CLOUD NATIVE
COMPUTING FOUNDATION

Rust and Skaffold for Iterative Development on Kubernetes

kubernetes

SKAFFOLD

MESOSPHERE

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Outline

Modern development techniques

- Iterative Development
- CI/CD
- Immutable infrastructure + Containers

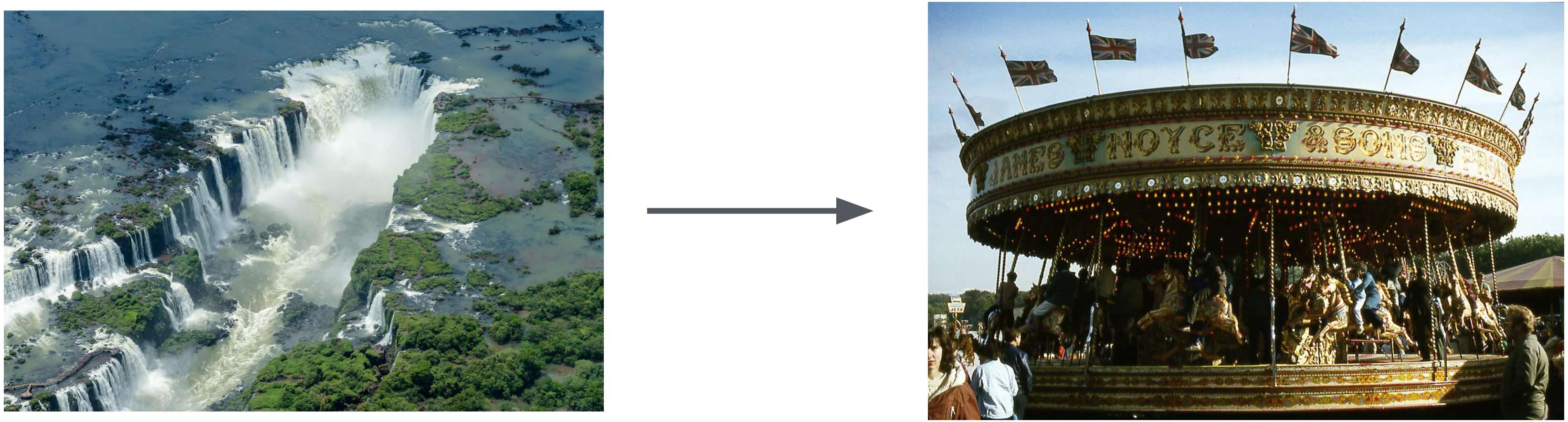
Challenges

Tools

- Rust, Kubernetes, Skaffold

Demo

Continuous/Iterative Development



- Design, develop, and test in repeated cycles
- Testing a new iteration must be quick & cheap

Continuous Integration/Continuous Deployment

- Automated testing as well as deployment of a web application
- Containers make it possible to replicate the same environment during development and in production

Pets -> Cattle -> Immutable Infrastructure

Challenges

- Building, pushing, and deploying isn’t easy
- Giant binaries/containers
- Applications need to be safe (concurrency + memory safety)

Rust

- Created at Mozilla as a “safe, concurrent, practical language”
- Low-level (static) language, performance similar to C++
- Strong emphasis on safety, control of the memory layout, concurrency
- Great & friendly community

Challenges with Rust

- Relatively young language
- Brings extra safety, but you have to pay some upfront price
- Many engineers are new to it; successfully integrating it into your stack can cost significant engineering time

