Continuous Deployment

17-313 Fall 2024

Foundations of Software Engineering

https://cmu-17313q.github.io

Eduardo Feo Flushing

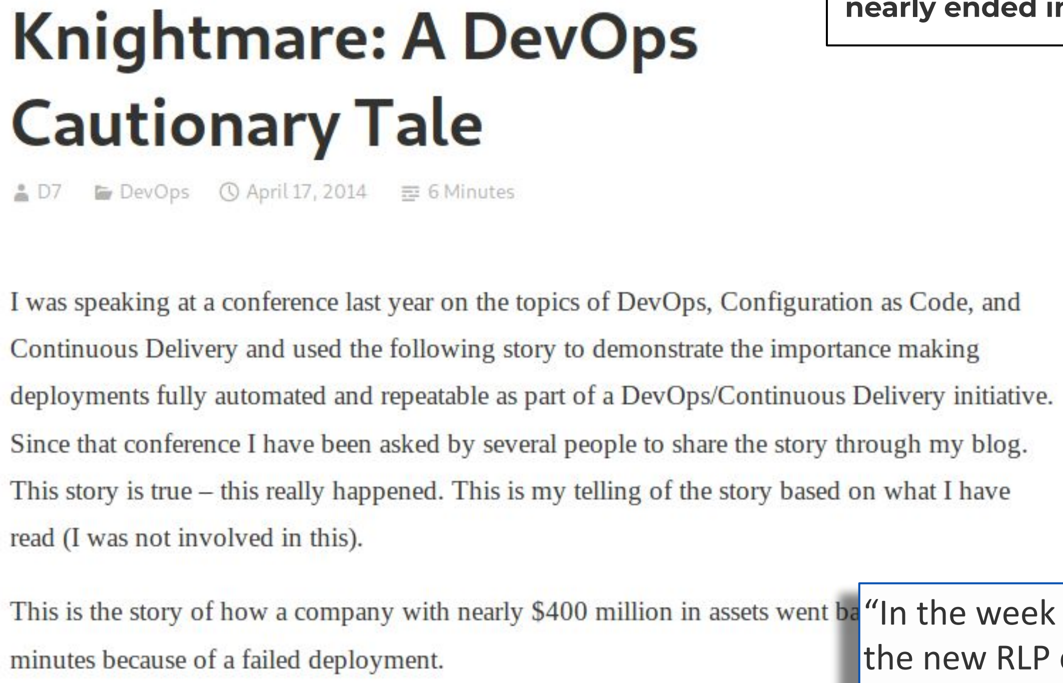
Continuous Delivery: Why?

“The biggest risk to any software effort is that you end up building something that isn’t useful. The earlier and more frequently you get working software in front of real users, the quicker you get feedback to find out how valuable it really is.”

Martin Fowler, Continuous Delivery

Motivating scenario: Failed Deployment at Knight Capital

"It took 17 years of dedicated work to build Knight Capital Group into one of the leading trading houses on Wall Street. And it all nearly ended in less than one hour."



Knightmare: A DevOps Cautionary Tale

D7 DevOps April 17, 2014 6 Minutes

I was speaking at a conference last year on the topics of DevOps, Configuration as Code, and Continuous Delivery and used the following story to demonstrate the importance making deployments fully automated and repeatable as part of a DevOps/Continuous Delivery initiative. Since that conference I have been asked by several people to share the story through my blog. This story is true – this really happened. This is my telling of the story based on what I have read (I was not involved in this).

This is the story of how a company with nearly $400 million in assets went ba

minutes because of a failed deployment.

"In the week before go-live, a Knight engineer manually deployed the new RLP code in SMARS to its 8 servers. However, he **made a mistake and did not copy the new code to one of the servers.** Knight did not have a second engineer review the deployment, and neither was there an automated system to alert anyone to the discrepancy. "

