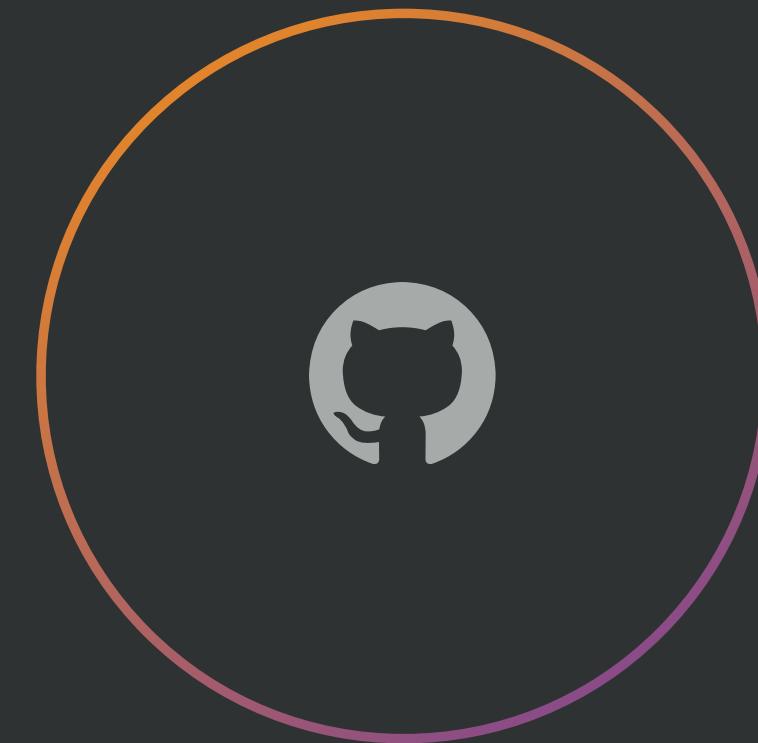




Kubernetes at GitHub

Aaron Brown, SRE

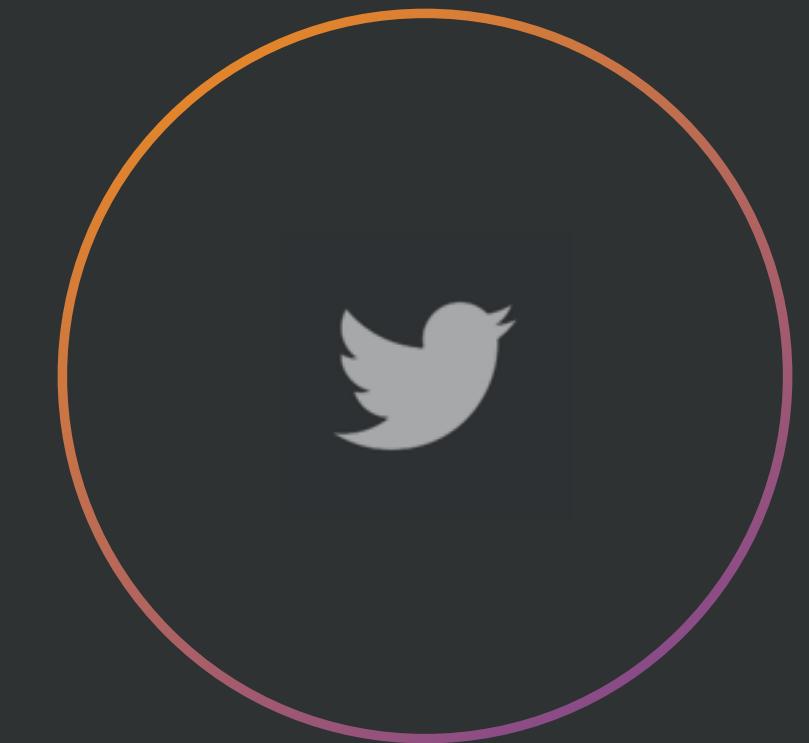
Me



GITHUB

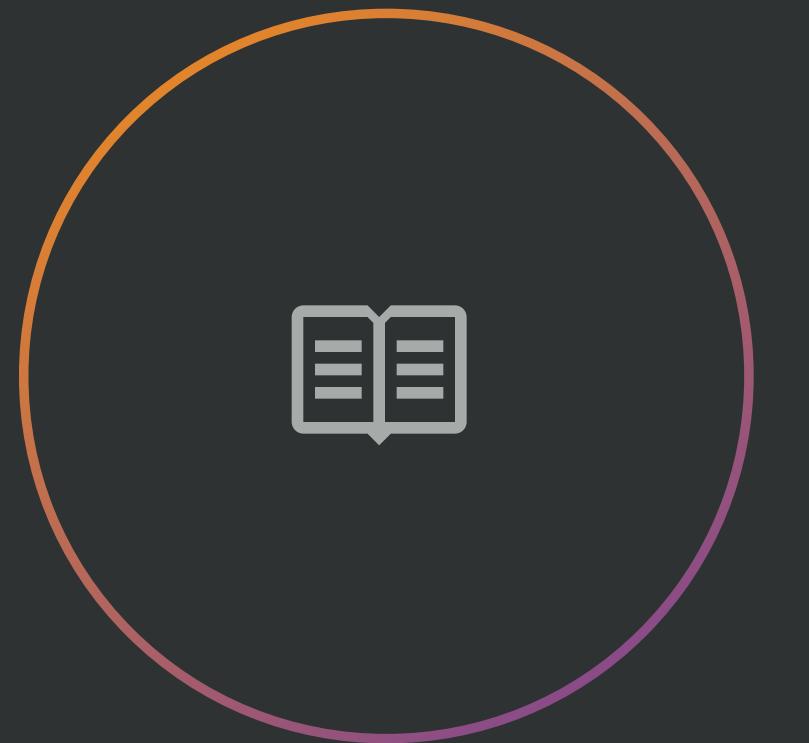
@aaronbbrown

aaronbbrown@github.com



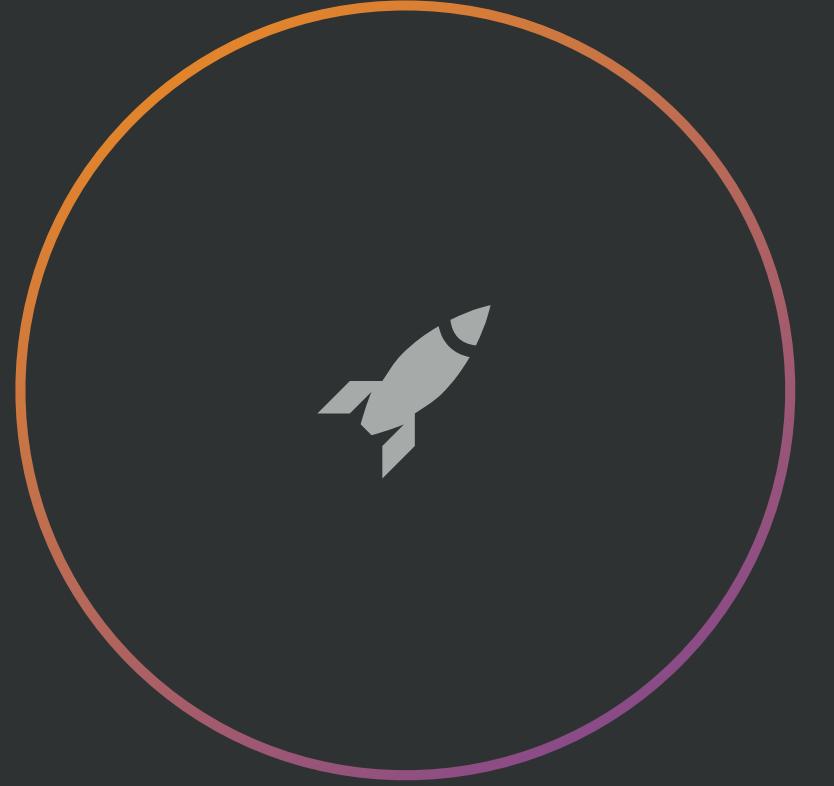
TWITTER

@aaronbbrown777



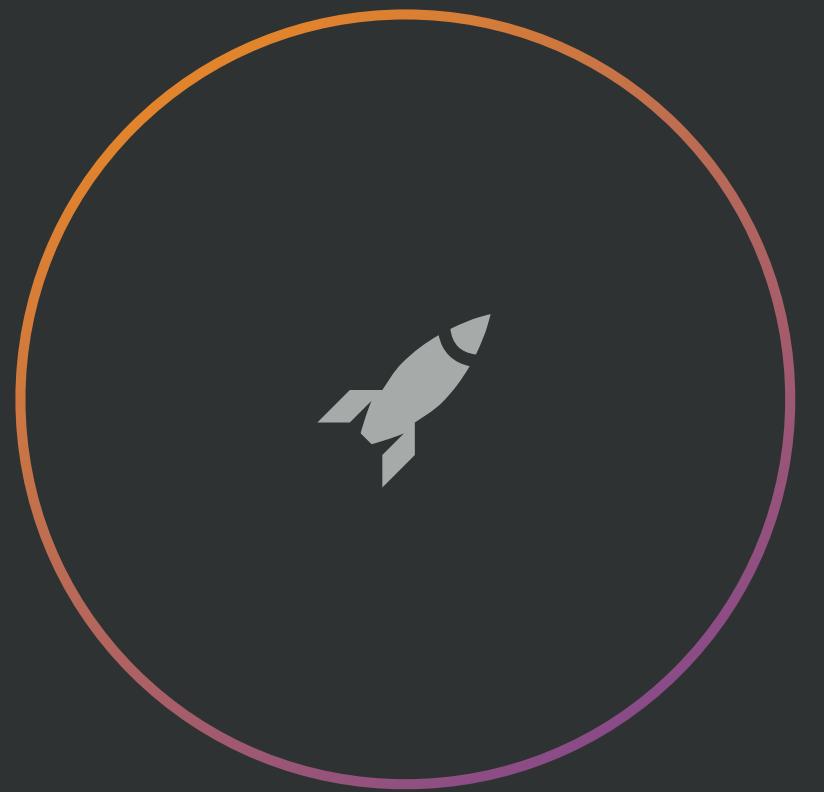
BLOG

blog.9minutesnooze.com



Friction

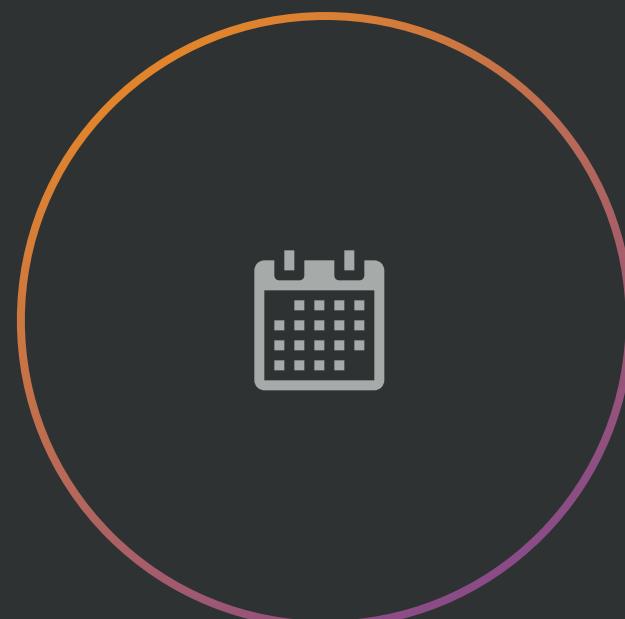




Reducing Friction

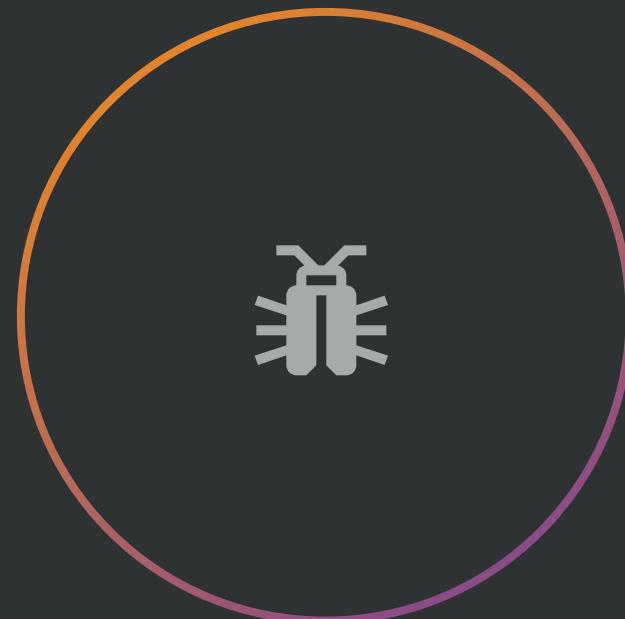


Developer Friction



MONOLITH

- Rails Monolith



SERVICES

- Engineers want to create new services
- Several hours to days of effort