Kubernetes

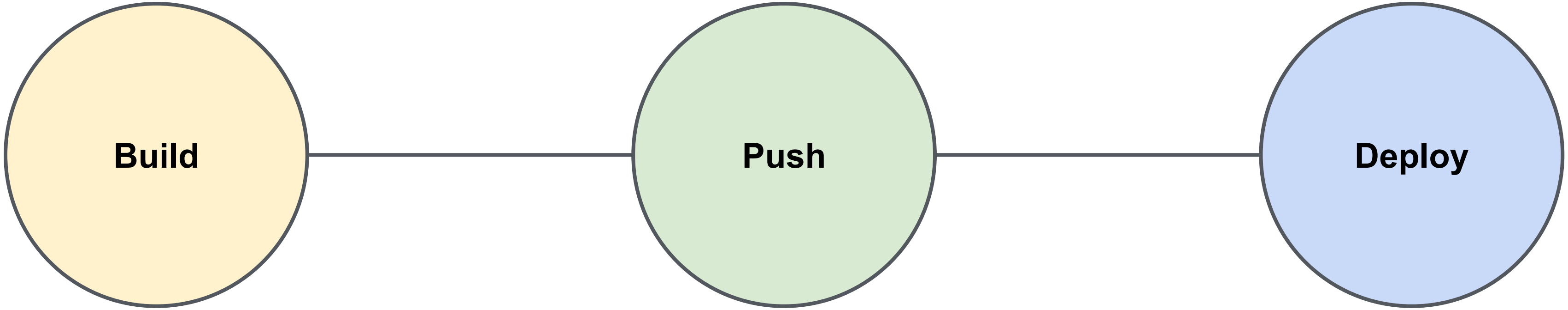
- Orchestrates containers across many different machines… or on your local dev machine
- Enables you to use immutable infrastructure
- Useful abstractions/tools to easily deploy or scale services
- DC/OS Multi-Kubernetes-Engine

Skaffold

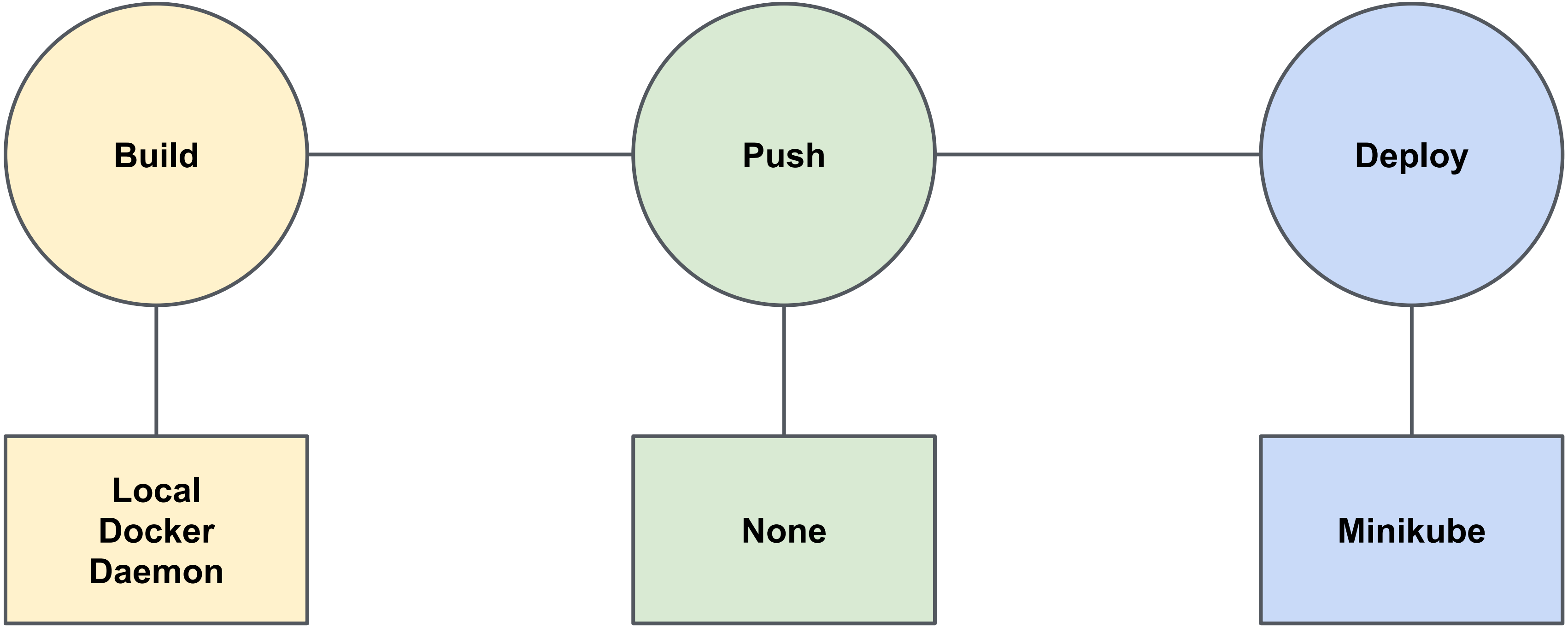
SKAFFOLD

- CLI tool that facilitates iterative development for Kubernetes applications
- Handles the workflow for **building, pushing, and deploying** an application
- Can be used to iterate on an application source code locally then deploy to local or remote Kubernetes clusters

