CSCC01 – Introduction to Software Engineering

DevOps

Motivation

- Lack of communication and understanding between the development and operations teams leads to:
  - Deployment failures
  - Increased downtime
  - Blame culture
- Lack of automation leads to:
  - Increased workload
  - Increased error rate
  - Stress and burnout among team members

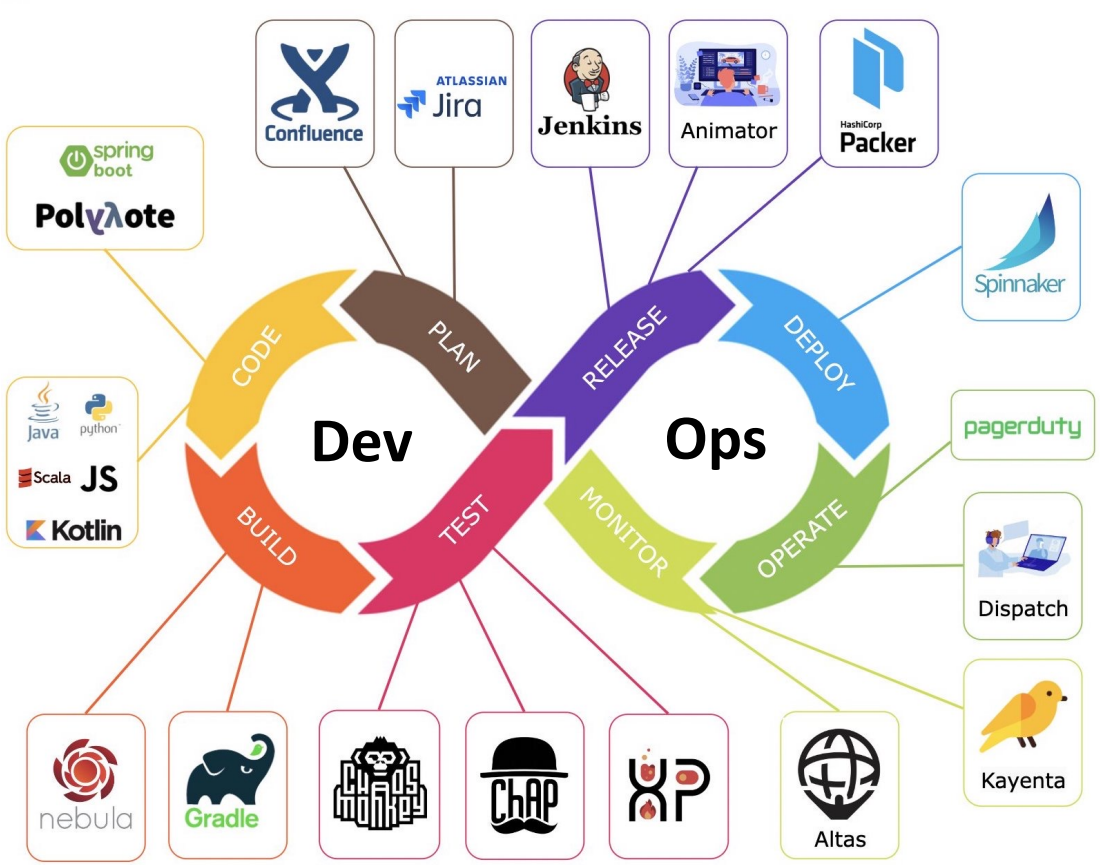
What is DevOps?

- DevOps is a software methodology that combines development (Dev) and IT operations (Ops) with the primary goals of:
  - Shortening the software development lifecycle
  - Delivering high-quality software continuously
- Promotes close collaboration between development and operations teams
- Relies heavily on automation
- The CI/CD pipeline is an integral part of DevOps
  - Continuous Integration
  - Continuous delivery

DevOps vs. Agile

- Agile focuses on development whereas DevOps focuses on development and operations
- Agile focuses on management processes (e.g. Scrum) whereas DevOps focuses on tools and automation
- Organizations often combine Agile and DevOps principles for a streamlined and efficient software development and delivery process

CI/CD Pipeline - Example



Containerization

- A container is an executable image that packages a service and its dependent libraries
  - Mainly a lightweight virtualization mechanism (operating system level)
- Containerization facilitates software development and deployment
- Containers are isolated from each other in terms of
  - Address space
  - Disk usage
  - Processor usage

Containerization

- Docker is a platform that supports containerization
- Containerization using Docker involves three main entities:
  - Dockerfile
  - Image
  - Container