- Often requires support from SRE



“

“F#@! IT, I'M ADDING IT TO THE RAILS APP.”

- GITHUB ENGINEER

”





“

“I’LL DEPLOY IT TO HEROKU”

- GITHUB ENGINEER



”



“

*“I WISH I COULD SPEND MORE TIME
CONFIGURING HOSTS.”*

- NO ENGINEER, EVER



Engineers Care About



LOGS
Aggregated

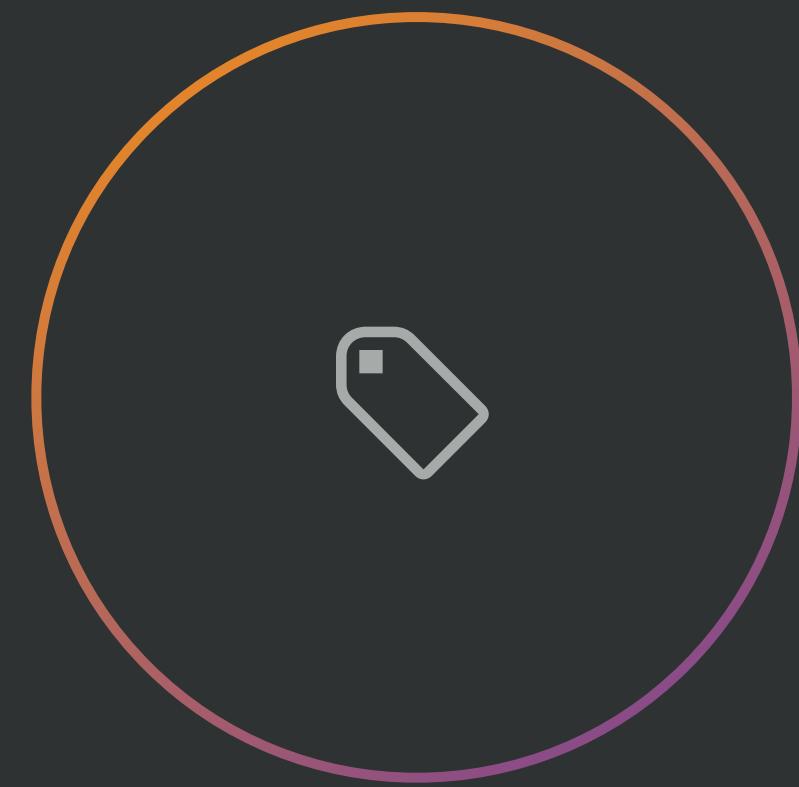


SERVICES
Discoverable



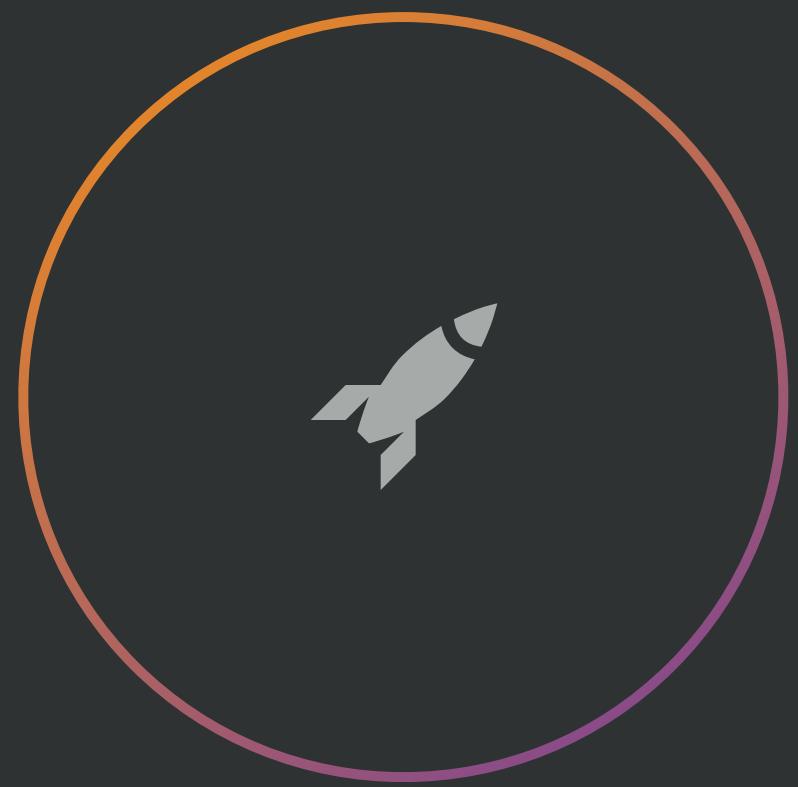
METRICS
Visible

Engineers Care About



ENVIRONMENTS

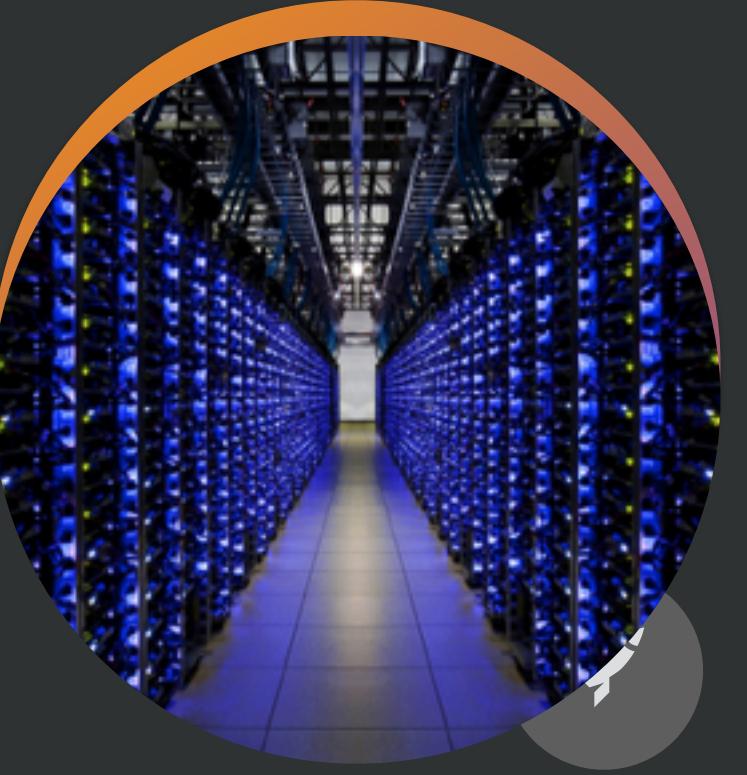
Production-like



DEPLOYMENTS

Homogenous

Operational Friction



DATACENTERS
(Several)



ROLES
(Hundreds)



