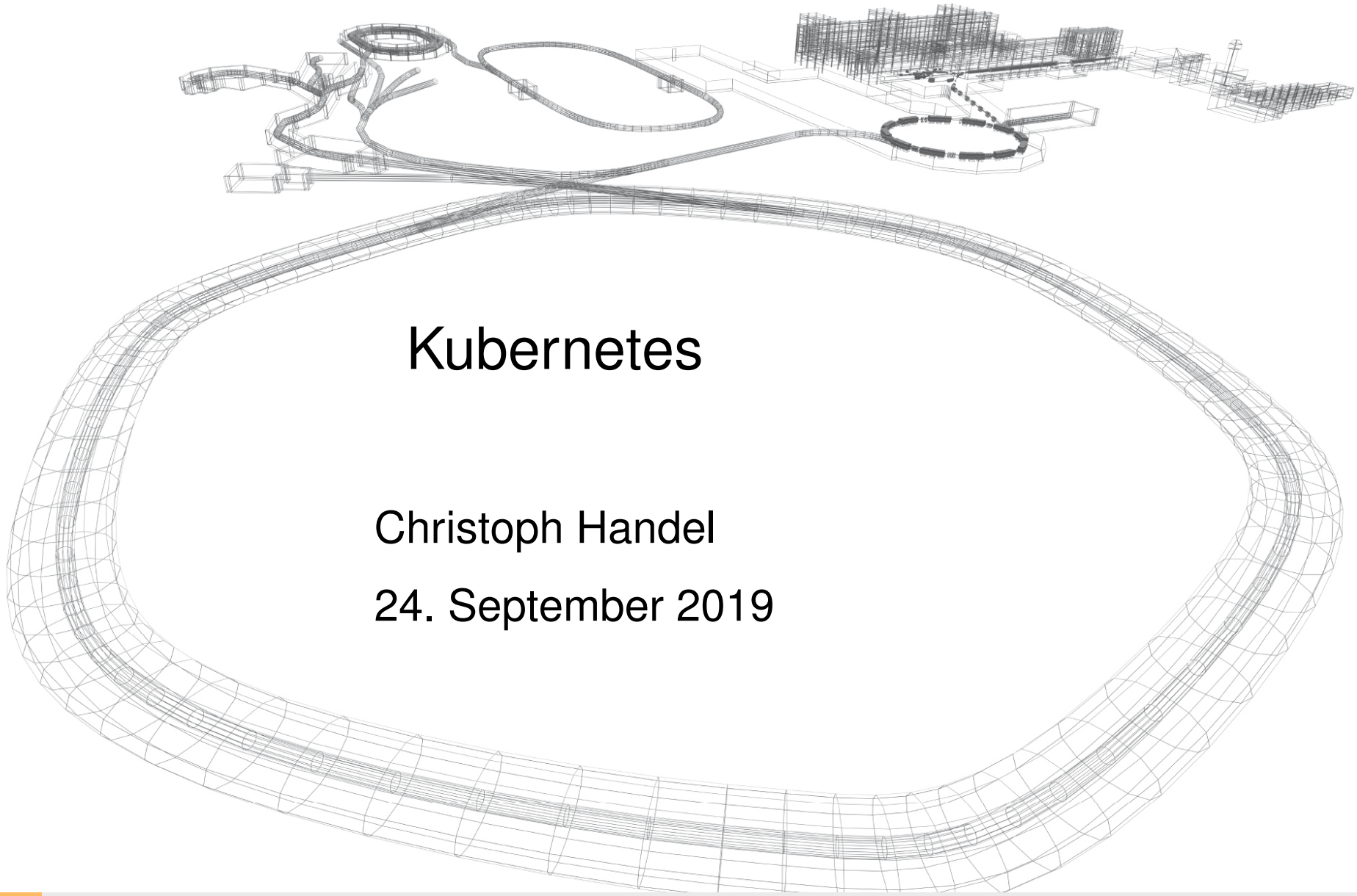

Kubernetes

Christoph Handel

24. September 2019

TOC

Who?

- History
  - created by Google in 2015
  - donated to Cloud Native Foundation
  - which is part of the Linux Foundation
  - apache license
- Used
  - Redhat (Openshift)
  - Oracle Cloud Infrastructure Container Engine
  - Amazon Elastic Kubernetes Service
  - Google Kubernetes Engine

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What?

Kubernetes is a portable, extensible, open-source platform for managing containerized workloads and services, that facilitates both declarative configuration and automation.