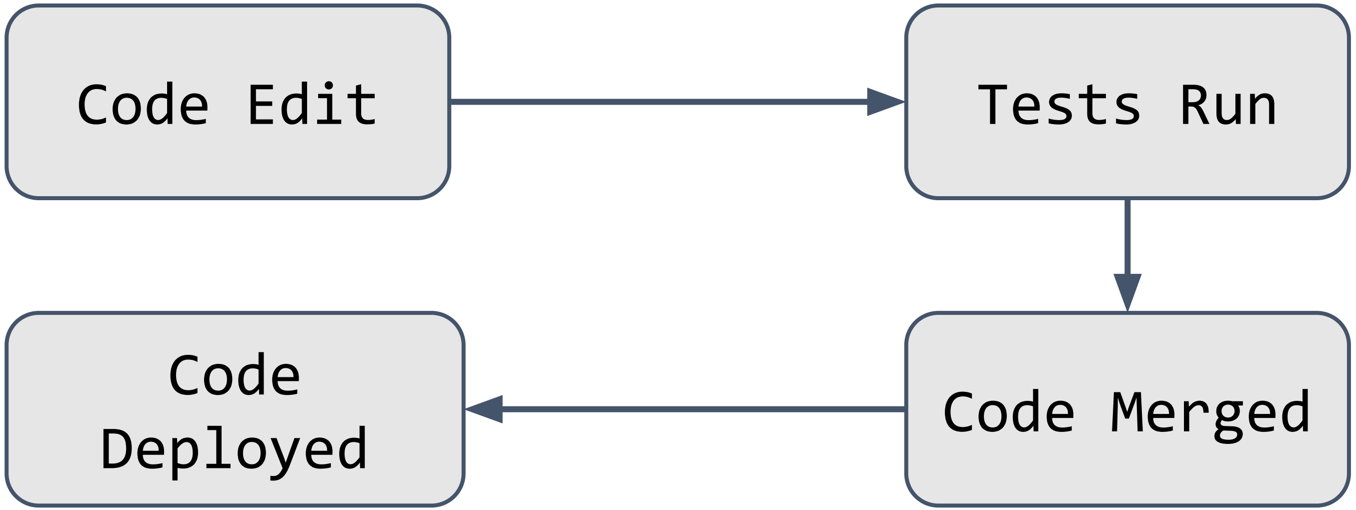
What could Knight capital have done better?

- Use capture/replay (simulated) testing instead of the real market in their tests
- Avoid including “test” and “dead” code in production deployments
- Automate deployments
- Define and monitor risk-based KPIs
- Create checklists for responding to incidents **(Risk Management!)**

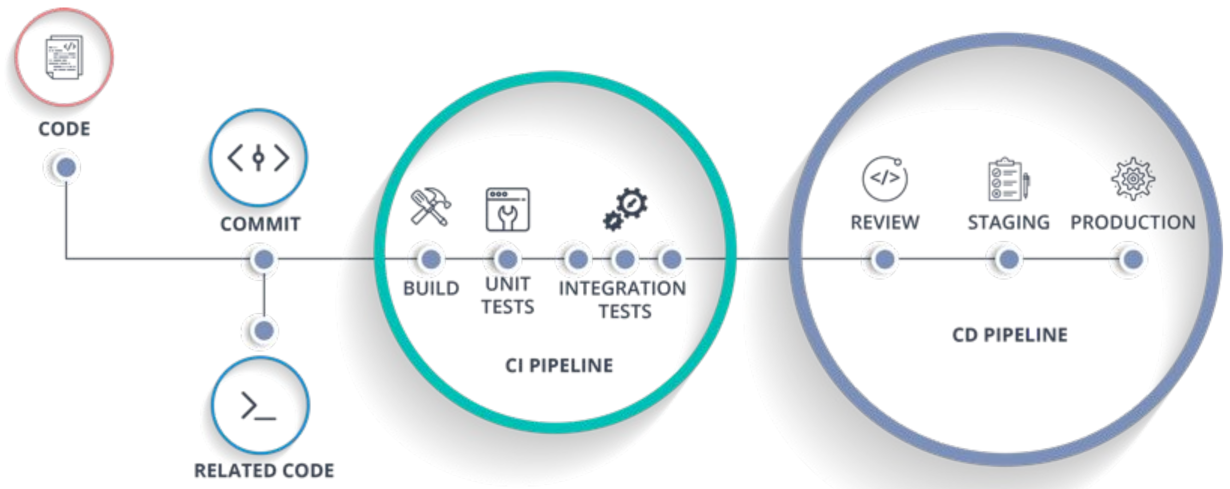
Continuous Delivery != Immediate Delivery

- Even if you are deploying every day ("continuously"), you still have some latency
- A new feature I develop today won't be released today
- But, a new feature I develop today can begin the **release pipeline** today (minimizes risk)
- Release Engineer: gatekeeper who decides when something is ready to go out, oversees the actual deployment process

CI/CD Pipeline overview



Example CI/CD Workflow



How can we continuously deploy our software in production?

