CI/CD

Continuous delivery continuous integration

Summary

- Overview of CI/CD
- Why CI/CD important?
- CI/CD for microservice
- CD and Facebook/OANDA case studies
- CI and Uber Submit Queue pipeline
- Limitation and Future Work
- Revenue and cost for the business

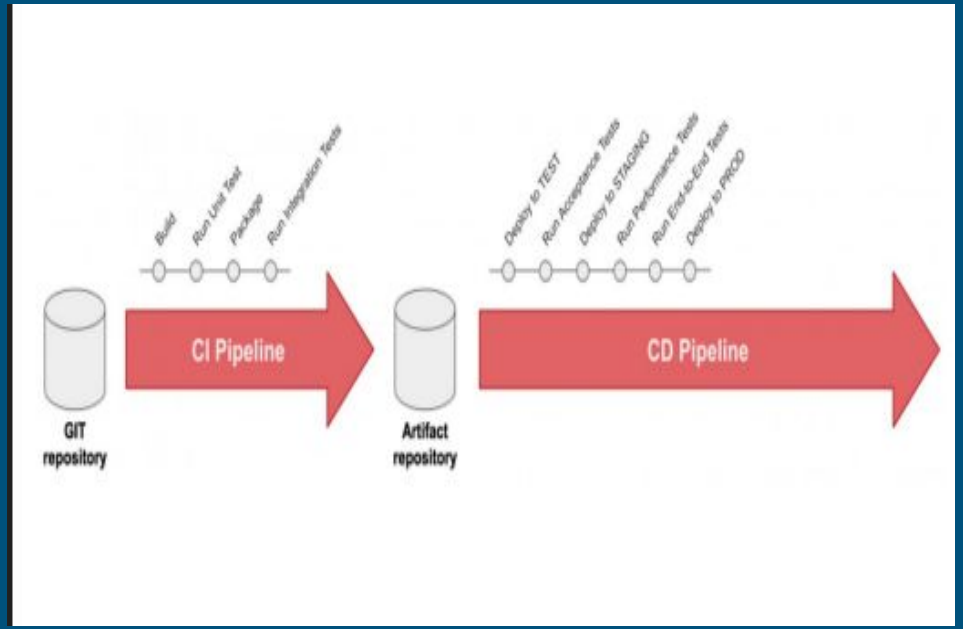
Overview of CI/CD

Continuous Integration - regularly build, test, and merge code changes into main branch.

Continuous Deployment - automatically test and release changes from the repo to production.

CI is generally a standard across all software projects.

CD on the other hand is not. Example: Aerospace Industries, Healthcare, etc.



Why is CI/CD useful?

- Release software with less risks
  - CI/CD takes care of the automated testing, deployment and rollbacks.
- Can improve developer productivity.
  - More automation, less context switching, etc
- Ship features and fix bugs faster.
- Ability to push out small changes and iterate on them continually.

CI/CD for microservices

- Requirements
  - Highly cohesive and loosely coupled services and teams ○ Teams and engineers that can make key-decisions independently
- Challenges:
  - Tools to support deployment and experience in managing them.
  - Senior Management buy-in.
  - Investment on the tools

Despite the challenges, a lot of companies use CI/CD to manage their release.

CI/CD in practice

Steps involved:

- Code Review
- Testing
  - Unit tests, integration tests, performance tests, etc
- Release engineering
  - Assess the risk and manage the deployment
- Deployment

Continuous Deployment

- Blue-green deployment
  - Deploy to a small fraction of people and dial it up

- Dark launches
  - Launch during non
  -peak hours

- Staging
  - Test the builds in multiple staging environments
  - Simulate some traffic

Transition to CI/CD

- Automated Testing infrastructure
    - Unit tests, Integration tests, Shadow tests, performance tests, etc

- Deployment Management System
    - Code reviews, VCS, deployment scheduling, staging pipelines, Rollbacks

CD Case Studies At Facebook and OANDA

- OANDA
  - Currency trading system that manages trades worth many billions every day
  - Small team with about 100 engineers
  - Code check-in -> Deployment Pipelines -> ad-hoc alert system using emails
- Facebook
  - Billions of queries per second
  - 1000s of engineers
  - Code check-in -> Release engineering -> Error reporting (SEV)

Goal: Using CI to Keep the Master Branch Green

- Instantly release new features from any commit point in the mainline
- Can roll back to any previously committed change
- Improve engineer’s productivity

Idea behind:

- Speculatively build possible outcomes for pending changes.
- Try to minimize the number of builds and parallelly build independent changes.

Limitation and Future Work

- No order for non-independent changes: Possible starvation for small changes
- Possible to implement a better machine learning method to train the prediction model
- Should abort a build which is near its completion but likelihood of success drops?
- Batch independent changes

Revenue and cost for the business

In the CI/CD space, open-source projects tend to be more engine-focused. An uneasy topic to talk about with open-source purists is the monetization strategy behind the projects. Popular CI/CD projects can be sponsored by commercial organizations selling enterprise renditions and services behind the projects. With a car analogy, if you get the engine for free, you would need seats, a body, and a host of safety features, like airbags, to complete the car. Typically, items that enterprises need, such as security hardening, specific patching, and even support, are relegated to paid enterprise editions of OSS CI/CD projects.

Once CI/CD is deploying to production on your behalf, it must be the only way to deploy. Any other person or process that meddles with production after CI/CD is running will inevitably cause CI/CD to become inconsistent and fail.