



OST

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Distributed Systems & Blockchain (DS1)

Deployment I

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Kubernetes

- We used docker and docker-compose for development
- Eventually, we need to deploy
- Kubernetes, K8s
 - Container orchestration (docker)
 - Automated deployment, scaling
 - Started by Google, now with CNCF
- Kubernetes-based PaaS
 - Google, Amazon, Azure (book), Digital Ocean,
...
 - Difficult pricing schemes



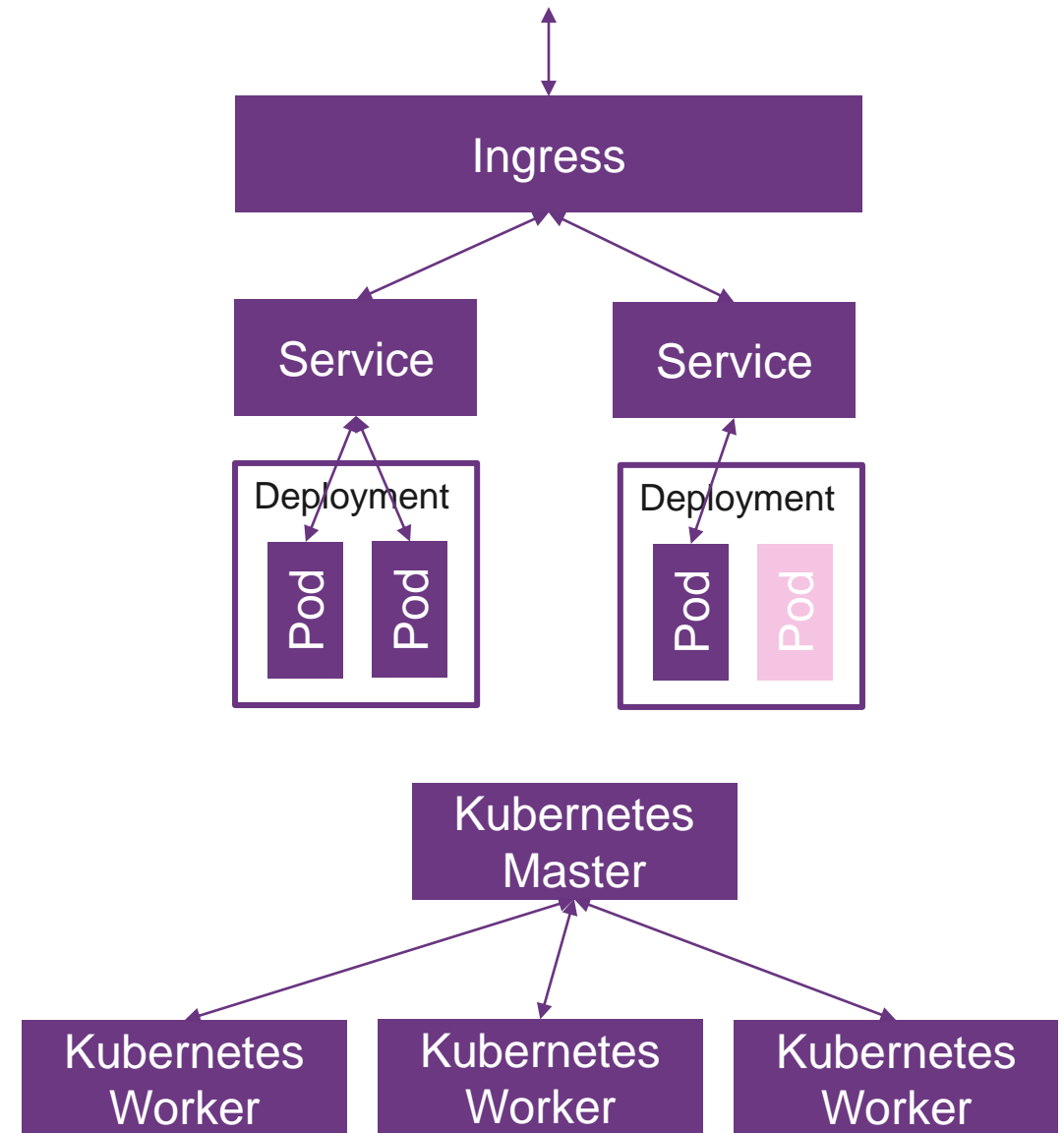
- 1.0 released in 2015
- Package manager Helm released in 2016 (convert docker-compose)
- Why Kubernetes?
 - Containers can crash, machine that runs container can crash (out of memory)
 - Development: run on one machine, deployment how and where to distribute?
 - Kubernetes manages the lifecycle of containers

Kubernetes

- Design principles
 - Configuration is declarative – declare state with YAML/JSON
 - “self-healing”
 - Abstraction layer for distributed system
 - Provides interface to interact with containers
 - Immutable containers
 - Don’t store state in a container. If a health check fails, Kubernetes removes the container and starts a new one
 - Rollback applications, use older version of container
 - SQL – may need to change schema
- Pod – one (or more close connected) container (long running)
 - Job – short running
 - Volume - directory accessible to all containers running in a Pod
- Deployment – define scale, HW limits
- Service – single entry point (internal), define a set of Pods
- Ingress – expose end points / external access
- Namespaces – run multiple projects on one cluster, separate with namespaces

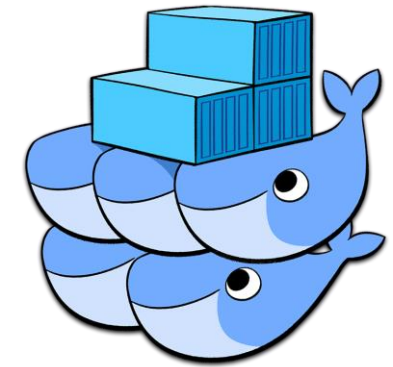
Kubernetes

- [StatefulSets](#) – e.g., when running a DB, Deployment when stateless, but [MySQL uses Deployment with persistent volume](#)
- [DaemonSets](#) – placement of pods
- [Minikube](#), [k3s](#)
 - Kubernetes master / server / control plane
 - Kubernetes worker / nodes / agent / compute machine
- Deploy any containerized application
 - Better use health endpoints
 - [Liveness/Readiness](#)



Docker Swarm

- Docker swarm – group multiple docker nodes
 - Deploy with docker-compose.yml (deploy:)
 - Similar base architecture: swarm manager / swarm nodes
 - Built into docker
 - docker swarm – manage swarm
 - docker node – manage nodes
 - Scheduler is responsible for placement of containers to nodes
 - Can use the same files, easy to setup?
 - Azure, Google cloud, Amazon
- Docker Swarm vs. Kubernetes



docker swarm

- “Docker Swarm has already lost the battle against Kubernetes for supremacy in the container orchestration space”
- “Kubernetes supports higher demands with more complexity while Docker Swarm offers a simple solution that is quick to get started with.”