Cloud Computing (24/25)
Q/A Session 3.1

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Assignment 3

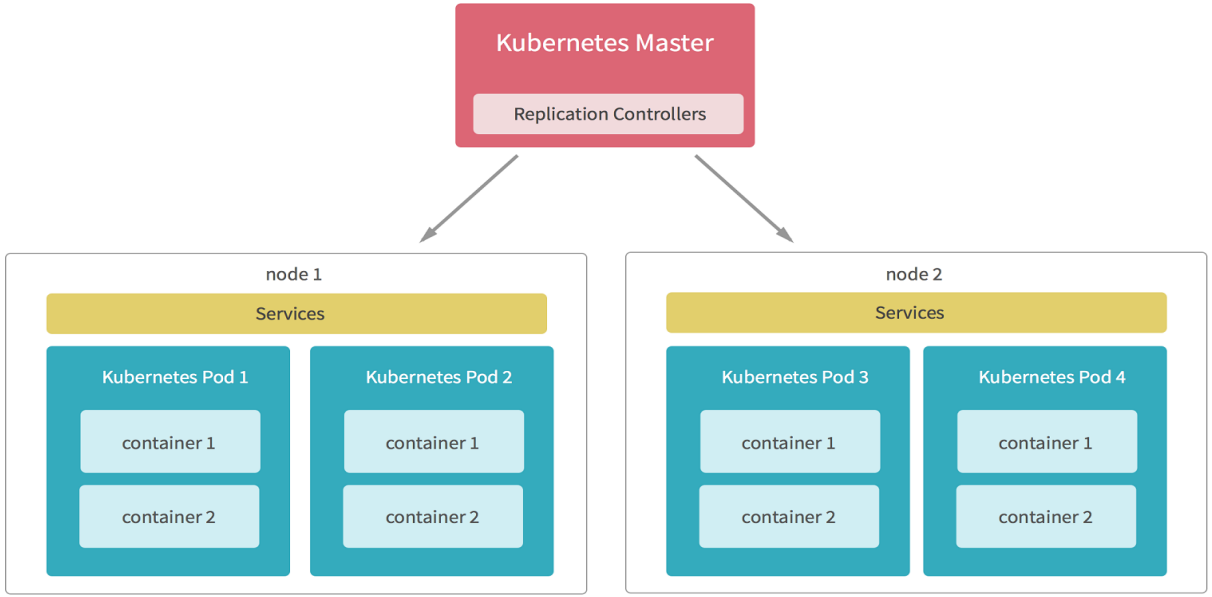
- In the previous assignments, you had a look at
  - Cloud services from the user perspective
  - Performance of different virtualization techniques
  - Cloud deployment and operation (Open Stack)
  - An introduction to Infrastructure as Code (Ansible)
  - Distributed data processing (Apache Spark)
  - A lot of networking
- Now: Reduce the pace a little (it’s Christmas after all)

Assignment 3

- Container Orchestration and (more) Infrastructure-as-Code paradigm
- Goal:
  - Deploy two interdependent HTTP services on a distributed infrastructure
- Tasks:
  1. Set up infrastructure using GCP virtual machines
  2. Install Kubernetes on cluster
  3. Prepare application containers using Docker
  4. Deploy webservices to Kubernetes cluster in an Ansible playbook