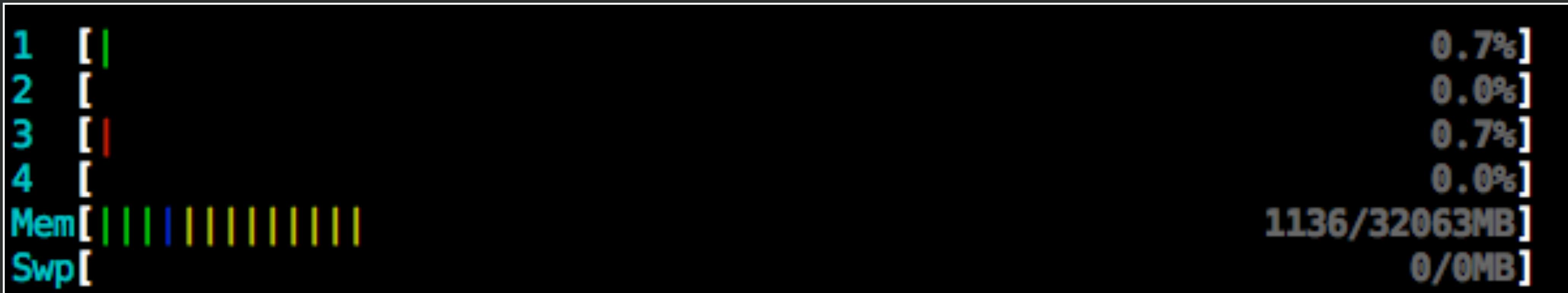
SERVERS
(Thousands)

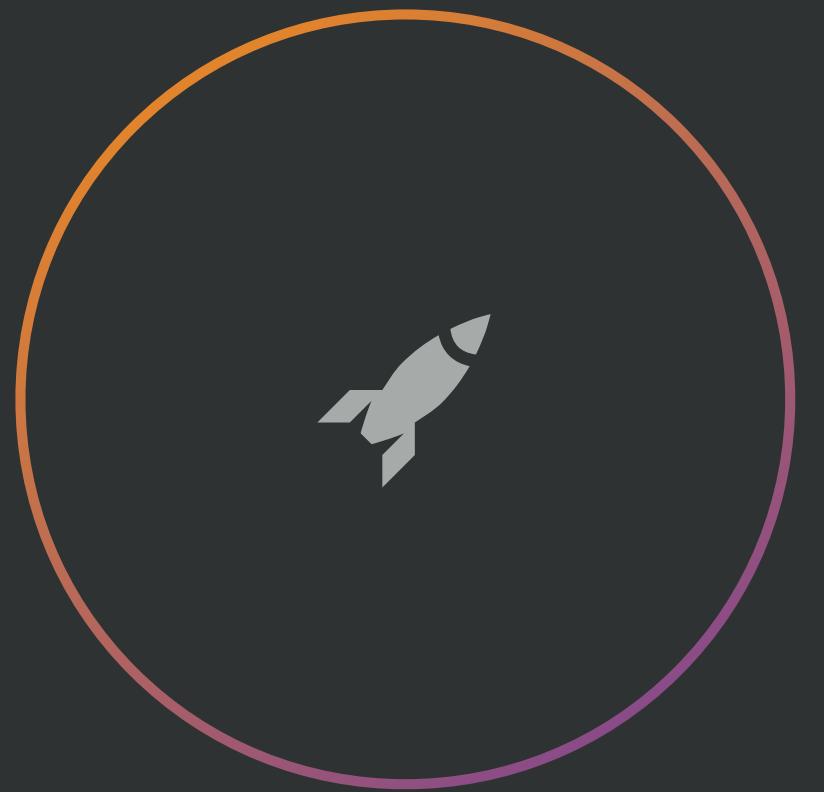
Operational Friction



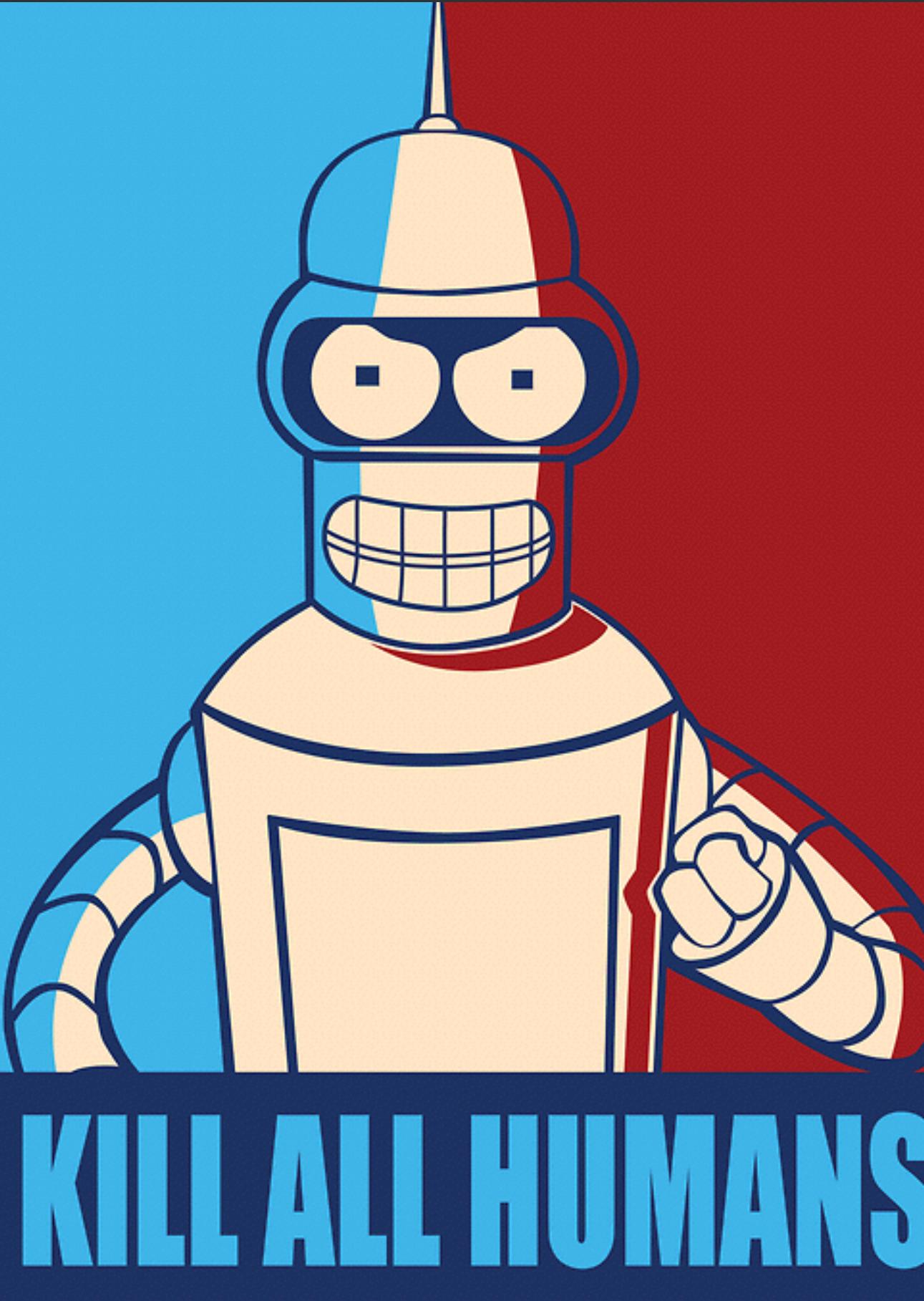
INEFFICIENT RESOURCE UTILIZATION

- Single service hosts with virtually no load
- 2 or 3 for redundancy!





