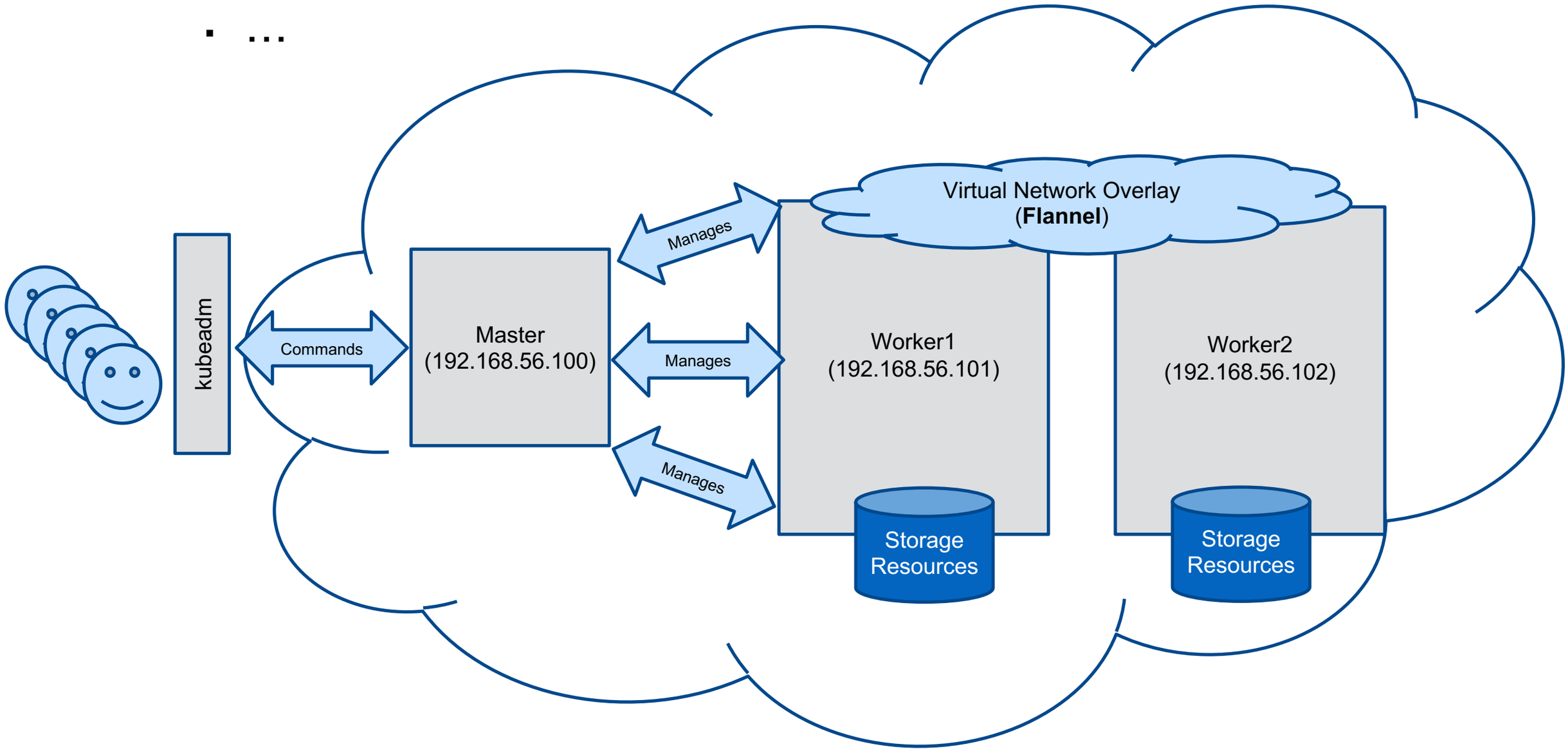
Cloud Computing Applications and Services
(Aplicações e Serviços de Computação em Nuvem)

Kubernetes

University of Minho
2023/2024

Cluster Setup

- ***kubeadm*** (administrator interface)
  - *init* (initializes cluster)
  - *reset* (destroys cluster)
  - …