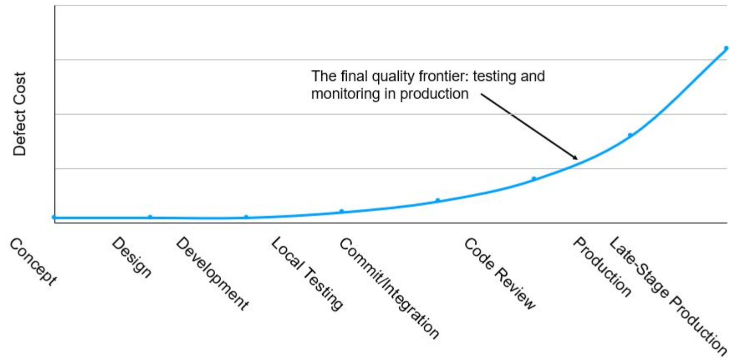
Continuous Deployment / Continuous Delivery

Continuous Delivery /Deployment

Done right

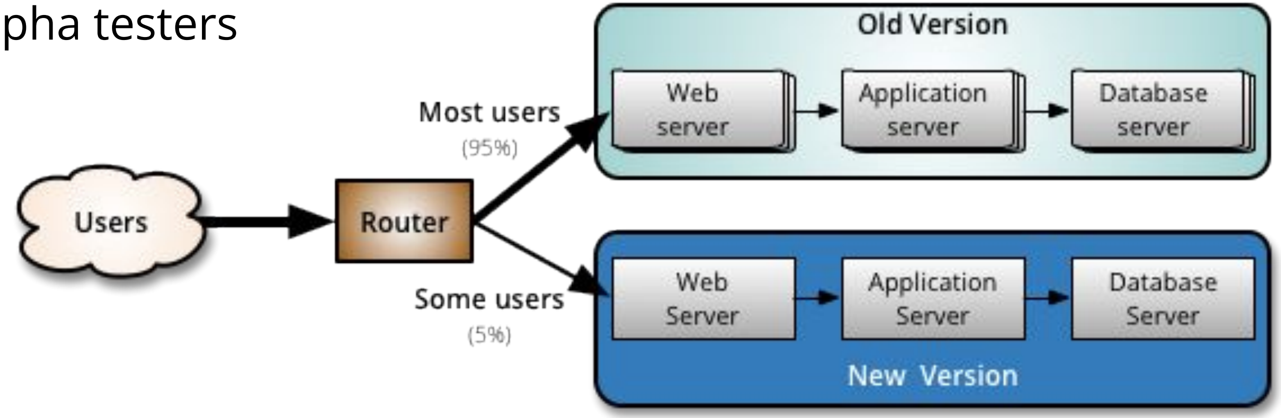
Continuous Delivery

- “Faster is safer”: Key values of continuous delivery
  - Release frequently, in small batches
  - Maintain key performance indicators to evaluate the impact of updates
  - Phase roll-outs
  - Evaluate business impact of new features