Humans



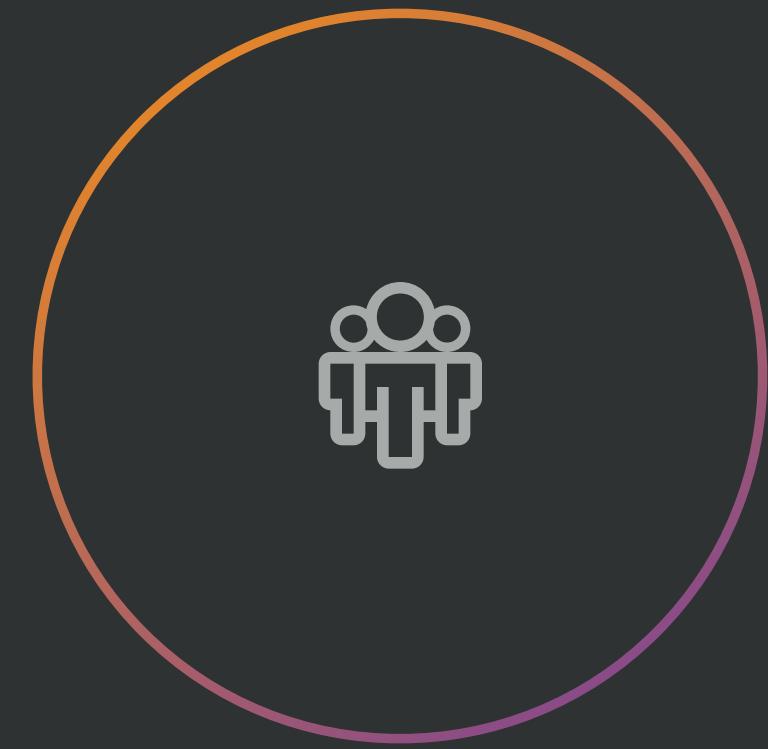
Kubernetes



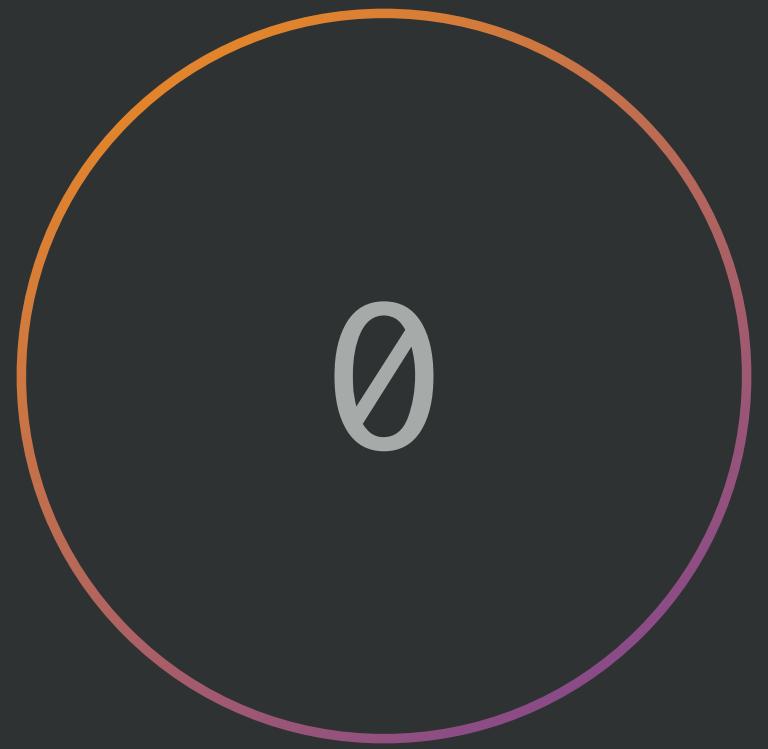
+



Why Kubernetes?



COMMUNITY



DAY 0
EXPERIENCE



GOOGLE
PEDIGREE

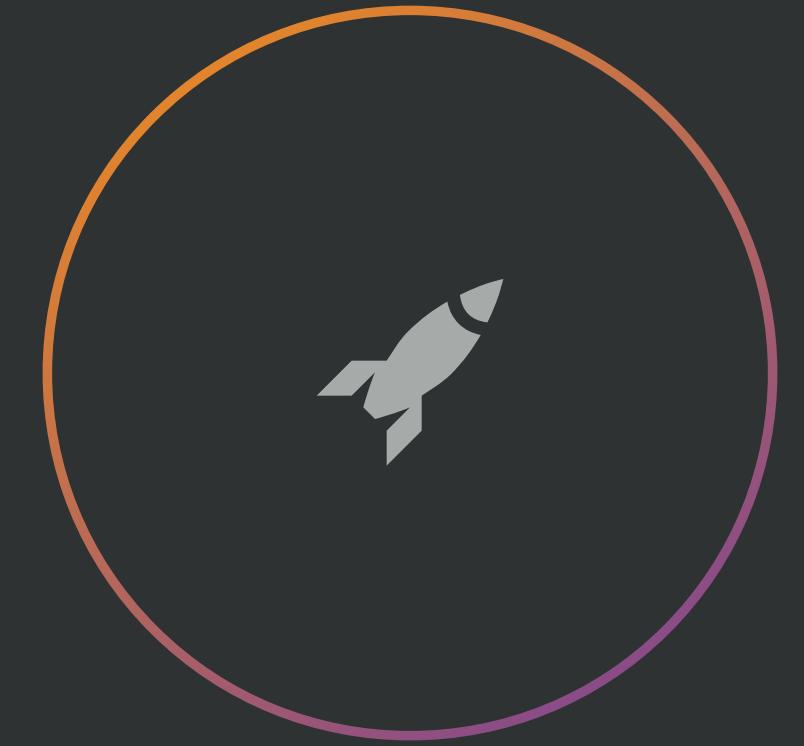


Ok, Kubernetes.
Now what?

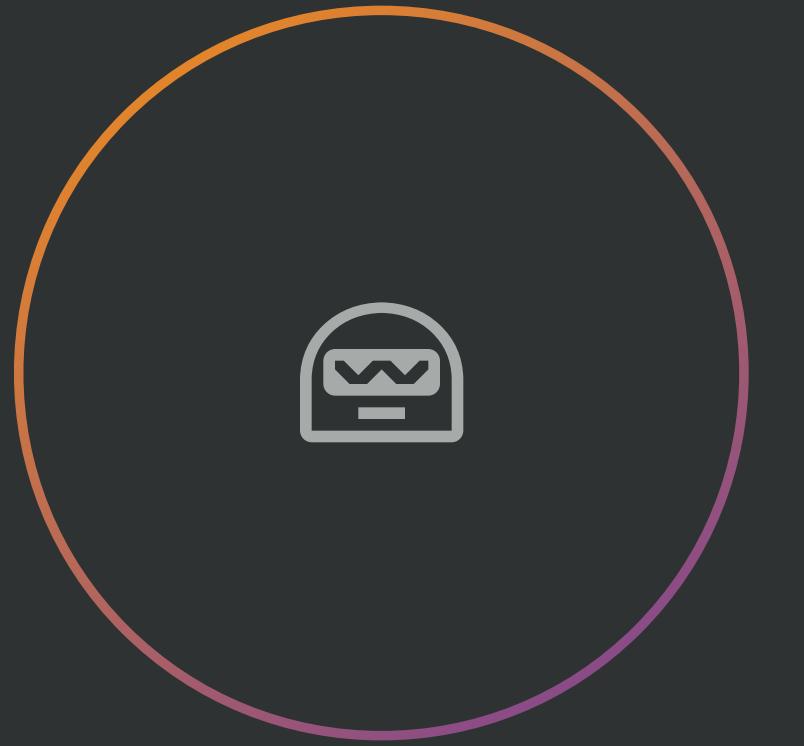
Team



SRE



PLATFORM



DEVELOPER
EXPERIENCE

Conservativism



github.Experience(kubernetes)++



Proof of Concept



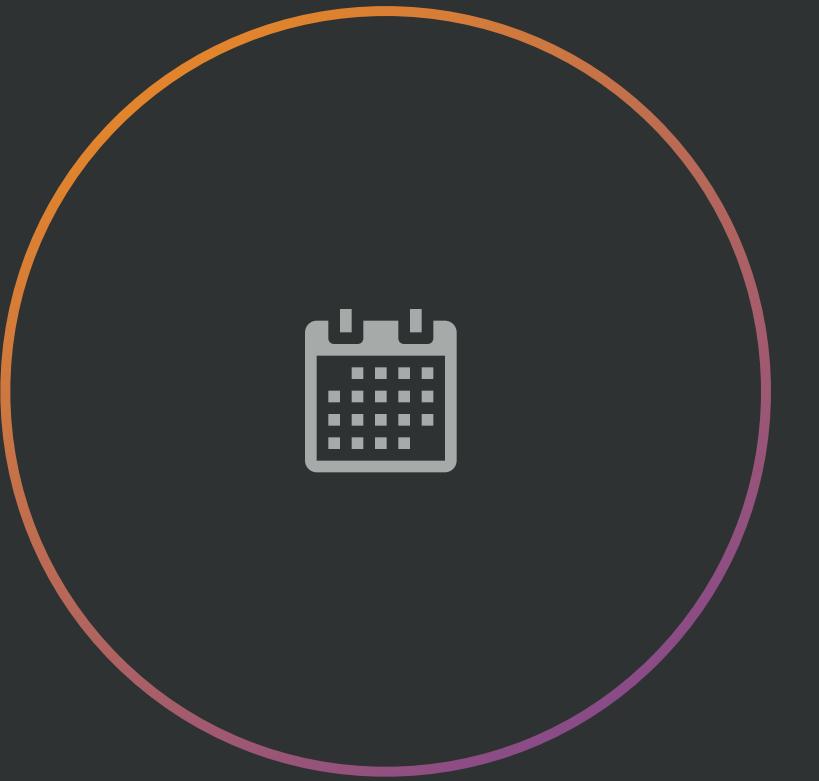
Simple

Simpler

Even Simpler?

There, that's good

Proof of Concept

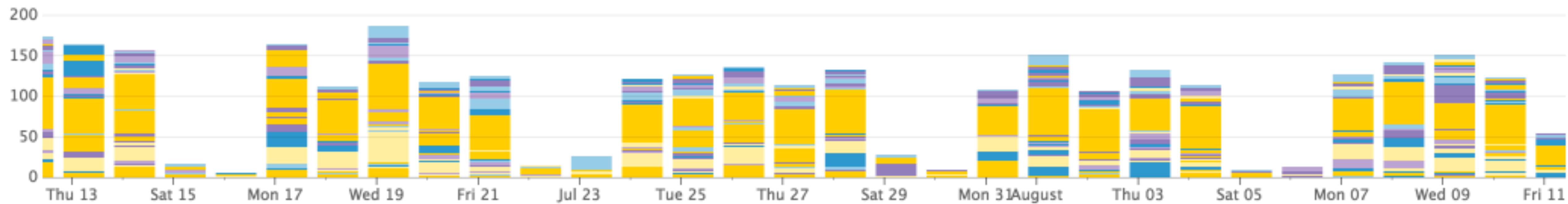


KOPS



AWS

Deploying



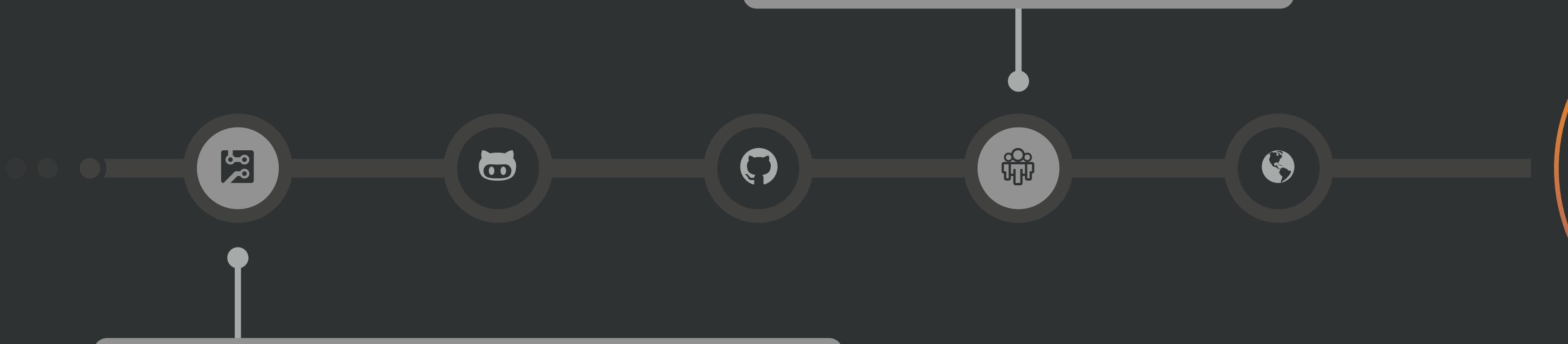
10:48 PM Aaron Brown .deploy <https://github.com/github/github/pull/77011> to prod