Kubernetes

- Distributed platform for orchestrating containerized applications

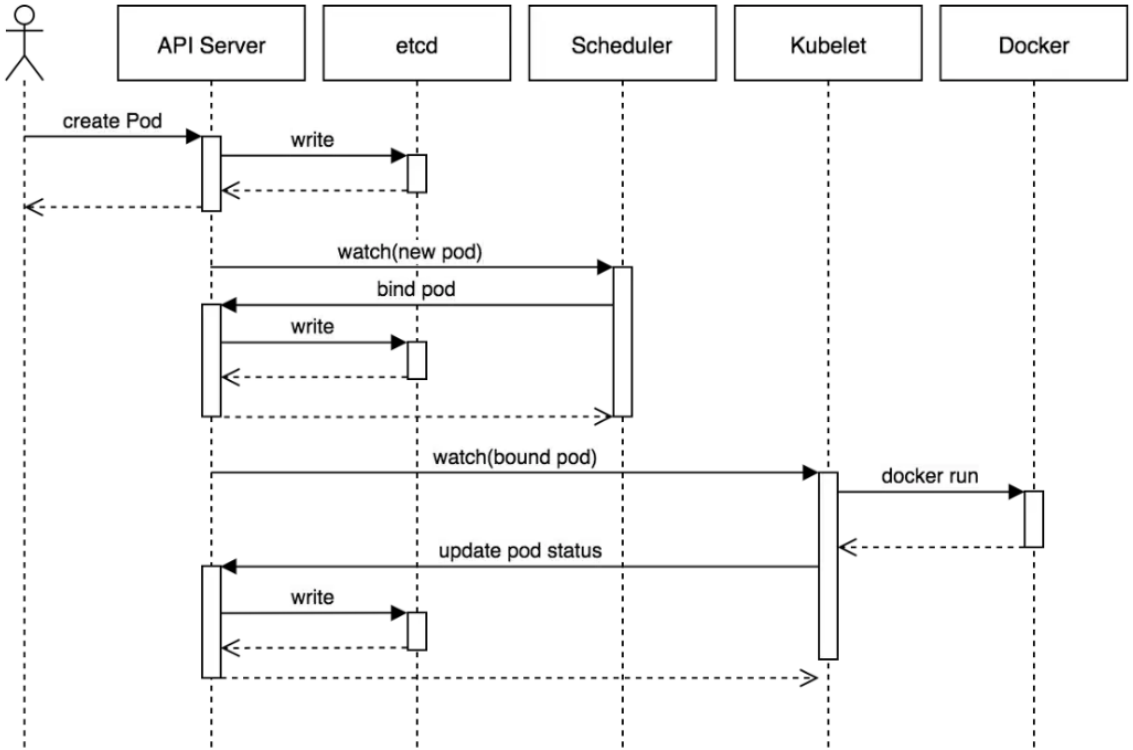


Example Pod Definition

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: nginx
spec:
  containers:
  - name: nginx
    image: nginx:1.14.2
    ports:
    - containerPort: 80
```

Kubernetes

Exemplary container runtime

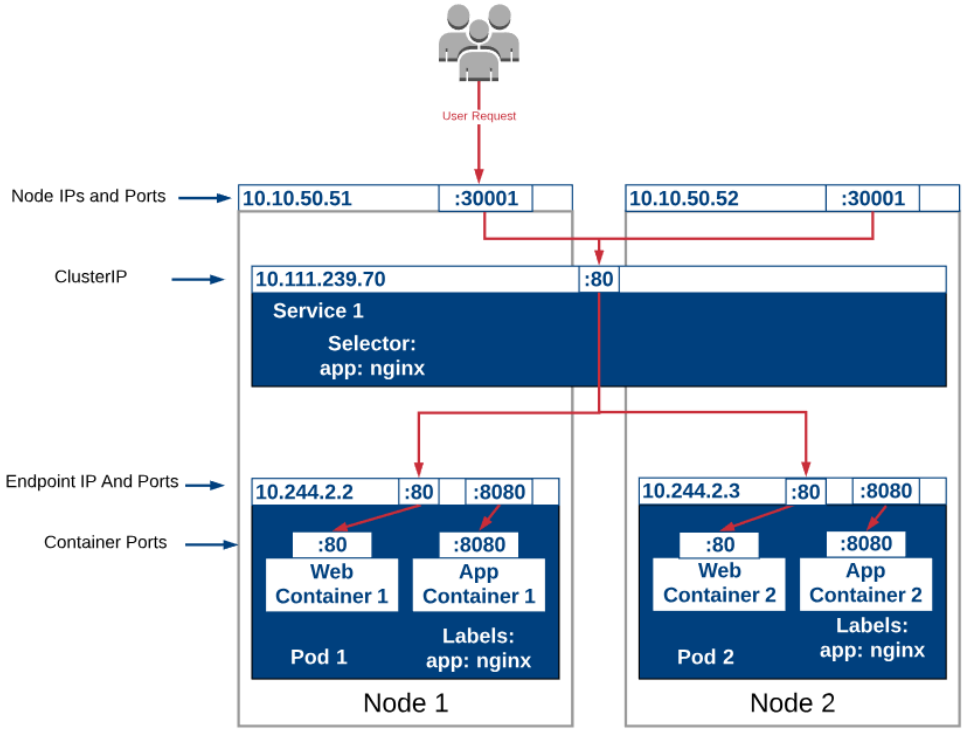


https://blog.heptio.com/core-kubernetes-jazz-improv-over-orchestration-a7903ea92ca

Kubernetes

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
  labels:
    app: nginx
spec:
  replicas: 2
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
      - name: web-container
        image: nginx
        ports:
        - containerPort: 80
```

