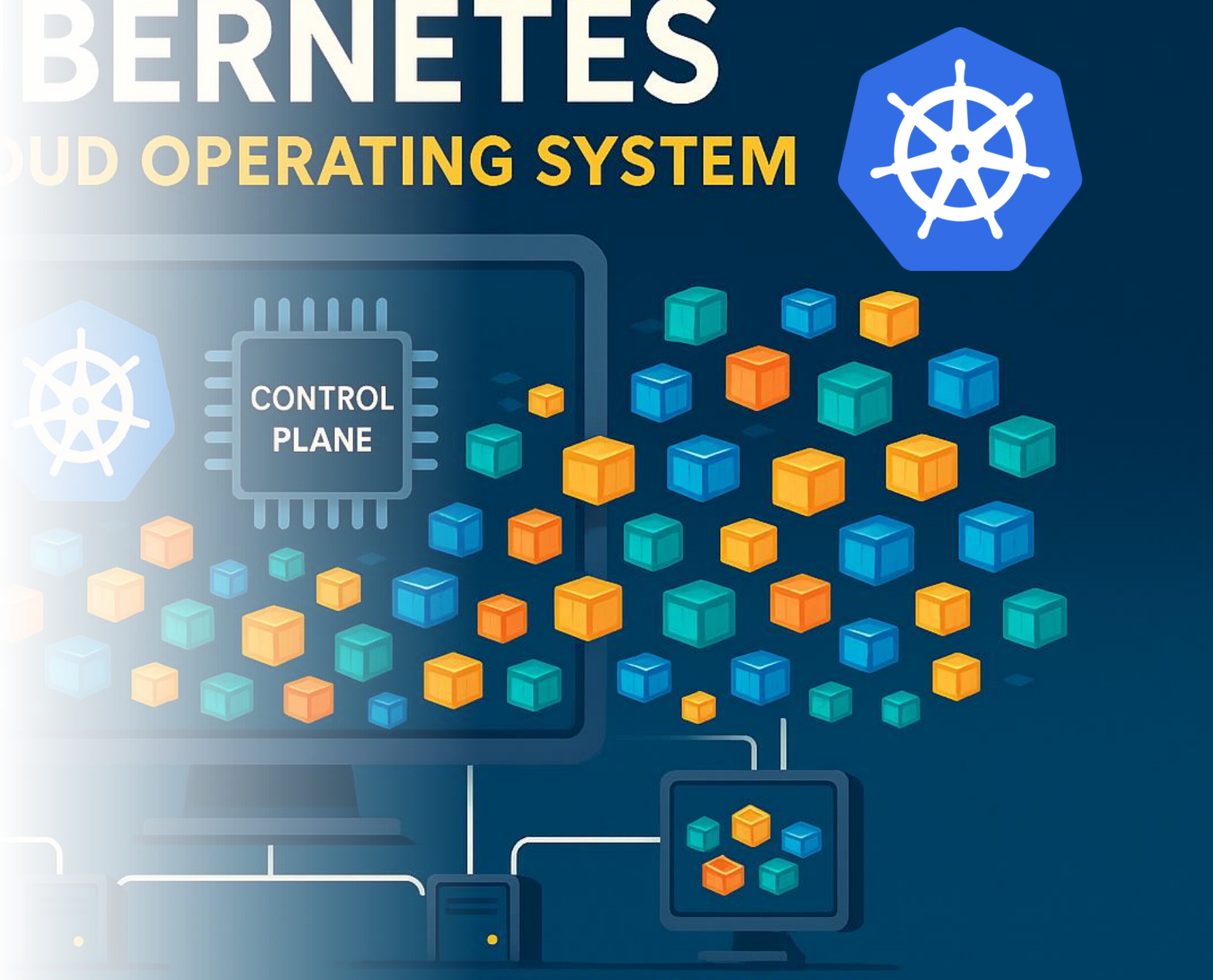
CS-UY 3913
Container
Operating Systems

Kubernetes Fundamentals



Instructor: Magdy Salem

Agenda

- What is Kubernetes?
- Core Concept and Architecture
- How Apps Run on K8s
- K8 vs Docker Swarm
- Demo
- Lab

What is Kubernetes?