- **~150/day production deployments**
- **~50/day Monolith Rails deployments**

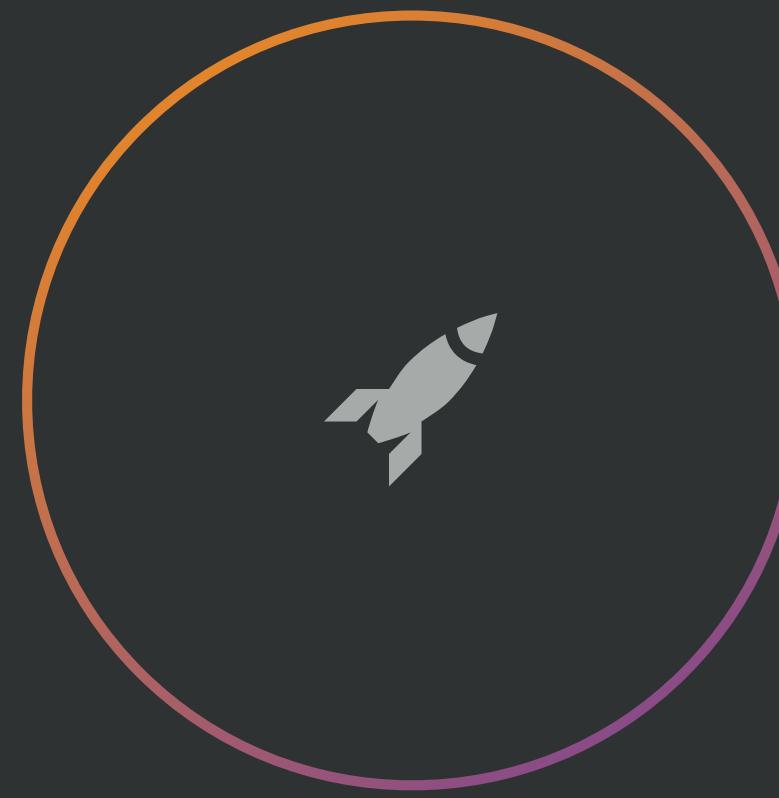
CI / Deployment



K8s resources?
kubectl apply



Dockerfile present?
docker build



Kubernetes @ GitHub

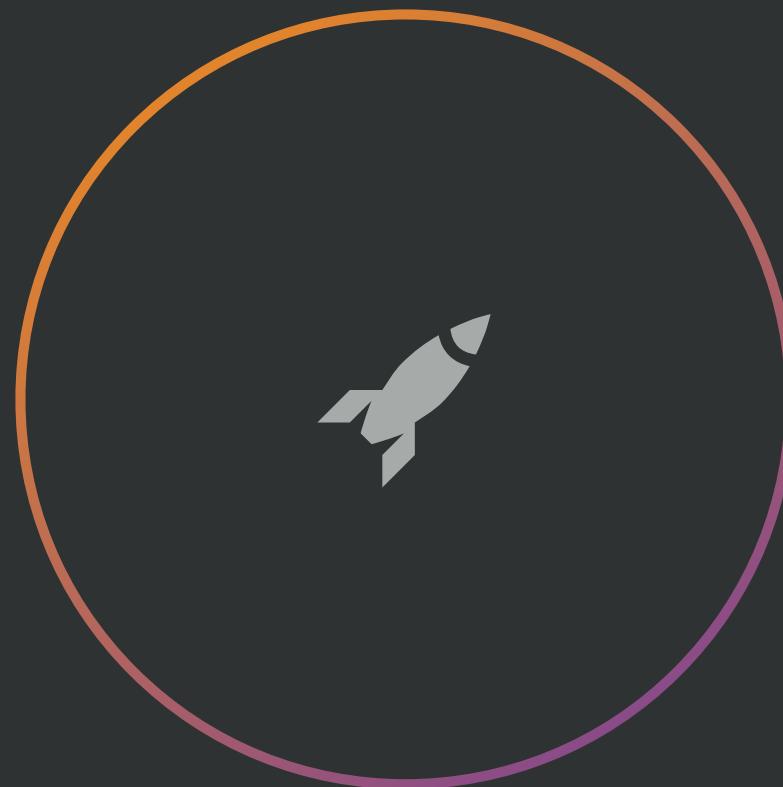


Hack Week

Kubernetes @ GitHub



Now what?



Monolith

github/github

github / github Private

Code Issues 3,406 Pull requests

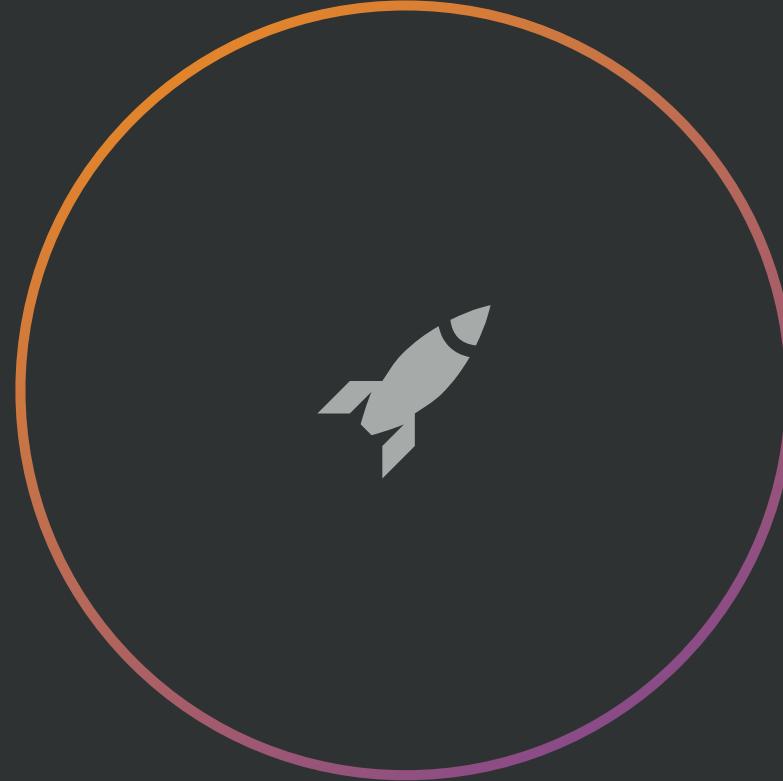
You're lookin' at it. <https://github.com>

A screenshot of a GitHub repository page for the "github/github" repository. The page title is "Monolith" followed by "github/github". The repository is marked as "Private". It shows a code tab, 3,406 issues, and pull requests. A prominent message at the bottom says "You're lookin' at it." followed by a link to https://github.com.

Kubernetes @ GitHub



```
git clone https://github.com/  
github/github ~/github/github
```



Monolith

github/github

github / github Private

Code Issues 3,406 Pull requests

You're lookin' at it. <https://github.com>

A screenshot of a GitHub repository page for "github / github". The page is private. It shows a code tab, 3,406 issues, and pull requests. A prominent message at the bottom reads "You're lookin' at it." followed by a link to https://github.com.



Operational Confidence

Kubernetes @ GitHub



Review Lab

Review-Lab

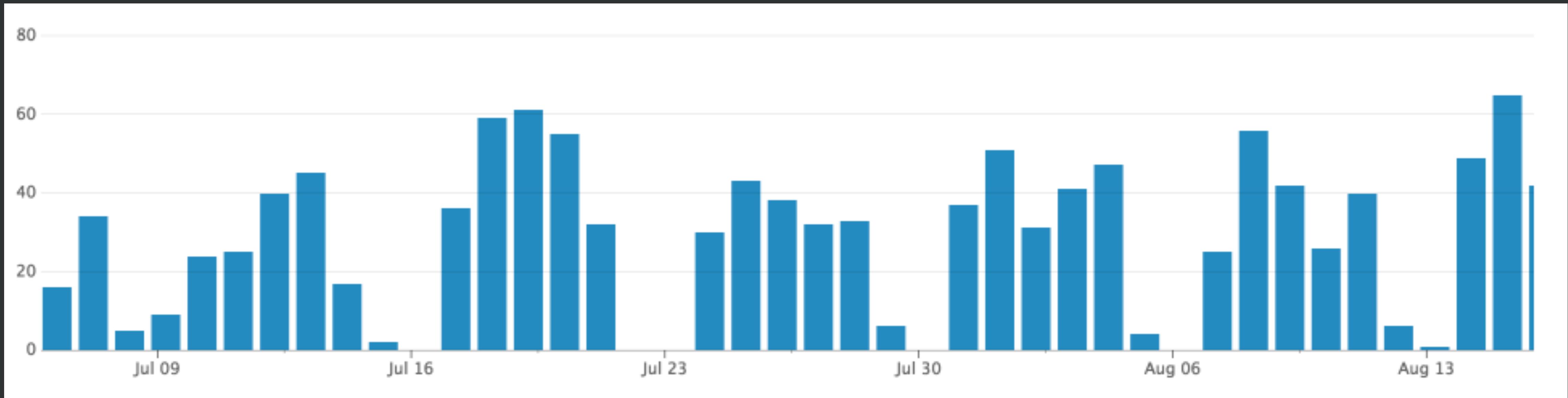


10:41 PM Aaron Brown .deploy github to me

10:41 PM @aaronbbrown is **deploying** github/master (**b9c5914...bd5b42c**) to review-lab Review the **deployment checklist** before deploying to production.