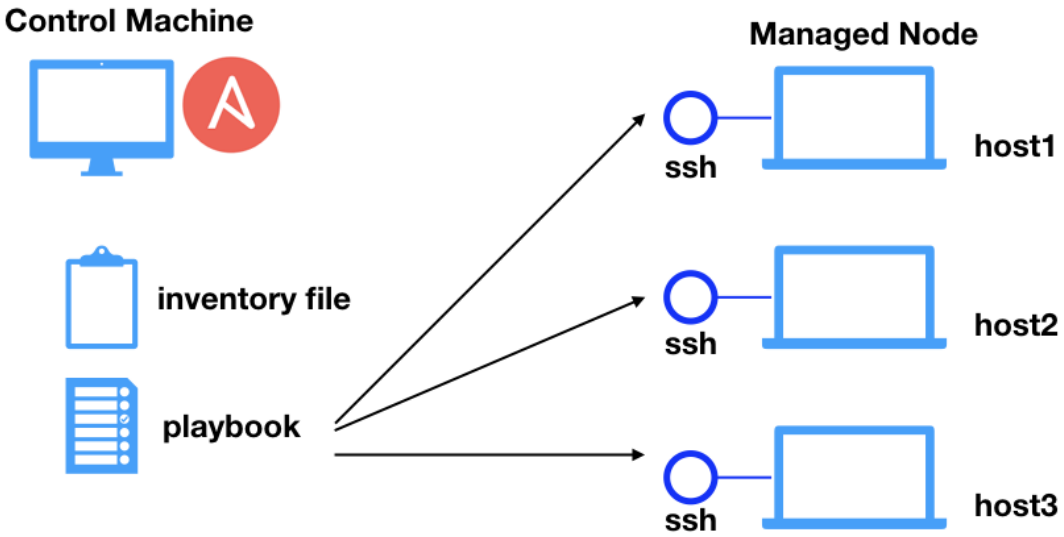
```yaml
apiVersion: v1
kind: Service
metadata:
  name: ingress-nginx
spec:
  type: NodePort
  ports:
  - name: http
    port: 80
    targetPort: 80
    nodePort: 30001
    protocol: TCP
  selector:
    app: nginx
```



https://theithollow.com/2019/02/05/kubernetes-service-publishing/

Ansible

- Declarative description of orchestration tasks on host level
- Idempotent “playbooks”
- Handy modules for all kinds of typical administration tasks



Target deployment

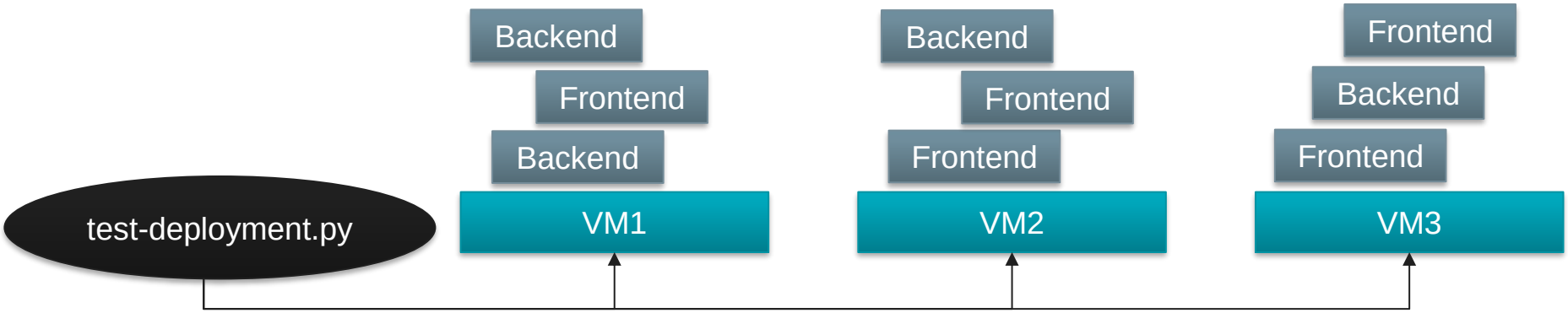
→ Attach HTTP response header:
CC-Frontend-Server-IP = $hostname

→ Forward request to backend

→ Attach HTTP response header:
CC-Backend-Server-IP = $hostname

→ Reply with simple text message

Target deployment



- Send many requests
- Evaluate Response headers

Practical Assignment 3

- Due: 13.01.2025
- Summary:
  - Prepare 3 GCP VMs
  - Deploy Kubernetes cluster using Kubespray (Ansible playbook)
  - Prepare simple Docker containers for dummy web service
  - Roll out web service in Kubernetes cluster using an own Ansible playbook
  - Evaluate the deployment with a provided test script

Very Last Reminder

Always remember to shut down your unused VMs!