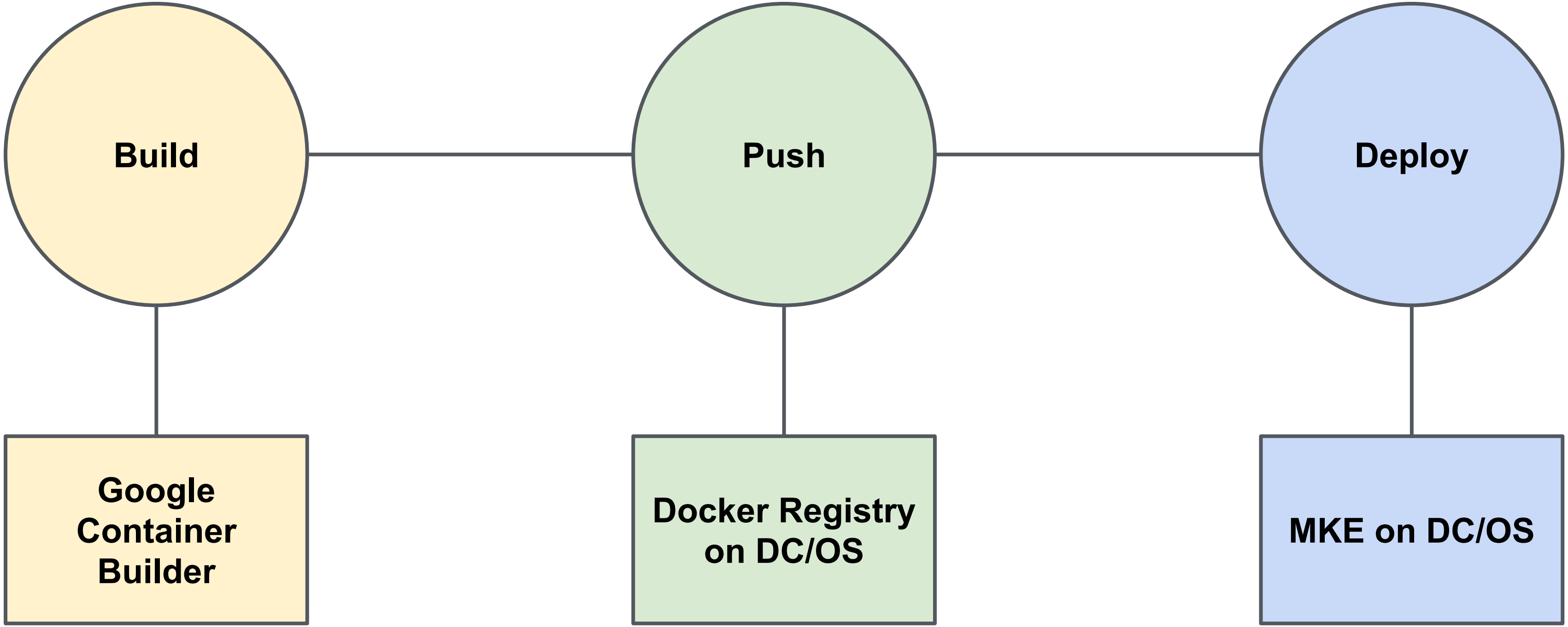
Skaffold



Skaffold (Local)



Skaffold (Remote)