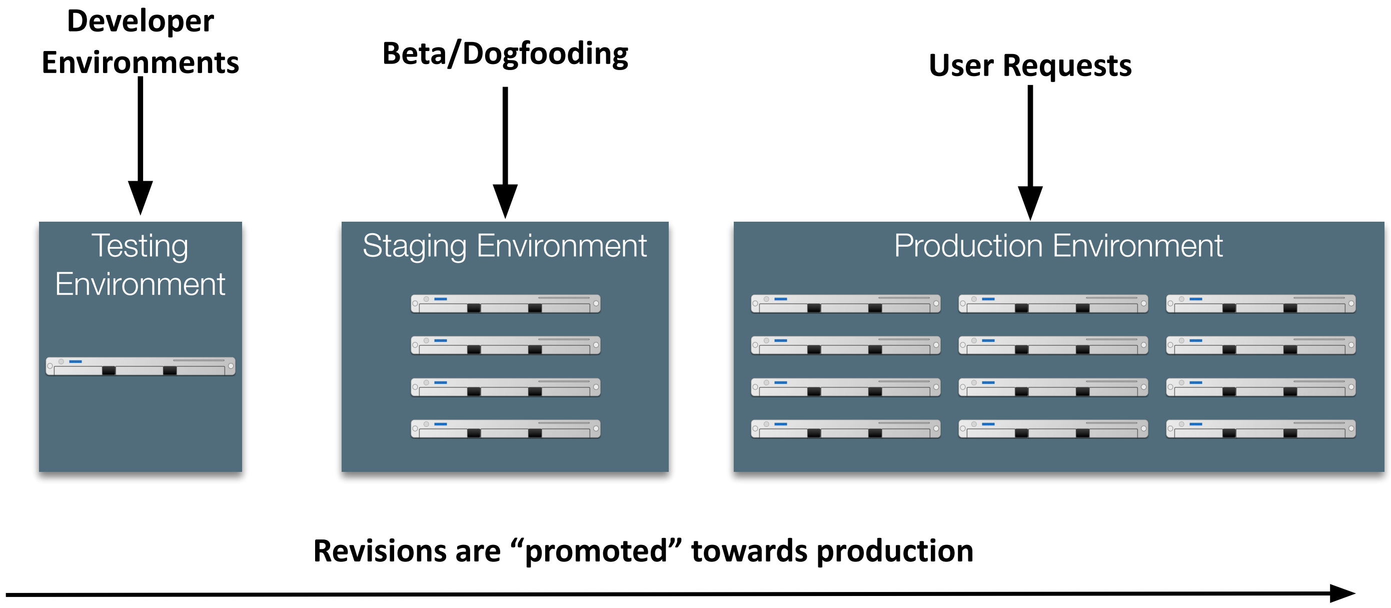


Split Deployments Mitigate Risk

- Idea: Deploy to a complete production-like environment, but don't have users use it, collect preliminary feedback
- Lower risk if a problem occurs in staging than in production
- Examples:
  - "Dogfooding" "Eat your own dogfood"
  - Beta/Alpha testers



Staging Environments for Continuous Delivery



Q/A takes place in each stage (including production!)

Continuous Delivery Tools

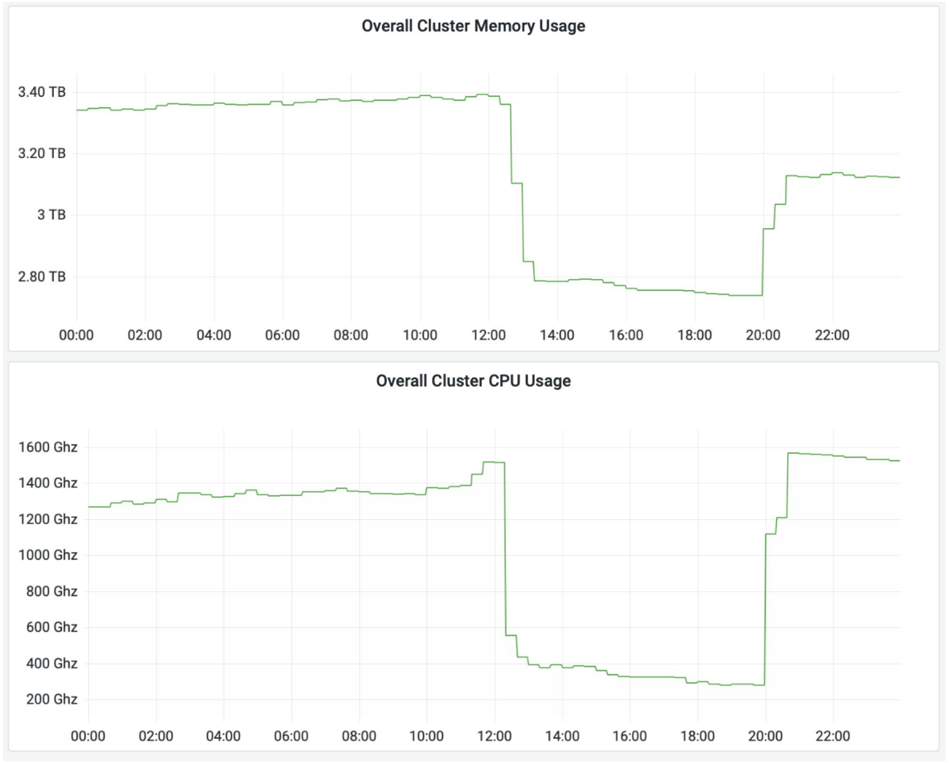
- Simplest tools deploy from a branch to a service (e.g. Vercel. Render.com, Heroku)
- More complex tools:
  - Auto-deploys from version control to a staging environment + promotes through release pipeline
  - Monitors key performance indicators to automatically take corrective actions

