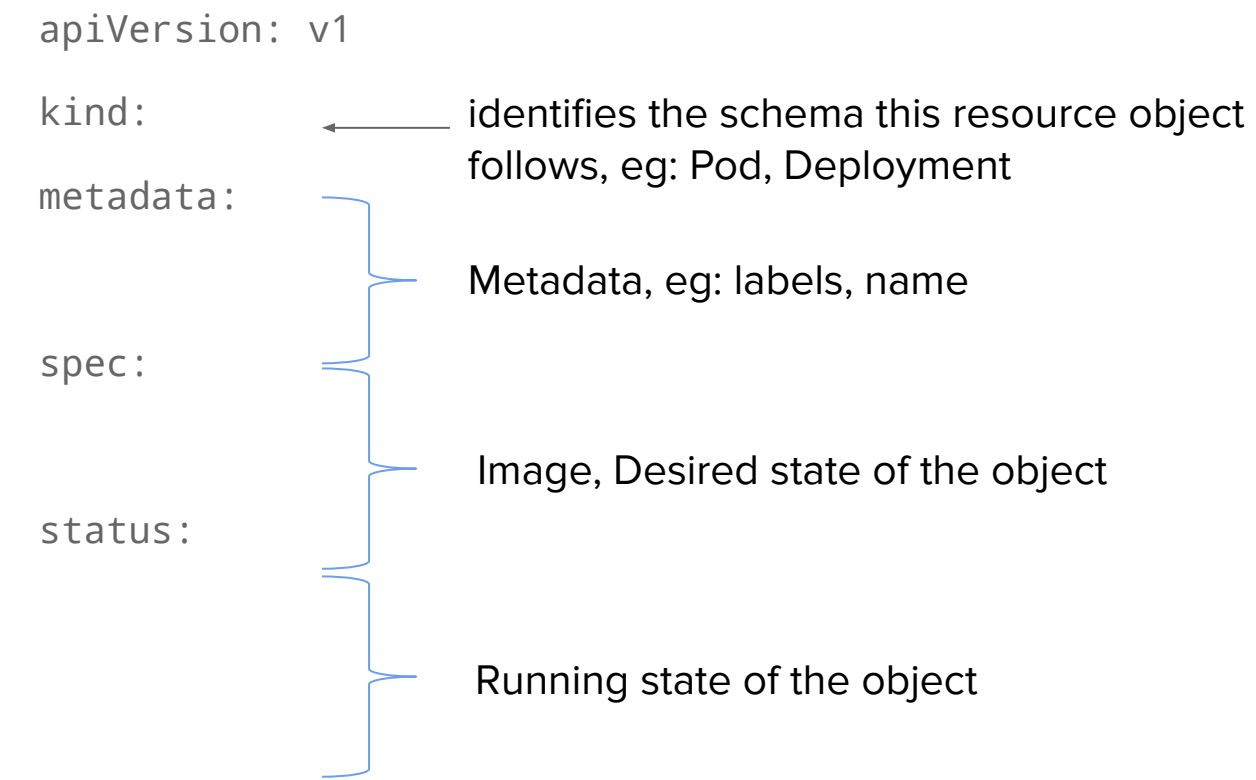
kubectl apply -f maeno-be.yaml

maeno-be.yaml

```yaml
apiVersion: v1
kind: Pod
metadata:
  creationTimestamp: null
  labels:
    run: maeno-backend
  name: maeno-backend
spec:
  containers:
  - image: kshithija/maeno-be:v1.0.0
    name: maeno-backend
    resources: {}
  dnsPolicy: ClusterFirst
  restartPolicy: Always
status: {}
```

This is called declarative method

Syntax


apiVersion: v1
kind:
identifies the schema this resource object follows, eg: Pod, Deployment
metadata:
Metadata, eg: labels, name
spec:
Image, Desired state of the object
status:
Running state of the object

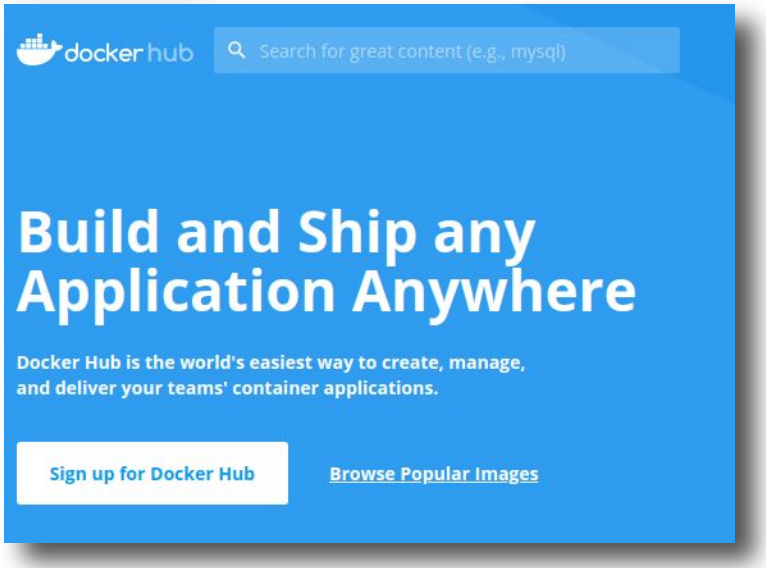
First micro service

Two-tier microservice application flow

Pod on rest is called 'image'

