Docker and Containers
Module 8: Introduction Kubernetes (K8s)

1. **Short introduction.**

2. **Demo: The docklab.de swarm.**

3. **Demo: The Raft Consensus Algorithm.**

What is Kubernetes?

- **Kubernetes (K8s) is an open-source system for automating deployment, scaling, and management of containerized applications.**

- **Kubernetes is the Greek word for governor (κυβερνήτης).**
  K8s = starting with K, 8 letters between, ending with s)

- **Designed by Google (2014) and now maintained by the Cloud Native Computing Foundation.**

- **Heavily tested by Google which runs billions of containers using K8s weekly.**

- **It aims to provide a platform for automating everything like deployment, scaling, operations and monitoring of application containers across clusters of hosts.**

- **Mainly used to orchestrate large deployments.**

- **Kubernetes is offered as a service on multiple public clouds, including AWS, Microsoft Azure, DigitalOcean and Google Kubernetes Engine (GKE)**

- **K8s was written in Go Language**

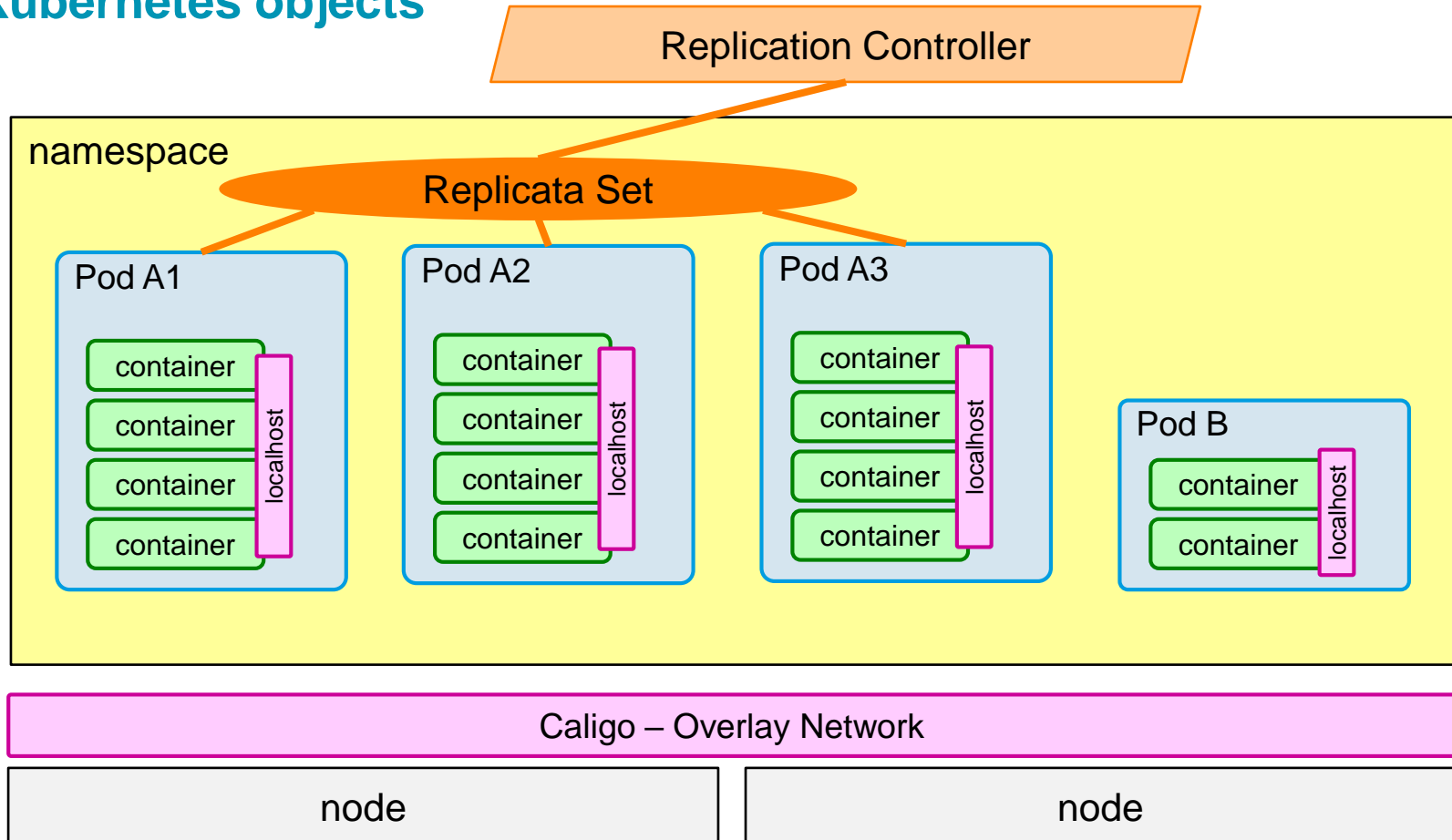*From: https://kubernetes.io/, https://en.wikipedia.org/wiki/Kubernetes*

Kubernetes key features

- **Horizontal scaling**
  Scales the application up and down from command line or UI.

- **Automated rollouts and rollbacks**
  Rolls outs changes while monitoring the health of your application. If something goes wrong, k8s will rollback the change automatically.

- **Service discovery and load balancing**

- **Storage orchestration**
  Auto mount local, public cloud or a network storage.

- **Secret and configuration management**

- **Self-healing**
  Restarts failed containers, replaces and reschedules containers when nodes die, kills containers that don't respond

- **Automatic load balancing**
  k8s schedules containers based on resource requirements and other constraints.

Compare: What is Kubernetes (k8s)? Introduction, Glossary, and Definitions for Kubernetes, https://www.bmc.com/blogs/what-is-kubernetes/

Kubernetes objects

Replication Controller

namespace

Replicata Set

Pod A1

| container |
| container |
| container |
| container |

localhost

Pod A2

| container |
| container |
| container |
| container |

localhost

Pod A3

| container |
| container |
| container |
| container |

localhost

Pod B

| container |
| container |

localhost

Caligo – Overlay Network

node

node

From: docker docs: https://docs.docker.com/engine/swarm/

Provide and manage Kubernetes

Production environment solutions:

- **Completely managed**
  by Amazon (Amazon EKS), DigitalOcean, Google (Google Kubernetes Engine (GKE)), Microsoft Azure (Azure Kubernetes Service (AKS)) and others

- **Turnkey / custom(cloud) / custom:**
  Rancher, Kubespray

- **Bootstrapping Clusters with kubeadm**

Minikube (https://github.com/kubernetes/minikube)

- **Minikube allows to spin up a full K8s cluster on a workstation within a VM.**

- **Minikube wants " to be the best tool for local Kubernetes application development and to support all Kubernetes features that fit."**

Kubectl: CLI tool used to interact with the cluster

From:
https://kubernetes.io/docs/setup/,
https://github.com/kubernetes/minikube

End