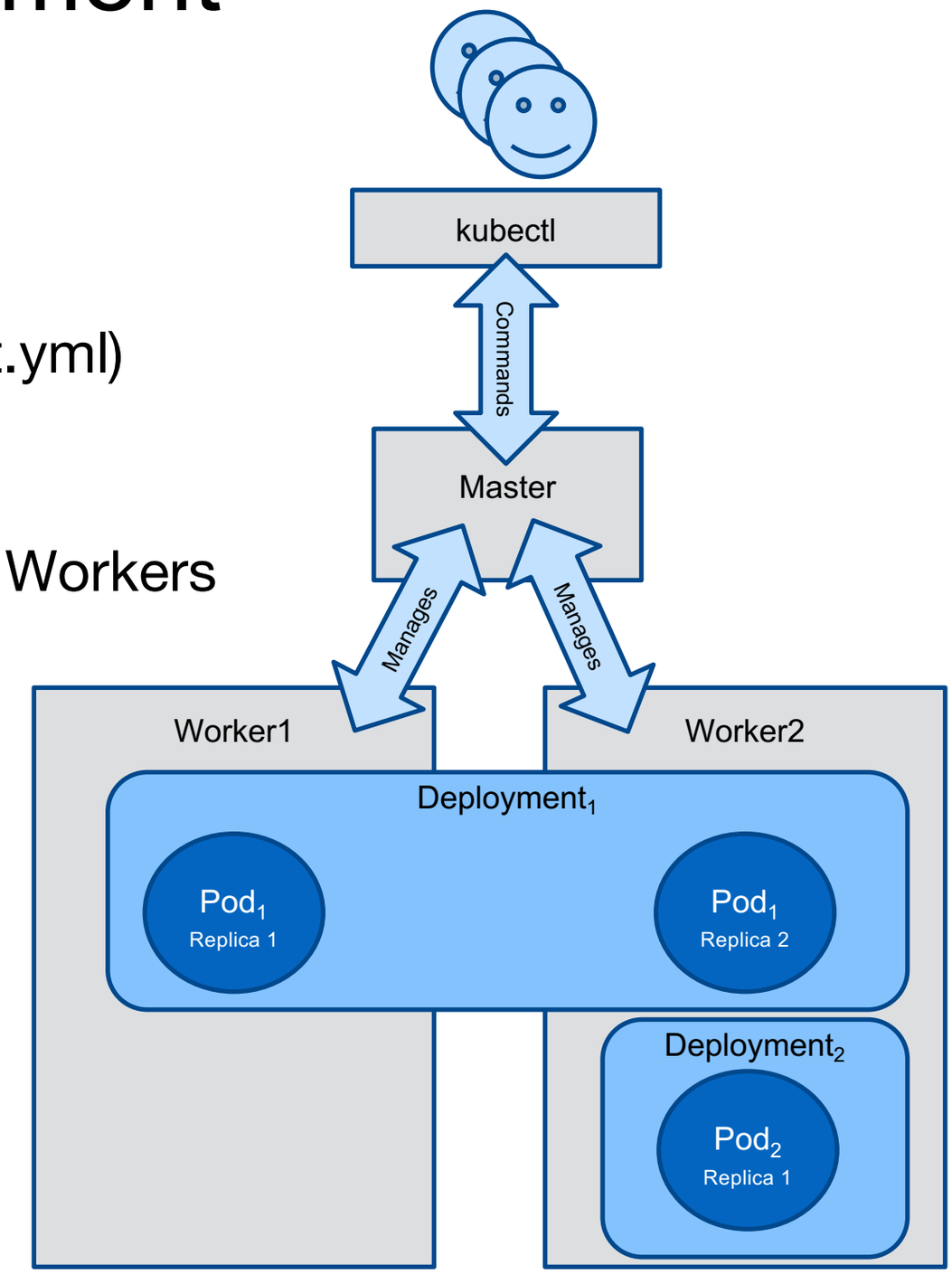


Pod Deployment

- ***kubectl*** *apply –f <file.yml>*
  (applies a client configuration)
  (*e.g.*, kubectl apply –f mysql_deployment.yml)

- A **Deployment specification** includes:
  - Number of Pod **Replicas** to create at Workers
  - **Strategy** for updating pods
    (*e.g.*, Recreate, RollingUpdate)
  - A **Pod template**
  - ...