@aaronbbrown's review-lab **deployment** of github/master (bd5b42c) is done! (12 ConfigMaps, 17 Deployments, 1 Ingress, 1 Namespace, 6 Secrets, and 23 Services)(118.59s) your lab is available at <https://aaronbbrown.review-lab.github.com>

Review Lab



Kubernetes @ GitHub



github.com

Metal



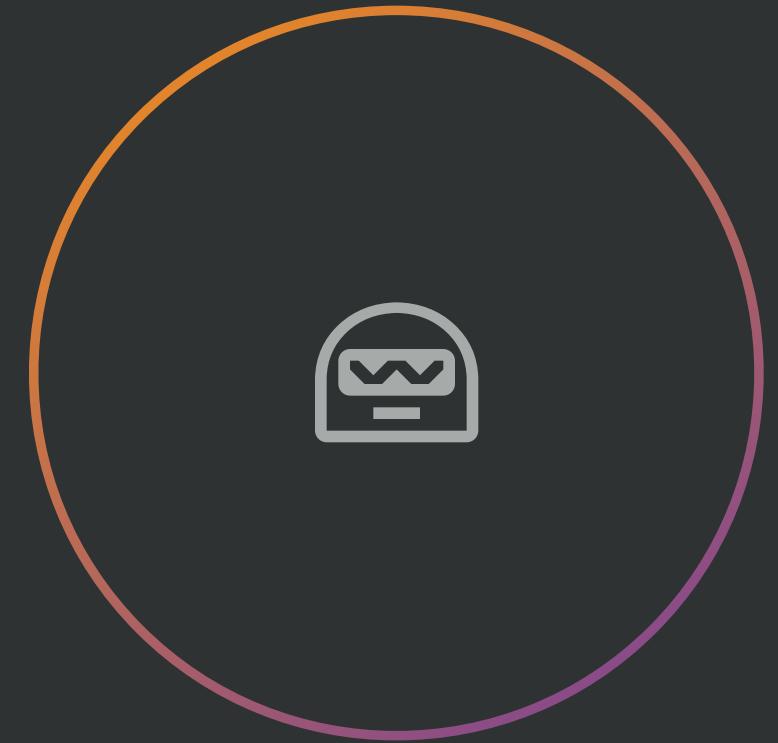
Building on Metal



RESEARCH



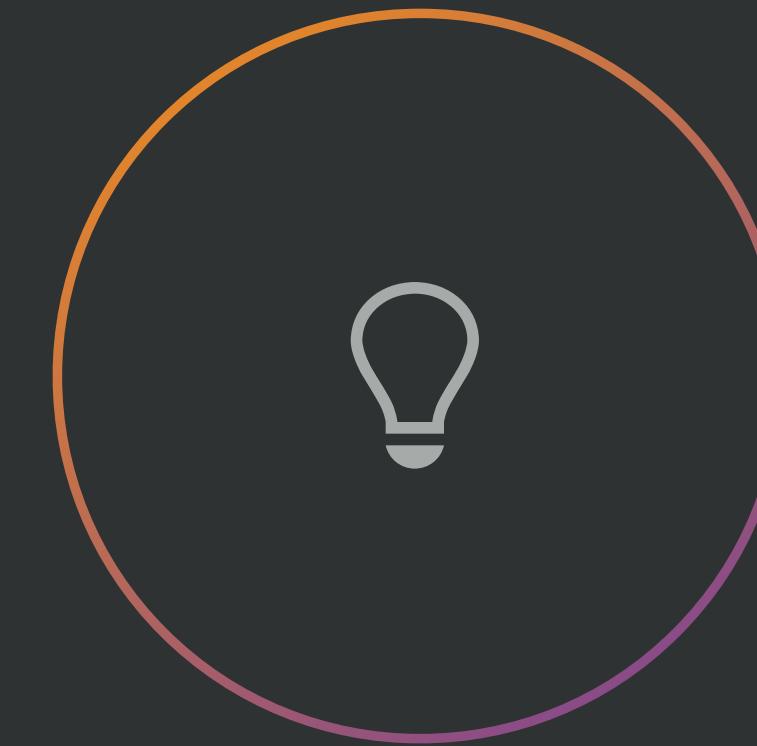
HAND-BUILD



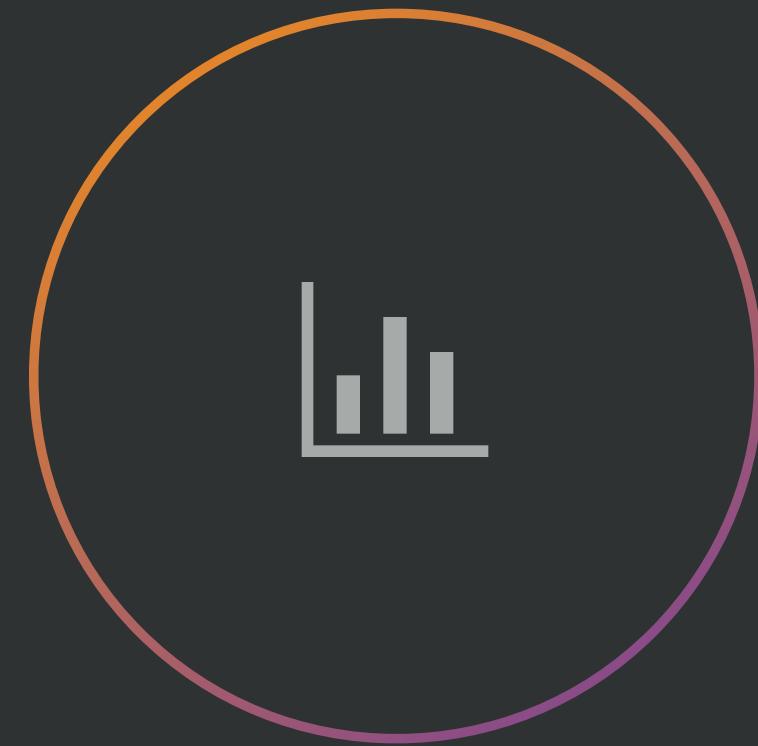
AUTOMATE



OPT-IN



EXPERIMENTS



RAMP-UP

Opt-in



A screenshot of a web browser window displaying the GitHub homepage. The address bar shows a secure connection to GitHub, Inc. [US] at https://github.com. The page header includes the GitHub logo and navigation links for 'fix-rails4-marketp...', 'Switch to GitHub:lab', and 'Rails 3'. The main search bar features the GitHub logo and the text 'Search GitHub'. At the bottom left, there is a user profile card for 'jnewland' with a small profile picture.



Zero-Downtime Deploys?
Nope.

Zero Downtime Deployments

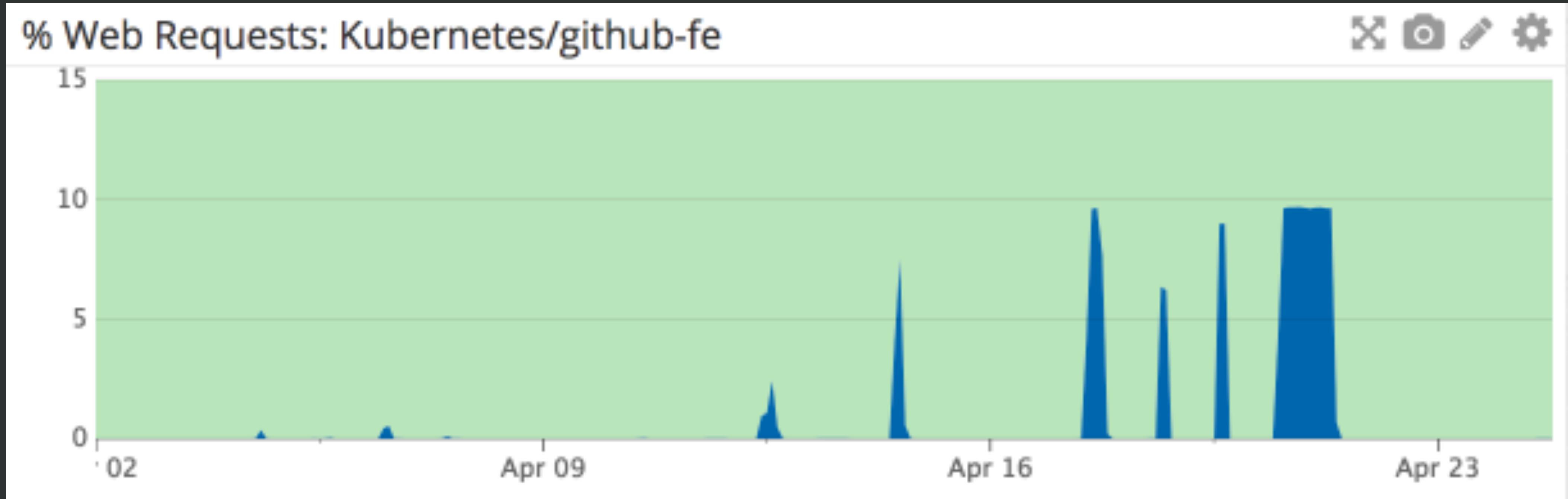


```
51 apiVersion: extensions/v1beta1
52 kind: Deployment
53 spec:
54   template:
55     spec:
56       containers:
57         - name: nginx
58           image: nginx
59           # Don't shut down before kube-proxy has converged.
60           lifecycle:
61             preStop:
62               exec:
63                 command: ["sleep", "5"]
64
65
66
67
```