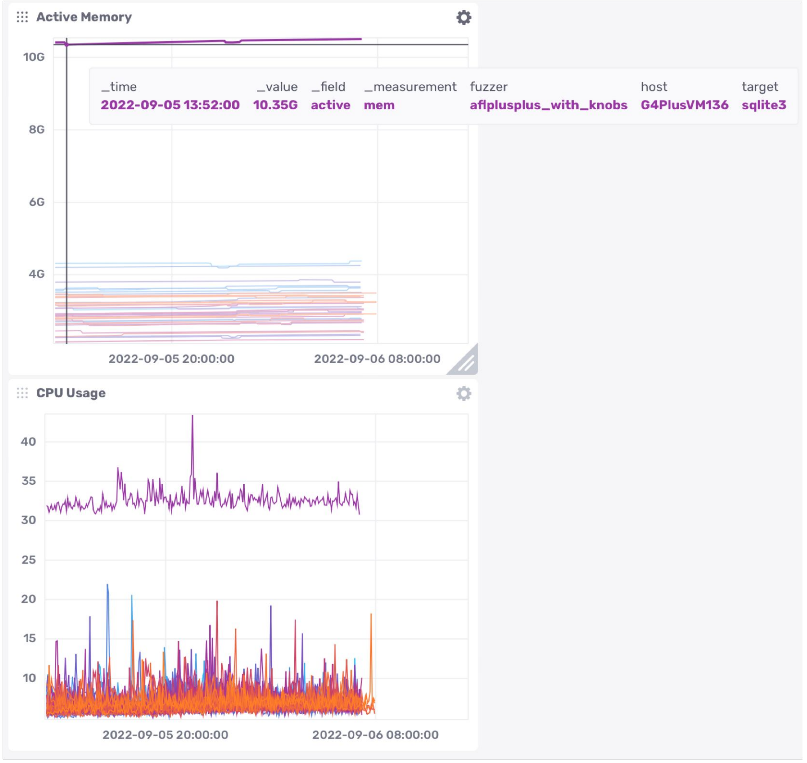
Example CD pipeline from Spinnaker's documentation:
https://spinnaker.io/docs/concepts/#application-deployment

Continuous Delivery **Needs** Monitoring

- Consider both direct (e.g. business) metrics, and indirect (e.g. system) metrics
- Hardware
  - Voltages, temperatures, fan speeds, component health
- OS
  - Memory usage, swap usage, disk space, CPU load
- Middleware
  - Memory, thread/db connection pools, connections, response time
- Applications
  - Business transactions, conversion rate, status of 3rd party components, logs

Monitoring can help identify operational issues



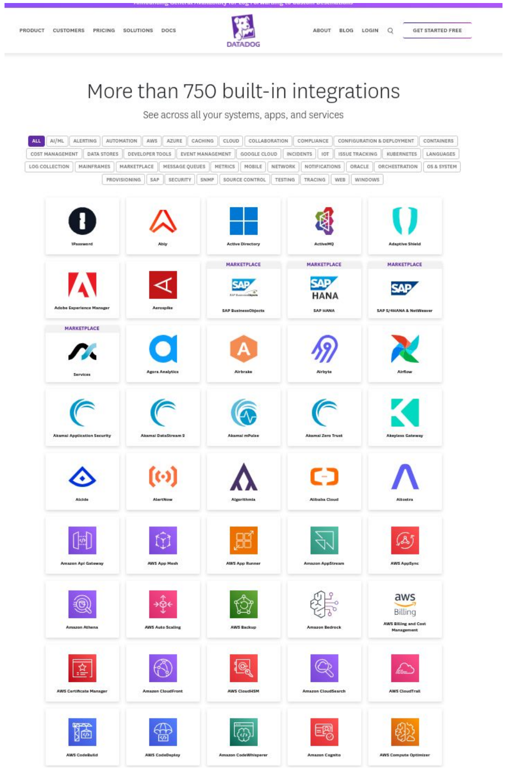


_time	_value	_field	_measurement	fuzzer	host	target
2022-09-05 13:52:00	10.35G	active	mem	aflplusplus_with_knobs	G4PlusVM136	sqlite3

Grafana (AGPL, c 2014)