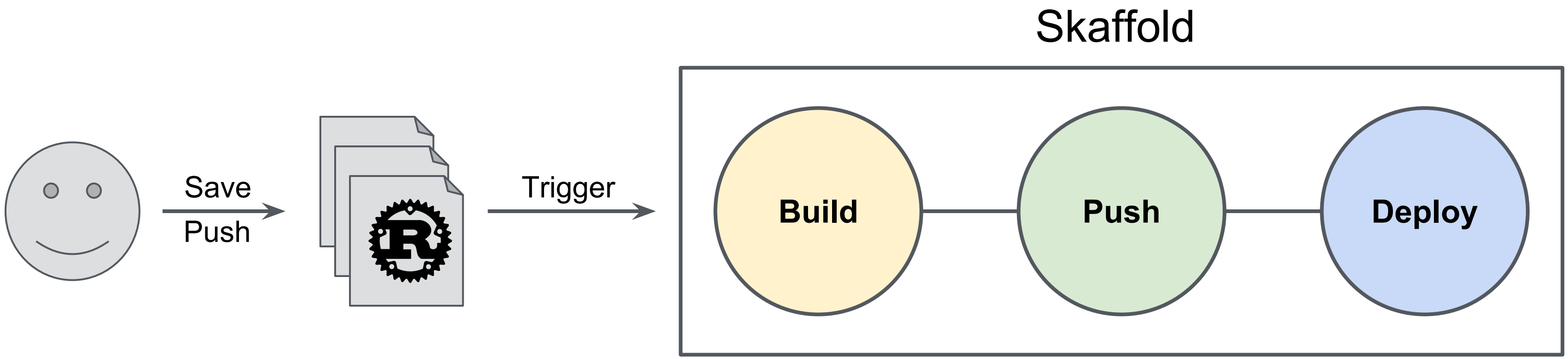


Using Skaffold

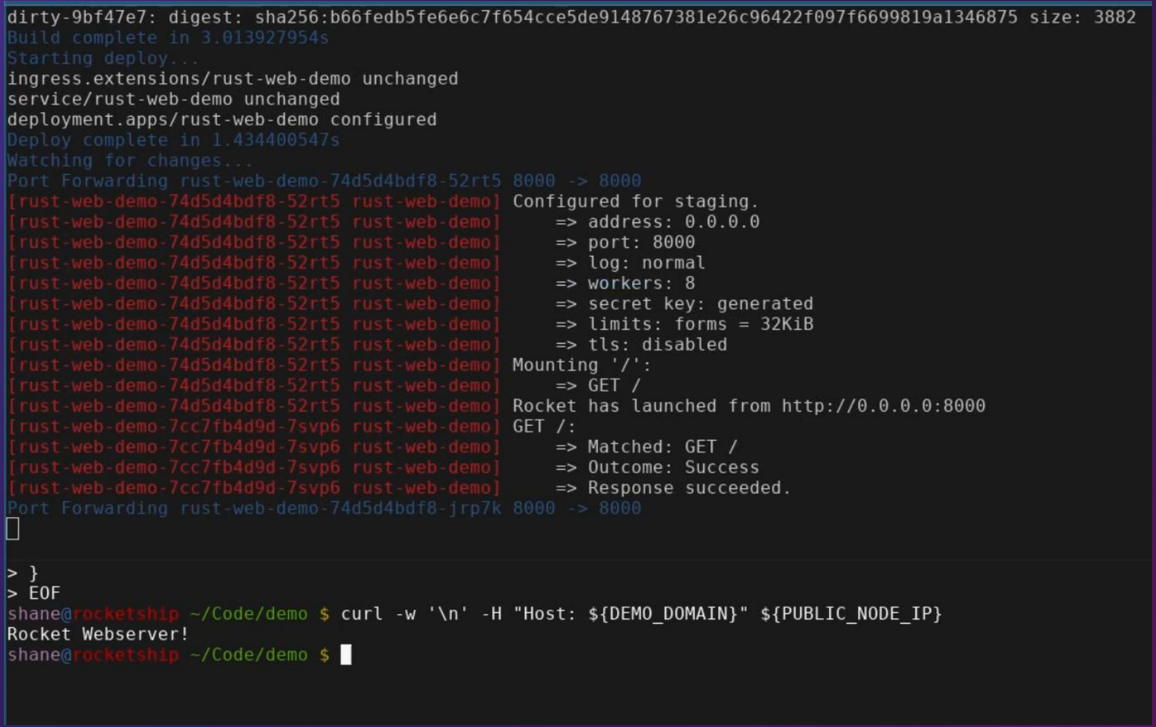
No need to have each new developer spend days setting up a new dev environment

1. Create k8s manifests (pod specs, ingress settings, etc)
2. Tell skaffold via skaffold.yaml how to build and deploy the application
3. Use “skaffold dev” on your local machine to deploy to a minikube cluster
4. Make your CI/CD pipeline run “skaffold run” when new code is checked-in