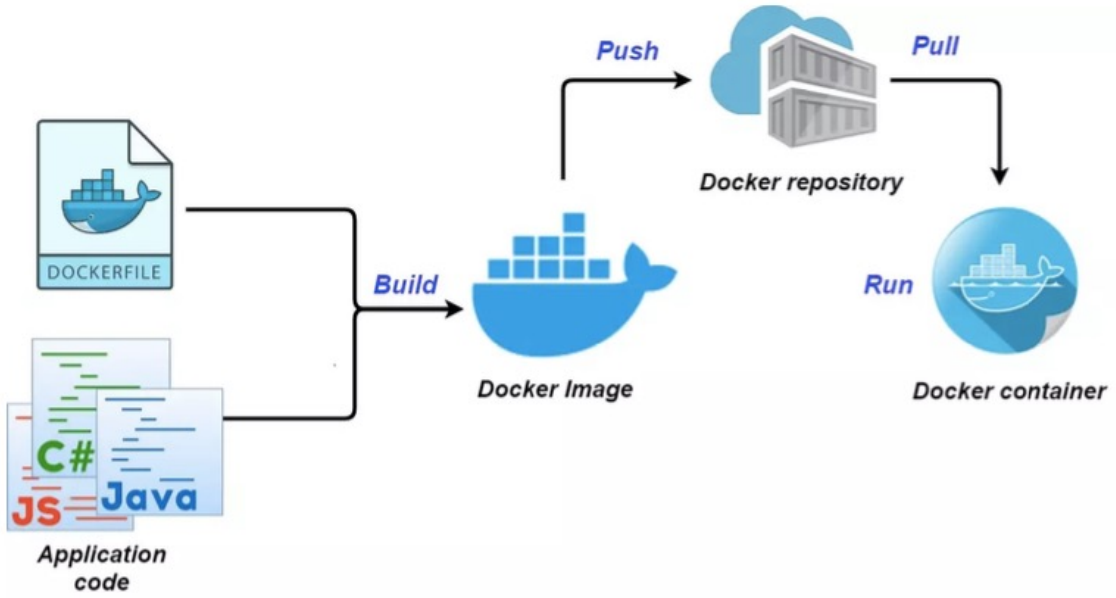
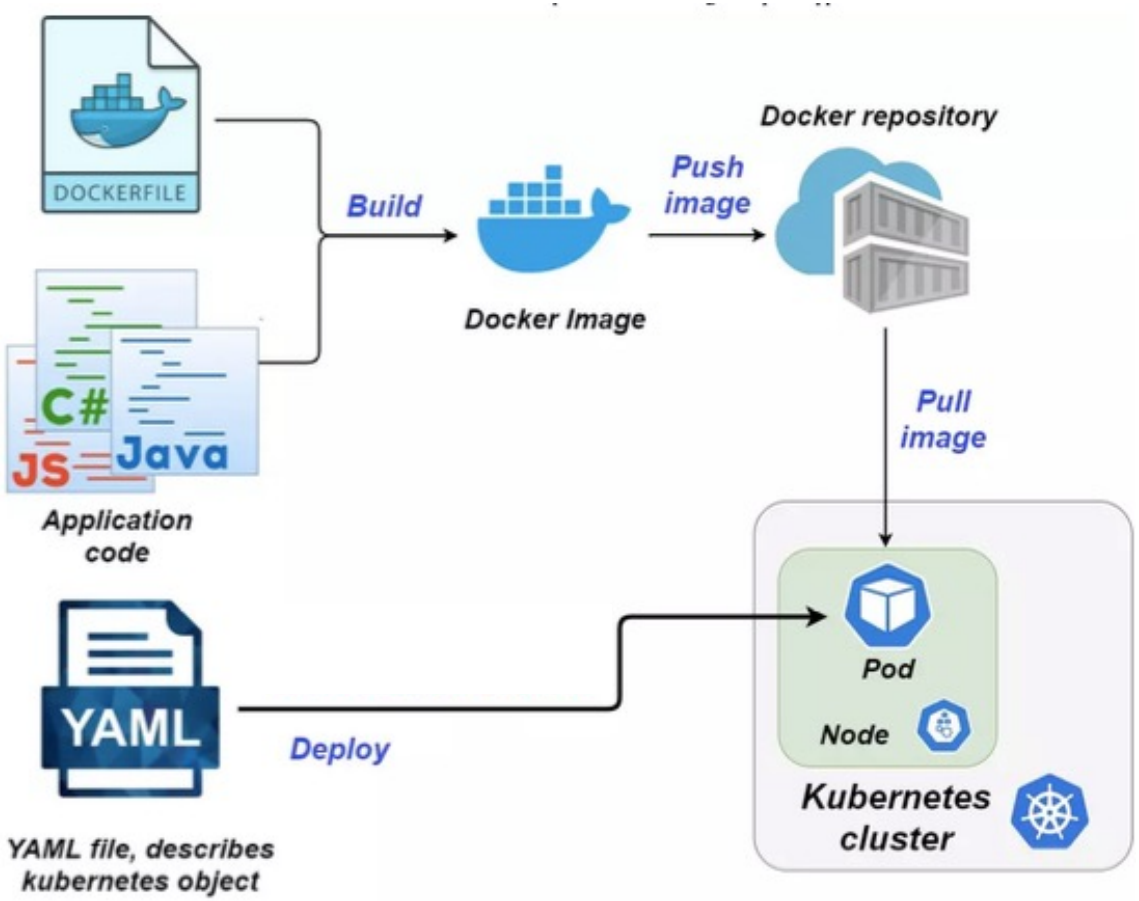