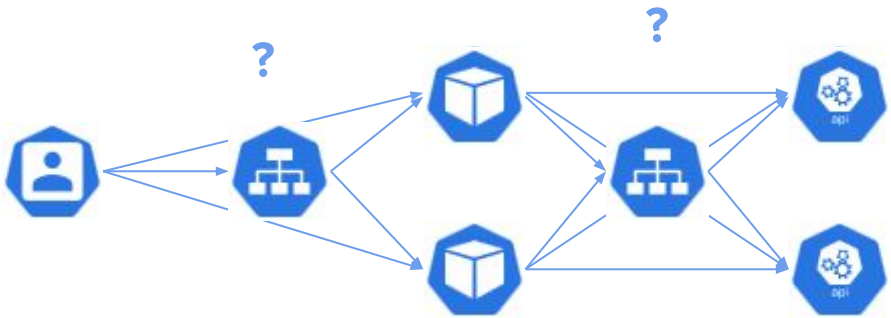
kubectl run maeno-backend --image=kshithija/maeno-be:v1.0.0

```yaml
apiVersion: v1
kind: Pod
metadata:
  creationTimestamp: null
  labels:
    run: maeno-backend
  name: maeno-backend
spec:
  containers:
  - image: kshithija/maeno-be:v1.0.0
    name: maeno-backend
    resources: {}
  dnsPolicy: ClusterFirst
  restartPolicy: Always
status: {}
```



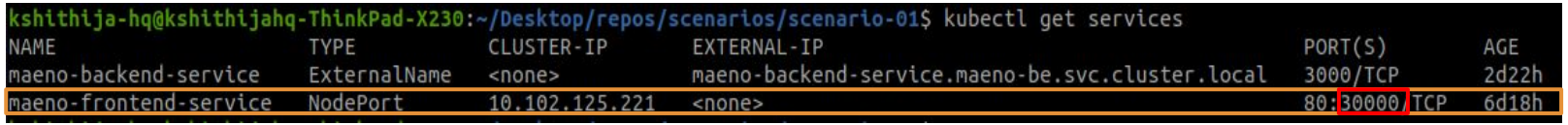
https://hub.docker.com/

Connectivity between pods



What is a ‘Service’

‘Services’ provide connectivity and load balancing



Scaling

It's not just the PODs and the Services

Deployment

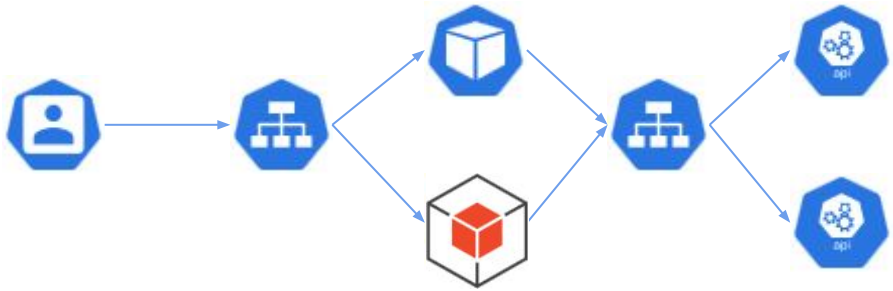
Replica Set

```
kshithija-hq@kshithijahq-ThinkPad-X230:~/Desktop/repos/scenarios/scenario-01$ kubectl get all
NAME                                 READY   STATUS    RESTARTS   AGE
pod/maeno-frontend-8f4cd9f-5rvcf     1/1     Running   2          2d19h
pod/maeno-frontend-8f4cd9f-jxw2c     1/1     Running   2          2d19h

NAME                                 TYPE           CLUSTER-IP       EXTERNAL-IP                                    PORT(S)        AGE
service/maeno-backend-service        ExternalName   <none>           maeno-backend-service.maeno-be.svc.cluster.local   3000/TCP       2d23h
service/maeno-frontend-service       NodePort       10.102.125.221   <none>                                         80:30000/TCP   6d19h

NAME                                 READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/maeno-frontend       2/2     2            2           6d19h

NAME                                       DESIRED   CURRENT   READY   AGE
replicaset.apps/maeno-frontend-8f4cd9f     2         2         2       2d19h
```

This is all that we provisioned so far

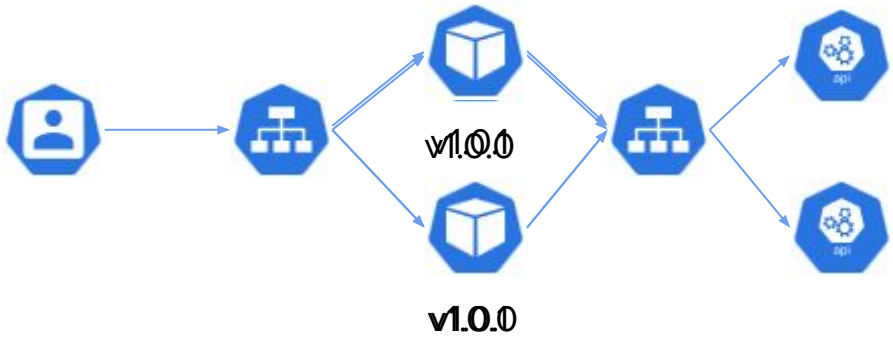
High availability

Let's kill a process



Rolling upgrade

Let's upgrade the frontend



Kubernetes in production

[Amazon EKS]

[Google GKE]

[Azure AKS]

CI/CD