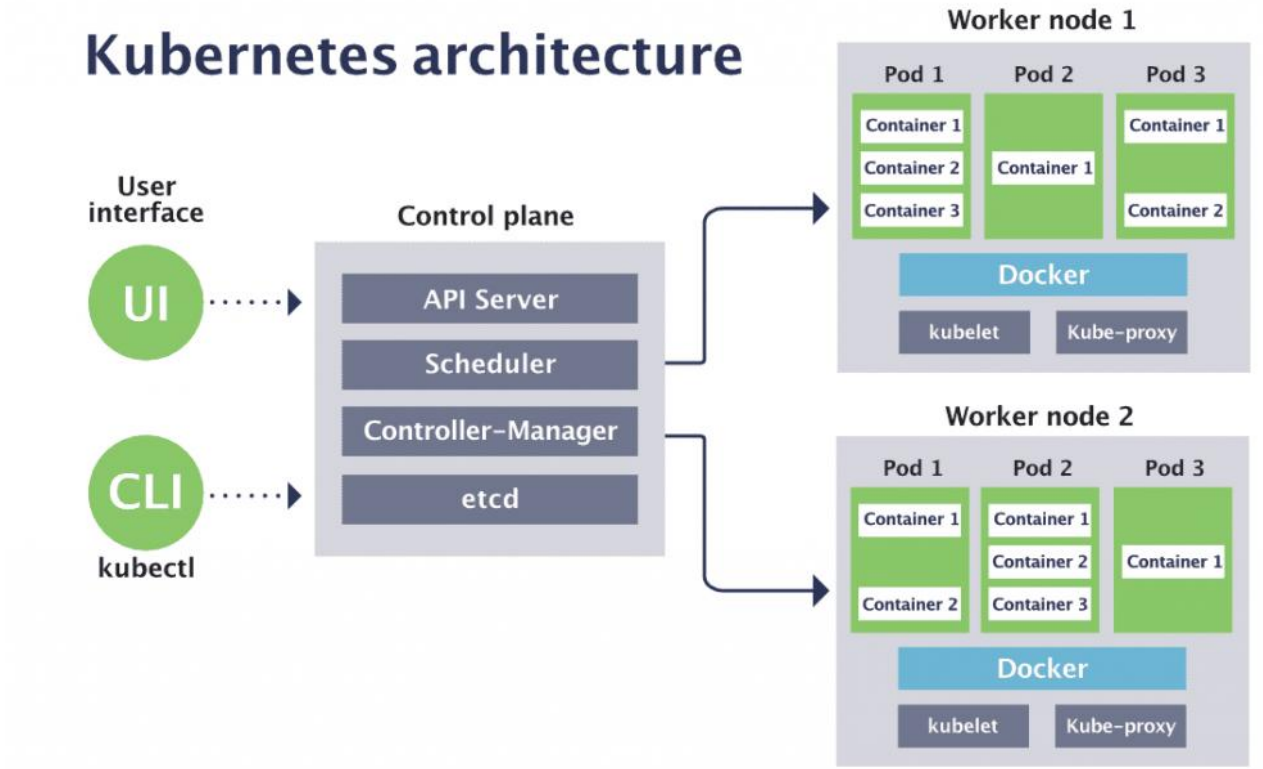
- Open-source platform for container orchestration
- Automates deployment, scaling, networking, and availability
- Think of Kubernetes as an OS for containers
- Originally developed by Google, donated to CNCF

The Problem Kubernetes Solves?

- Manual container orchestration doesn't scale
- Microservices add complexity: more services, dependencies, environments
- We need: automated deployment, scaling, healing, service discovery

Core Concepts & Architecture

- Cluster = control plane + worker nodes
- Pod = smallest deployable unit)
- Deployment = manages desired state of apps
- Service = stable networking endpoint for Pods
- ETCD, Scheduler, Controller Manager, Kubelet

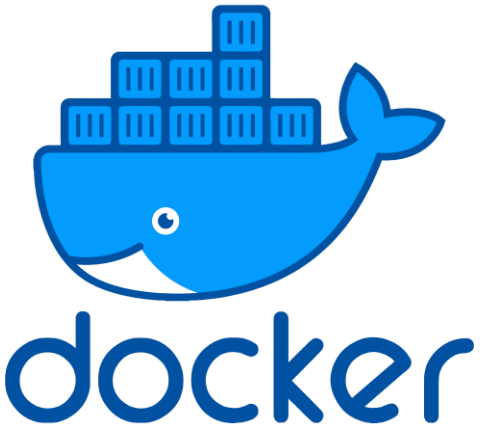


How Apps Run on Kubernetes

- Declarative YAML defines desired state
- Controllers ensure actual state matches desired
- Rolling updates and rollback are built-in
- Hierarchy: Deployment -> ReplicaSet -> Pods

Kubernetes vs Docker Swarm

- K8s: Strong ecosystem, complex, extensible
- Swarm: Simpler, but limited adoption andfeatures
- Both support: healing, scaling, load balancing
- K8s supports CRDs, namespaces, operators



Demo

Lab