Image source: https://devops.fastdev.com/articles/kubernetes-as-a-modern-platform-for-enterprise.html

Orchestration

- Container orchestration addresses the complexities of deploying and managing large-scale, distributed applications composed of multiple interconnected containers
- Orchestration tasks include:
  - Service discovery
  - Health monitoring
  - Automated scaling
  - Load balancing
- Kubernetes is a popular open-source platform for container orchestration

Kubernetes



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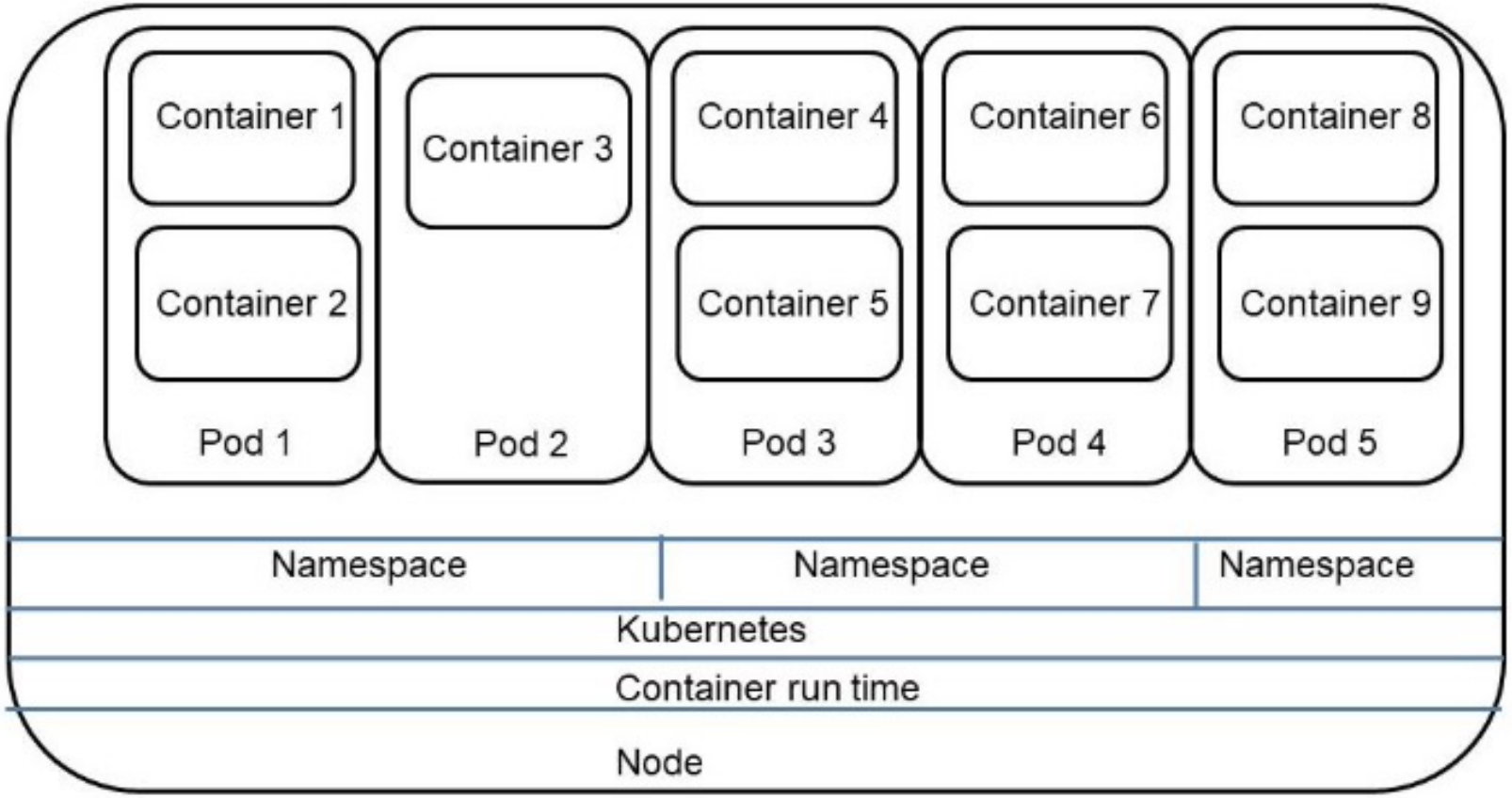
Kubernetes Architecture



DevOps Metrics

- Quantitative measurements used to evaluate and improve the quality of software development and delivery
- Widely adopted DevOps metrics
  - Lead time for changes
  - Change failure rate
  - Deployment frequency
  - Mean time to recovery

Case Study – DevOps at Netflix

- Architecture
  - Microservices
- Culture
  - You build it, you run it
- Tooling
  - Delivery tooling
  - Operations tooling
- Skills
  - Operational expertise