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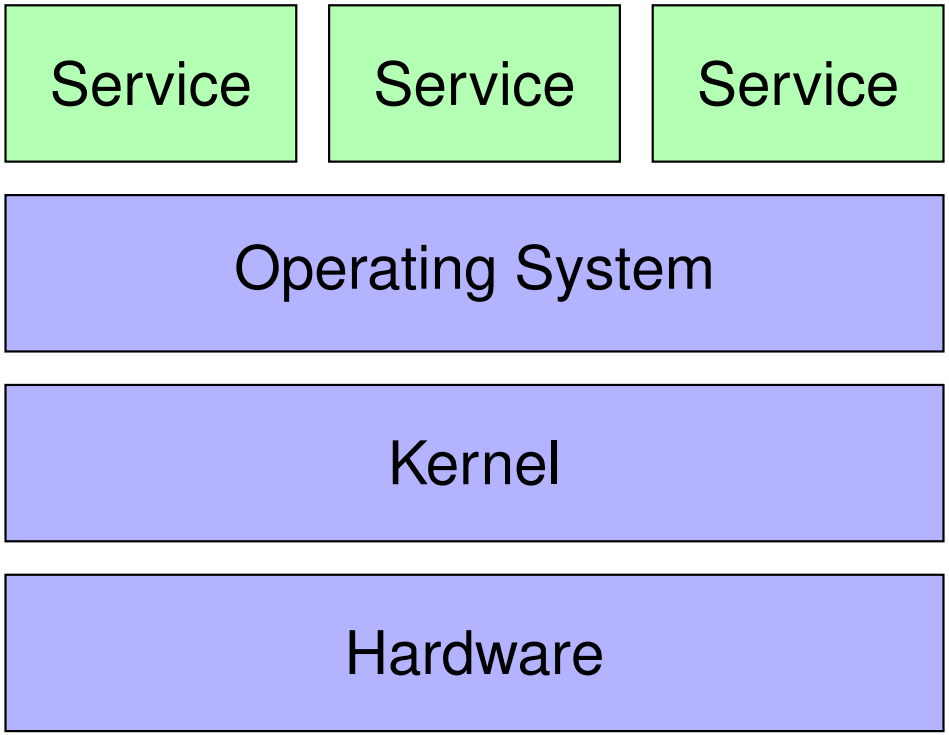