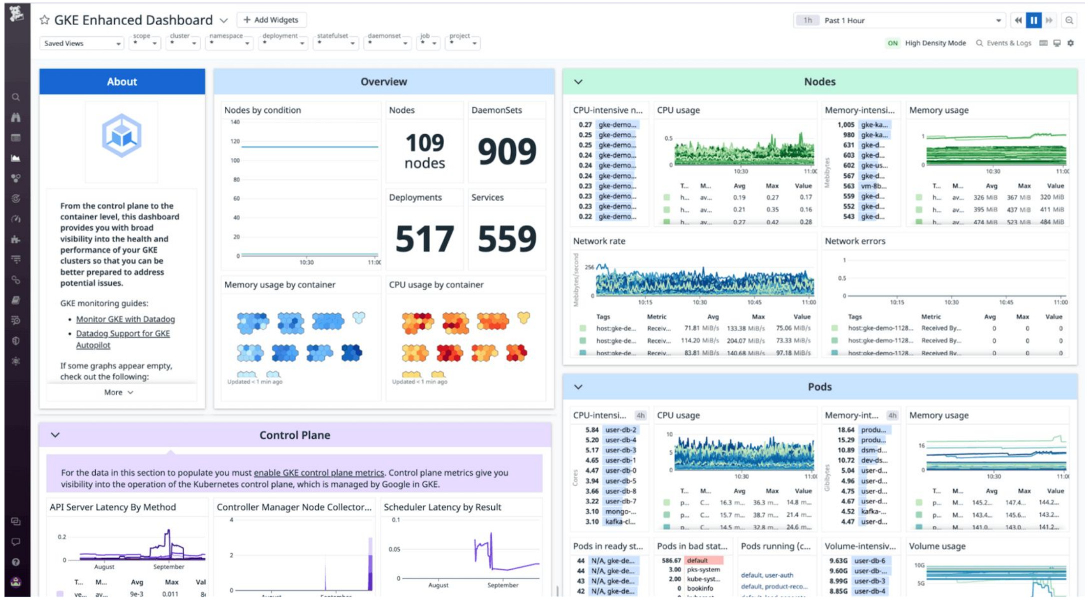
InfluxDB (MIT license, c 2013)

Cloud Monitoring as a Service



More than 750 built-in integrations

See across all your systems, apps, and services



From the control plane to the container level, this dashboard provides you with broad visibility into the health and performance of your GKE clusters so that you can be better prepared to address potential issues.

GKE monitoring guides:

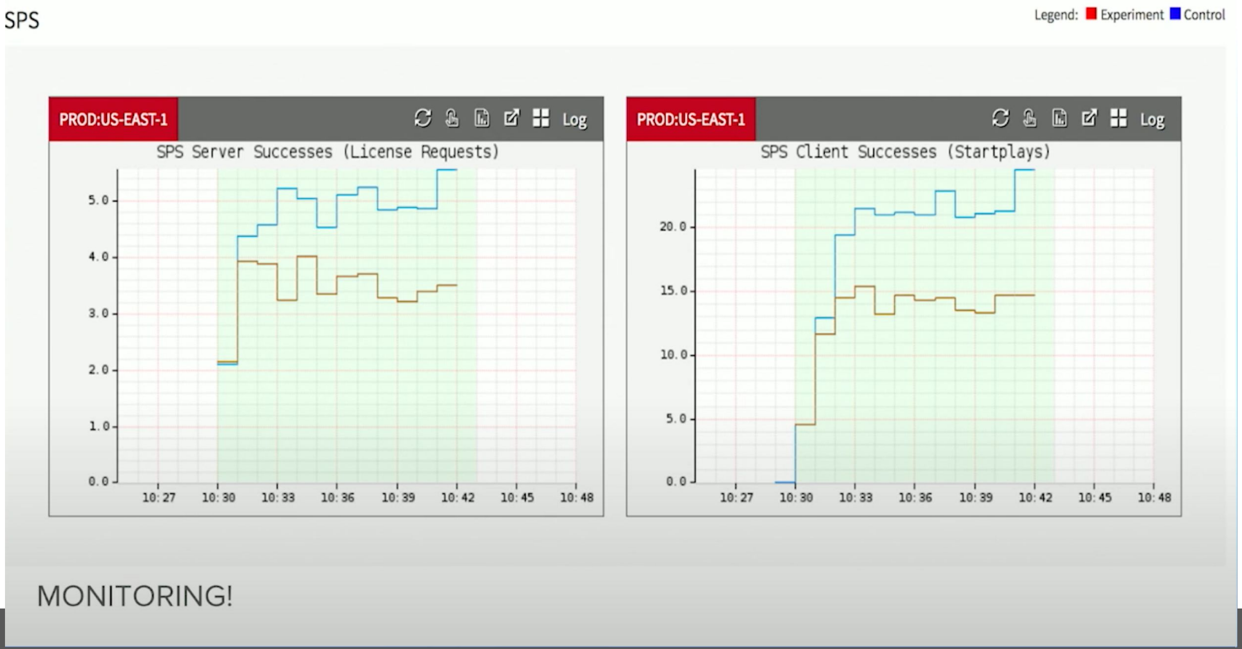
- Monitor GKE with Datadog
- Datadog Support for GKE Autopilot

If some graphs appear empty, check out the following:

For the data in this section to populate you must enable GKE control plane metrics. Control plane metrics give you visibility into the operation of the Kubernetes control plane, which is managed by Google in GKE.