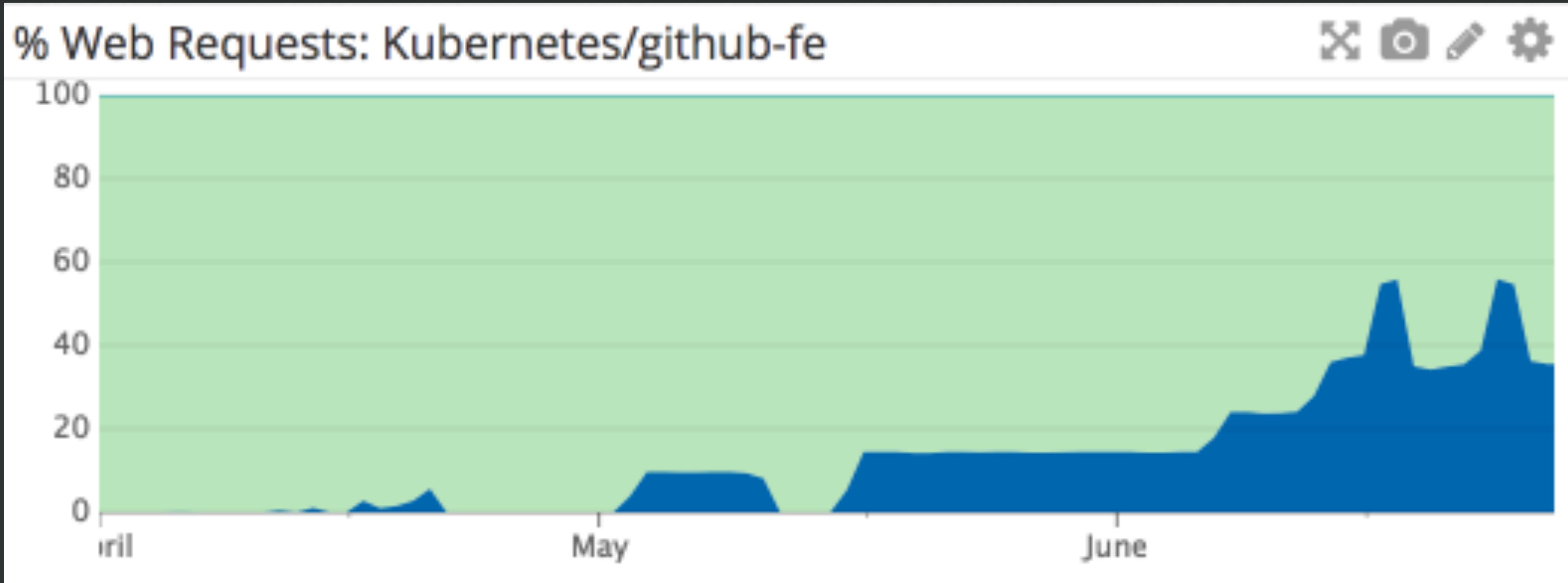
Controlled Experiments



Controlled Experiments



Ramp-Up



Failure Points



K8S DAEMONS NETWORK

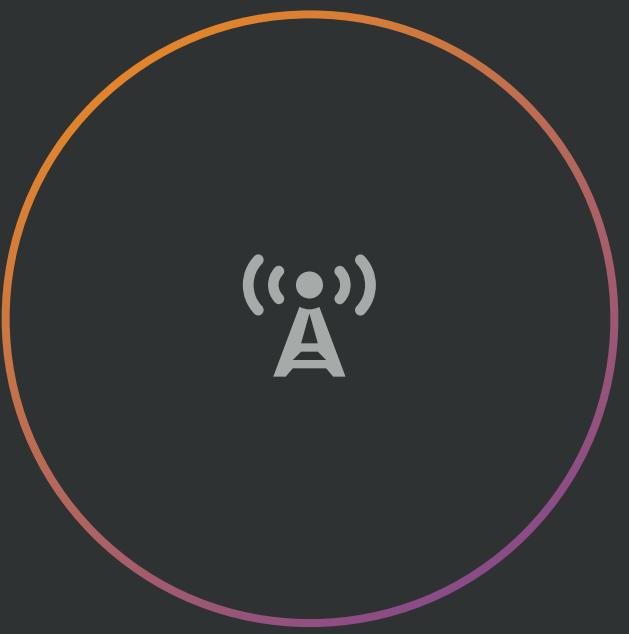
kube-proxy

kube-apiserver

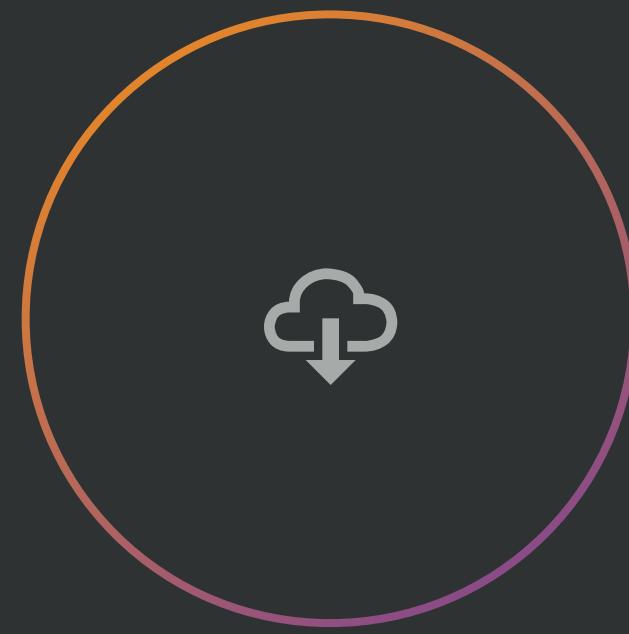
kube-dns

kube-controller-manager

kubelet

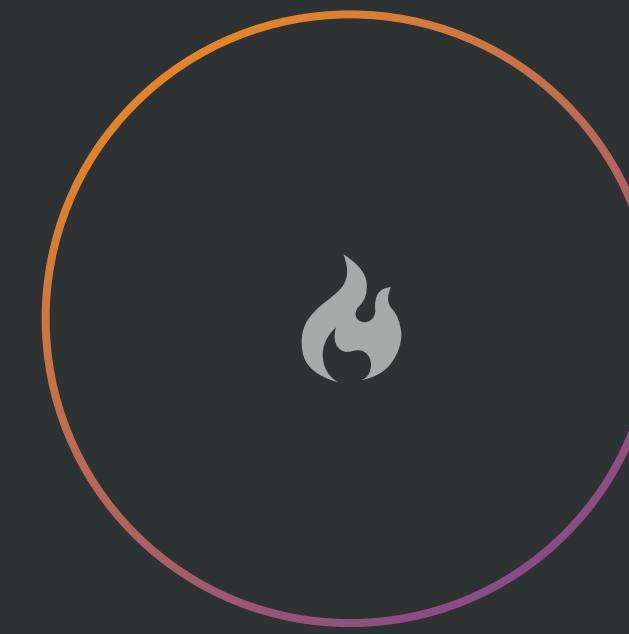


“A”