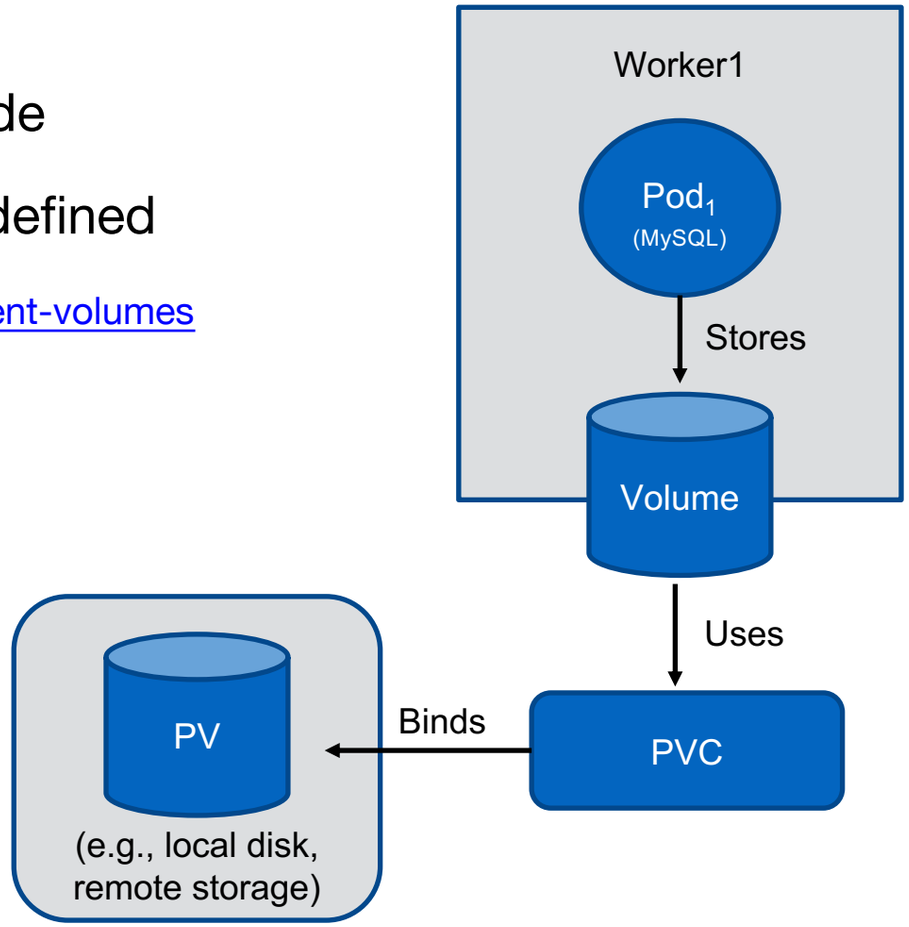
- **Pod template** defines:
  - **Containers**:
    name, image, env variable(s),
    exposed ports, volume mount(s)
  - **Associated volumes**
    (*i.e.*, PVC)