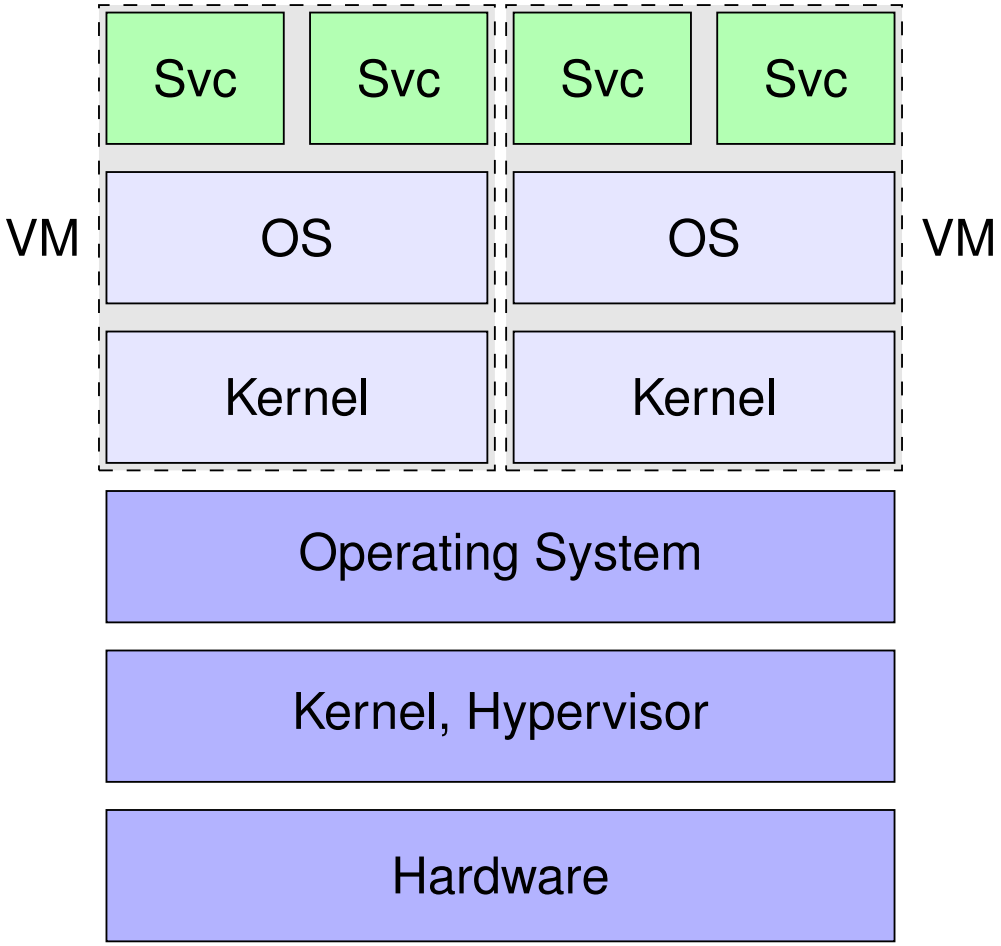
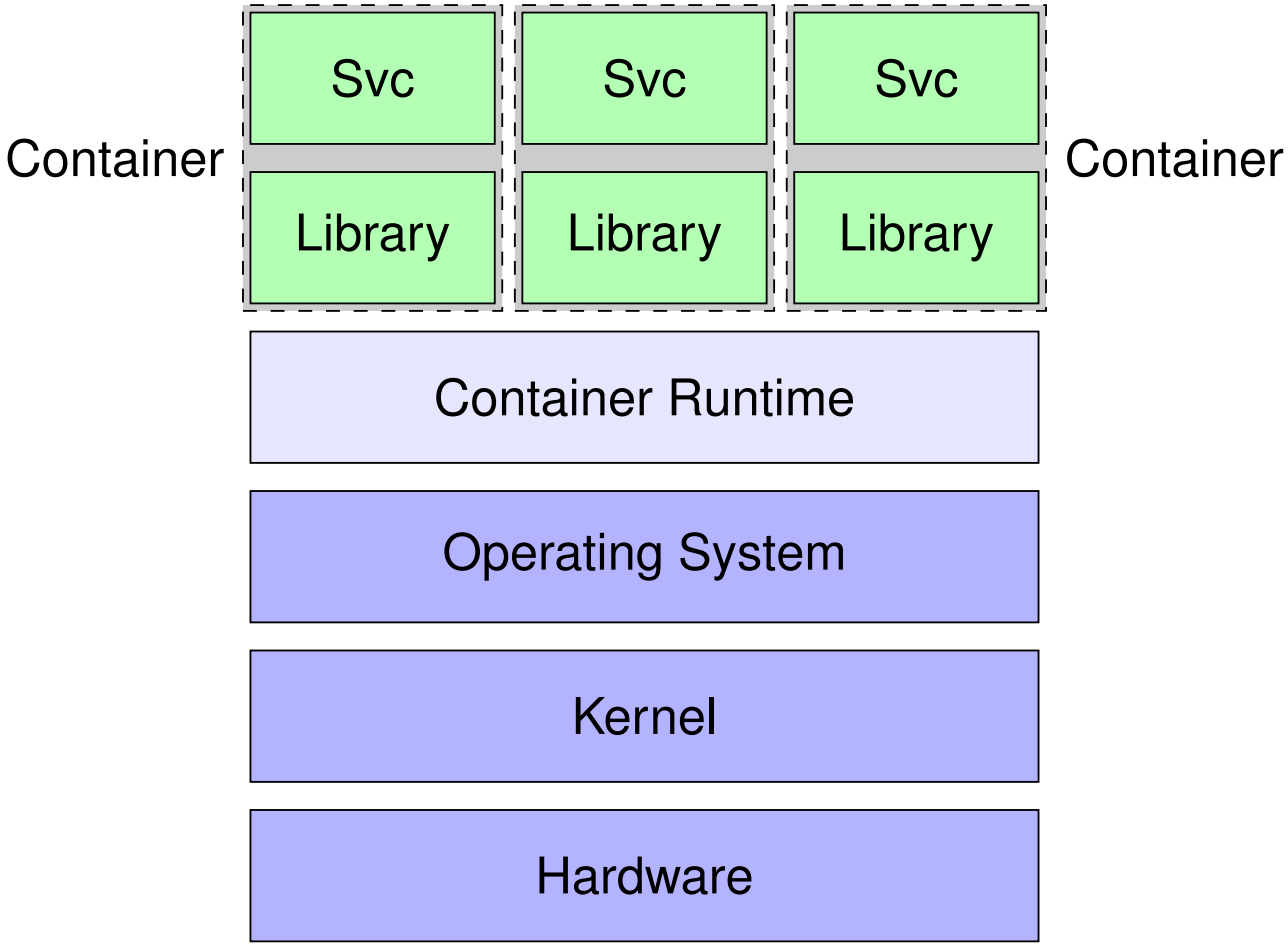
Bare Metal