Continuous Delivery Tools Take Automated Actions

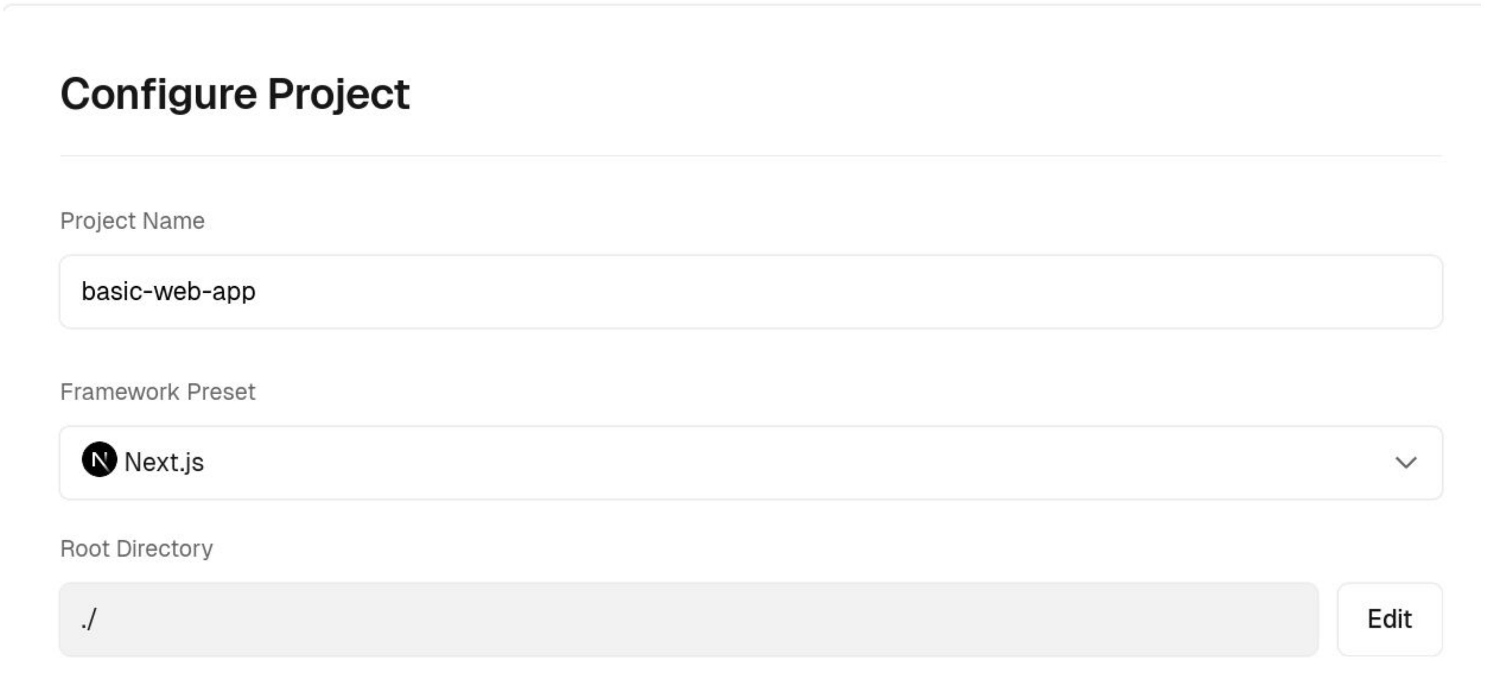
- Example: Automated roll-back of updates at Netflix based on SPS



https://www.youtube.com/watch?v=qyzymLlj9ag

Activity: Try CD by yourself

1. Fork this repo: https://github.com/CMU-17313Q/basic-web-app-f24
2. Follow the instructions in the readme to run and test the development server locally.
3. Once you have it running locally visit `http://localhost:3000` and try different queries like *Who was Shakespeare?* and *What is your Andrew ID?*
4. Complete the activity tasks following the instructions in cmu-17313q.github.io/recitations/deployment-workshop-f24/
5. `Submit a link to the deployed site (link on Slack)`