DATA STORE

etcd



DOCKER

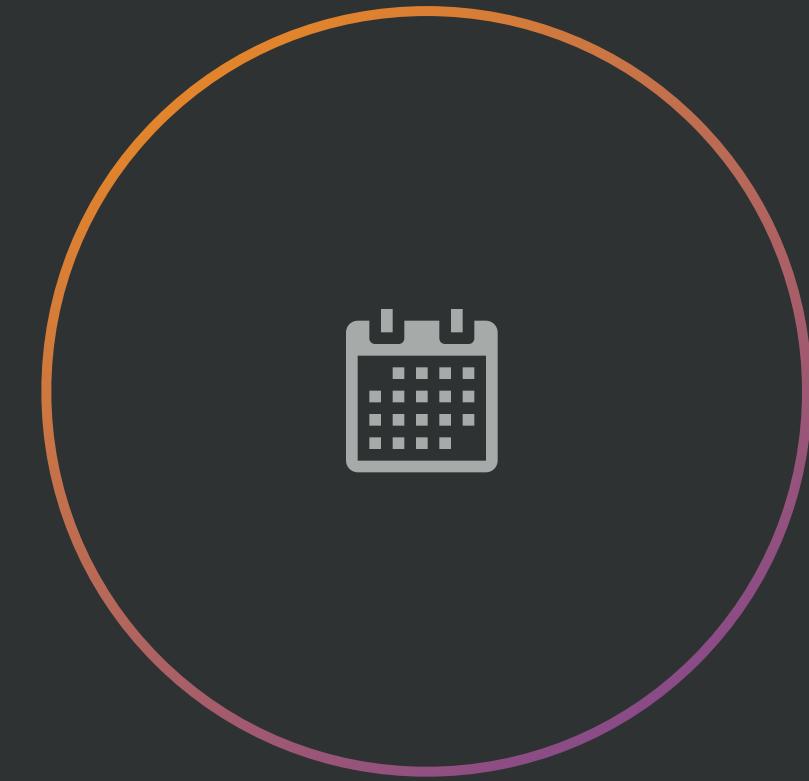
Fear



Failure is Always an Option



Cluster Groups



MAINTENANCE
Upgrades
Experiments

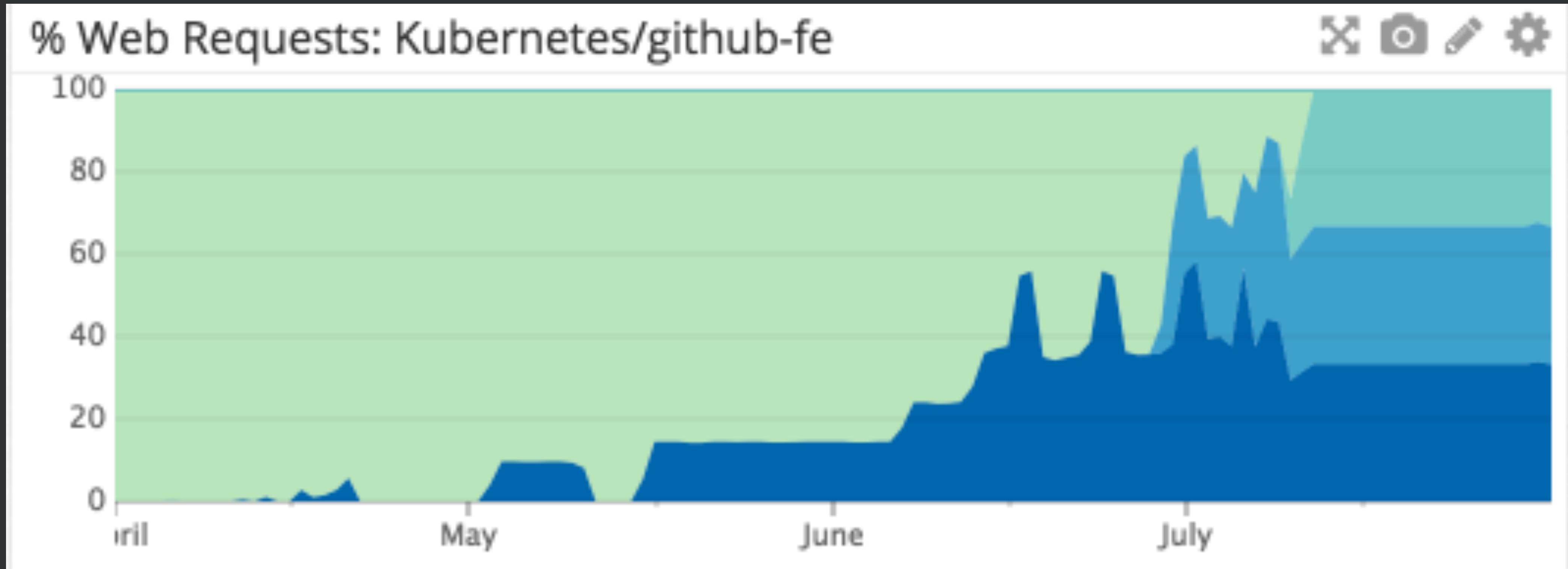


FAILURE
Low Impact

Cluster Groups



Ramp-Up





Cluster Groups Status: In Progress

Kubernetes @ GitHub



Friction?

Kubernetes @ GitHub



Yes



Kubernetes @ GitHub



Multi-tenancy

Kubernetes @ GitHub



Kommunity



 **Aaron Brown**
@AaronBBrown777

Hey [@kelseyhightower](#), if you're surfing GitHub today, you might find it interesting that all your web bits come thru Kubernetes as of today.

7:42 PM - 11 Jul 2017

319 Retweets 721 Likes



39 319 721 |||

 **Kelsey Hightower** ✅
@kelseyhightower

Following

This is a big deal. GitHub using Kubernetes in production. I remember when their team was just kicking the tires.

Aaron Brown @AaronBBrown777
Hey [@kelseyhightower](#), if you're surfing GitHub today, you might find it interesting that all your web bits come thru Kubernetes as of today.

7:47 PM - 11 Jul 2017

502 Retweets 1,060 Likes



15 502 1.1K 88

Kommunity



 **Kelsey Hightower** ✅ @kelseyhightower

Following ▾

This also marks the day the Kubernetes project became self-hosted.

Kelsey Hightower ✅ @kelseyhightower
This is a big deal. GitHub using Kubernetes in production. I remember when their team was just kicking the tires. twitter.com/AaronBBrown777...

8:00 PM - 11 Jul 2017

146 Retweets 477 Likes

10 146 477



More Info

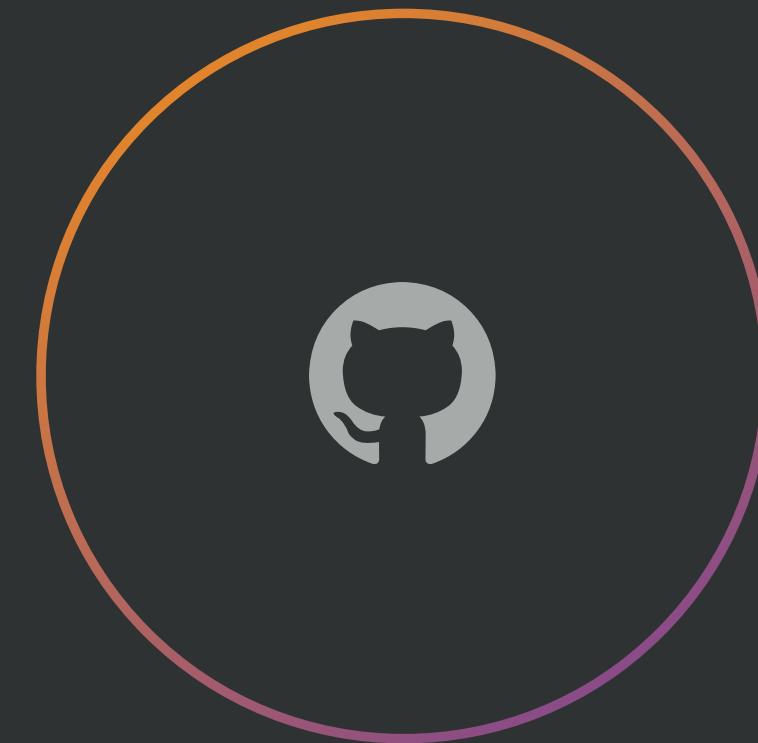


[https://githubengineering.com/
kubernetes-at-github/](https://githubengineering.com/kubernetes-at-github/)

Thanks!



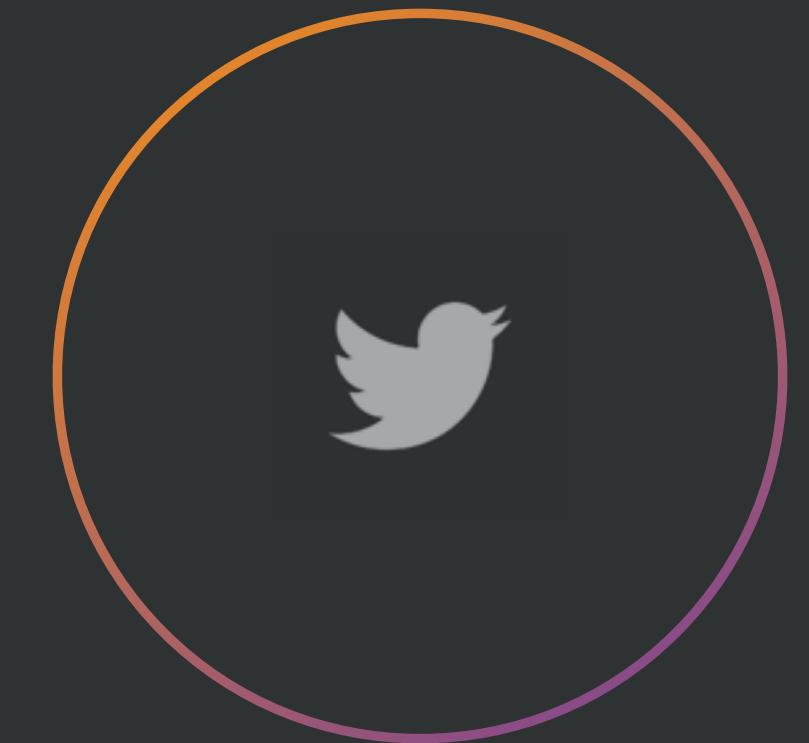
Me



GITHUB

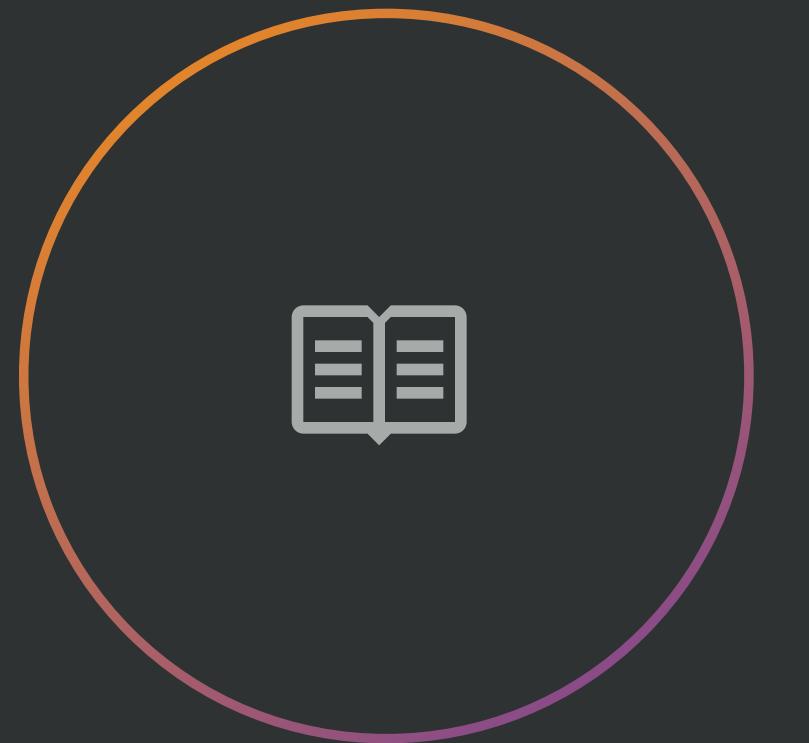
@aaronbbrown

aaronbbrown@github.com



TWITTER

@aaronbbrown777



BLOG

blog.9minutesnooze.com