Service
Service
Service
Operating System
Kernel
Hardware

Virtual Machine



Container

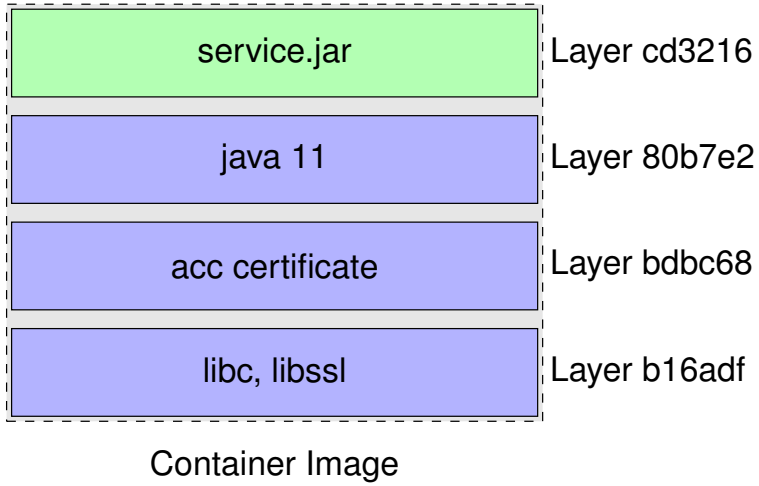

Container
Svc
Svc
Svc
Library
Library
Library
Container
Container Runtime
Operating System
Kernel
Hardware

Container

- Encapsulate a Service and all it's required libraries.
- Is isolated from other Processes. Including CPU, Memory, Network and Filesystem.
- Runs on the same Kernel.
- Becomes a portable Software Package

Container Images and Layers

- A container image constists of multiple layers
- Each layer can add or overwrite files in lower layers
- Layers are checksumed
- Layers can be shared



Building Base Image

```
FROM centos:7.6.1810

# set repositories
RUN rm -f /etc/yum.repos.d/*
ADD repos/* /etc/yum.repos.d/

# install some default packages
RUN yum install -y gsicert unzip which

# cleanup to keep image smaller
RUN yum clean all
```

- `podman build -t aco/base:7.6.1810`
- `podman push aco/base:7.6.1810 registry.acc.gsi.de/aco/base:7.6.1810`

Building Application Images

```
FROM aco/jdk11:7.6.1810

# download and unpack application to /opt
RUN curl -f -L -o /opt/app.zip \
  "https://artifacts.acc.gsi.de/.../app.zip"
RUN unzip /opt/app.zip -d /opt && rm -f /opt/app.zip

# set default command of container
CMD /opt/bin/app.sh
```

Not everything is docker

- Container Runtime
  - docker
  - rkt
  - cri-o
  - …
- Container Build
  - docker
  - podman
  - buildah
  - …

TOC

What?

Kubernetes is a portable, extensible, open-source platform for managing containerized workloads and services, that facilitates both declarative configuration and automation.

Declare

- Write declaration
- Hand declaration to kubernetes
- Kubernetes downloads images, configures network, creates containers
- Kubernetes maintains desired state, restarting crashed containers, etc.

Deployment

Define a Deployment that runs a container two times.

```
kind: Deployment
metadata:
  name: lsa-server
spec:
  replicas: 2
  # template for creating pods
  template:
    spec:
      containers:
      - name: lsa-server
        image: sample/lsa-server:13.1.0-RC-SR-SNAPSHOT
        # we update the image without incrementing the version
        imagePullPolicy: Always
```

Service

Make the service externally available with loadbalancing.

```
kind: Service
metadata:
  name: lsa-server
spec:
  type: LoadBalancer
  ports:
  - port: 52325
    protocol: TCP
    name: registry
  sessionAffinity: ClientIP
  selector:
    app: lsa-server
```

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Summary

- package software including dependencies
- declare everything: parameter, version, ip port, ...
- deploy identical software multiple times by changing parameters.
- creating test setups is cheap
- high availability
- privilige seperation

the bad

- need to declare everything: parameter, version, ip port, . . .
- update base image library requires rebuild application images
- infrastructure. Kubelet, metallb, etcd, coredns, . . .
- disk space
- complexity. Especially network with lot's of natting
- danger of growing mold. Enforced cleanup policy required.

the unknown

Not yet tested/solved

- storage. Only nfs used, this won't scale well
- permission system
- monitoring, logging
- webinterface, dashboards