Configure Project

Project Name

basic-web-app

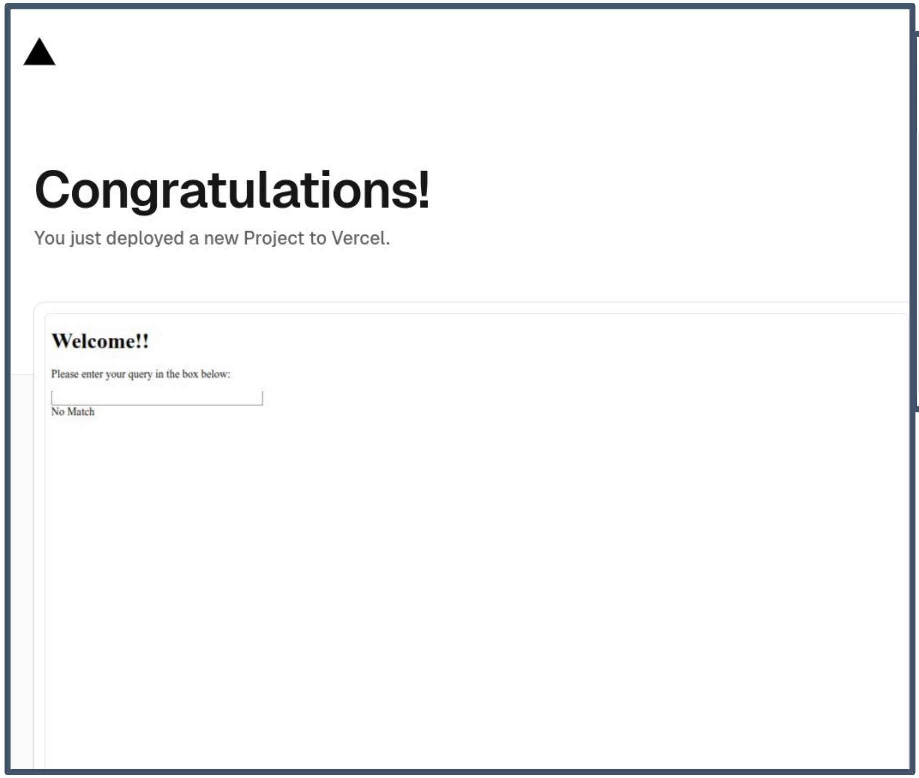
Framework Preset

Next.js

Root Directory

./

Edit



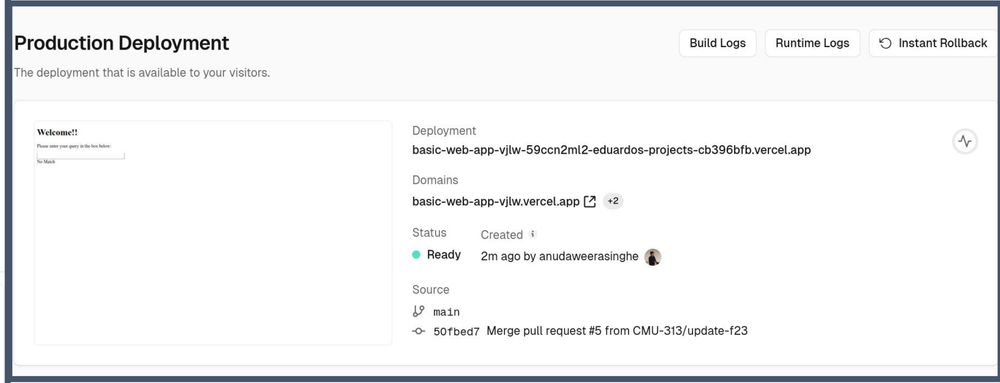
Congratulations!

You just deployed a new Project to Vercel.

Welcome!!

Please enter your query in the box below:

No Match



Production Deployment

The deployment that is available to your visitors.

Deployment
basic-web-app-vjlw-59ccn2ml2-eduardos-projects-cb396bfb.vercel.app

Domains
basic-web-app-vjlw.vercel.app +2

Status: Ready
Created: 2m ago by anudaweerasinghe

Source
main
50fbed7 Merge pull request #5 from CMU-313/update-f23