Demo Flow



Demo



```
dirty-9bf47e7: digest: sha256:b66fedb5fe6e6c7f654cce5de9148767381e26c96422f097f6699819a1346875 size: 3882
Build complete in 3.013927954s
Starting deploy...
ingress.extensions/rust-web-demo unchanged
service/rust-web-demo unchanged
deployment.apps/rust-web-demo configured
Deploy complete in 1.434400547s
Watching for changes...
Port Forwarding rust-web-demo-74d5d4bdf8-52rt5 8000 -> 8000
[rust-web-demo-74d5d4bdf8-52rt5 rust-web-demo] Configured for staging.
[rust-web-demo-74d5d4bdf8-52rt5 rust-web-demo]     => address: 0.0.0.0
[rust-web-demo-74d5d4bdf8-52rt5 rust-web-demo]     => port: 8000
[rust-web-demo-74d5d4bdf8-52rt5 rust-web-demo]     => log: normal
[rust-web-demo-74d5d4bdf8-52rt5 rust-web-demo]     => workers: 8
[rust-web-demo-74d5d4bdf8-52rt5 rust-web-demo]     => secret key: generated
[rust-web-demo-74d5d4bdf8-52rt5 rust-web-demo]     => limits: forms = 32KiB
[rust-web-demo-74d5d4bdf8-52rt5 rust-web-demo]     => tls: disabled
[rust-web-demo-74d5d4bdf8-52rt5 rust-web-demo] Mounting '/':
[rust-web-demo-74d5d4bdf8-52rt5 rust-web-demo]     => GET /
[rust-web-demo-74d5d4bdf8-52rt5 rust-web-demo] Rocket has launched from http://0.0.0.0:8000
[rust-web-demo-7cc7fb4d9d-7svp6 rust-web-demo] GET /:
[rust-web-demo-7cc7fb4d9d-7svp6 rust-web-demo]     => Matched: GET /
[rust-web-demo-7cc7fb4d9d-7svp6 rust-web-demo]     => Outcome: Success
[rust-web-demo-7cc7fb4d9d-7svp6 rust-web-demo]     => Response succeeded.
Port Forwarding rust-web-demo-74d5d4bdf8-jrp7k 8000 -> 8000
```

```
> }
> EOF
shane@rocketship ~/Code/demo $ curl -w '\n' -H "Host: ${DEMO_DOMAIN}" ${PUBLIC_NODE_IP}
Rocket Webserver!
shane@rocketship ~/Code/demo $
```

Future Work

- Make the service highly-available:
  - Use an HA posgres setup
  - Zero-downtime deployments
- Utilize more of the dependencies’ capabilities and increase efficiency:
  - Use connection pools for Diesel
  - Use Rocket managed state

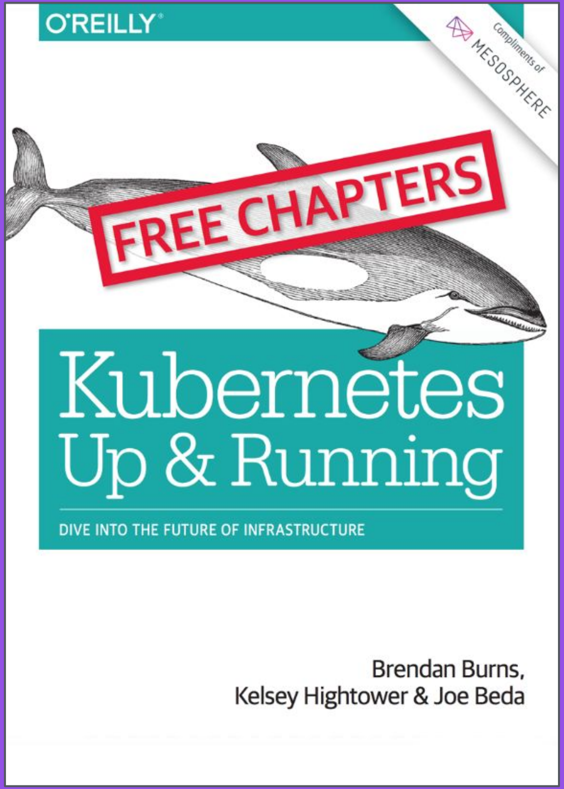
Resources

- Mesosphere Kubernetes Engine (MKE) - https://mesosphere.com/product/kubernetes-engine/
- https://github.com/shaneutt/dcos-k8s-rust-skaffold-demo

Special Thanks

Shane Utt

Jörg Schad



https://mesosphere.com/resources/running-kubernetes-oreilly-ebook/

THANK YOU!

ANY QUESTIONS?

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