Example:
Pod_1 – Swap
Pod_2 - MySQL

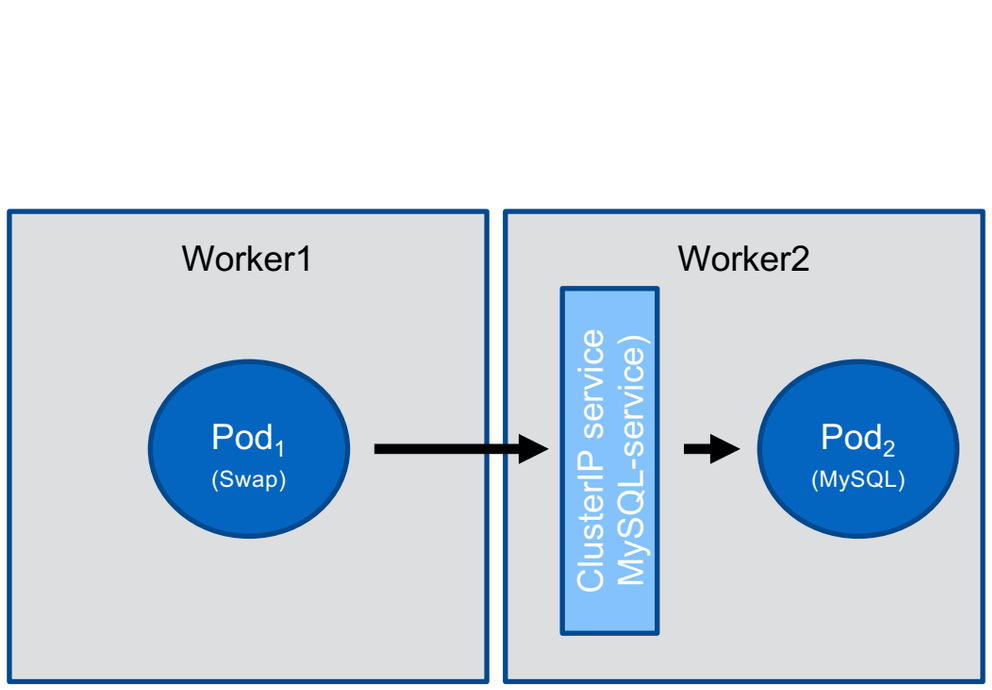
Volumes

- **Persistent Volume (PV)** – piece of storage provisioned manually by an administrator or dynamically by **storage classes**
  (e.g., from a local file system -- check persistent-volume.yml -- or a remote storage server)
- **Persistent Volume Claim (PVC)** – a request for storage by a user
  (check mysql-pvc.yml). Can ensure persistency even if the pod is terminated.
- **Local Persistent Volumes** - PV type for provisioning local storage at K8s cluster nodes.
  - the K8s scheduler ensures that a pod using this volume type is always scheduled to the same node
- **Important** – Cloud services (*e.g.*, GCP) provide pre-defined storage classes and PVs
  - https://cloud.google.com/kubernetes-engine/docs/concepts/persistent-volumes
- For more info check:
  - https://kubernetes.io/docs/concepts/storage/persistent-volumes/

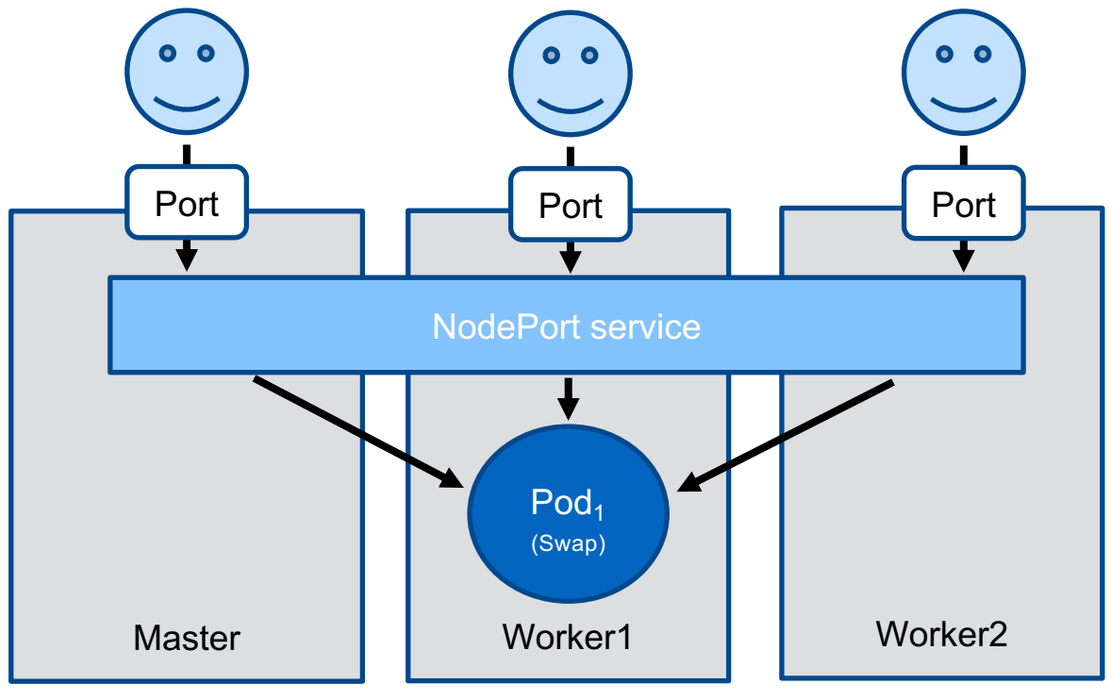


Services

- **ClusterIP:** Exposes the Service on a cluster-internal IP
- **NodePort:** Exposes the Service on each Node's IP at a static port that can be accessed externally
- **LoadBalancer:** Exposes the Service externally using a cloud provider's load balancer



ClusterIP



NodePort

Useful info (some)

- **K8s object / resource types**
  - *nodes*
  - *deployment*
  - *replicaset*
  - *pod*
  - *pv*
  - *pvc*
  - *….*
- **Check resources / objects***
  - *kubectl get all*
  - *kubectl get <object_type> [name]*
  - *Kubectl describe <object_type> [name]*
- **Deploy and Delete objects**
  - *kubectl apply –f <file.yml>*
  - *kubectl delete –f <file.yml>*
  - *kubectl delete <type> [name]*
- **Execute commands at pods**
  - *kubectl exec –it <pod_name> -- <command>*
- ***Check pod logs***
  - *kubectl logs <pod_name>*

***Note:** Selectors can be used to filter only resources with a given label or set of labels
Example: *kubectl get all --selector=tier=database* will show the objects with the label *tier=database*