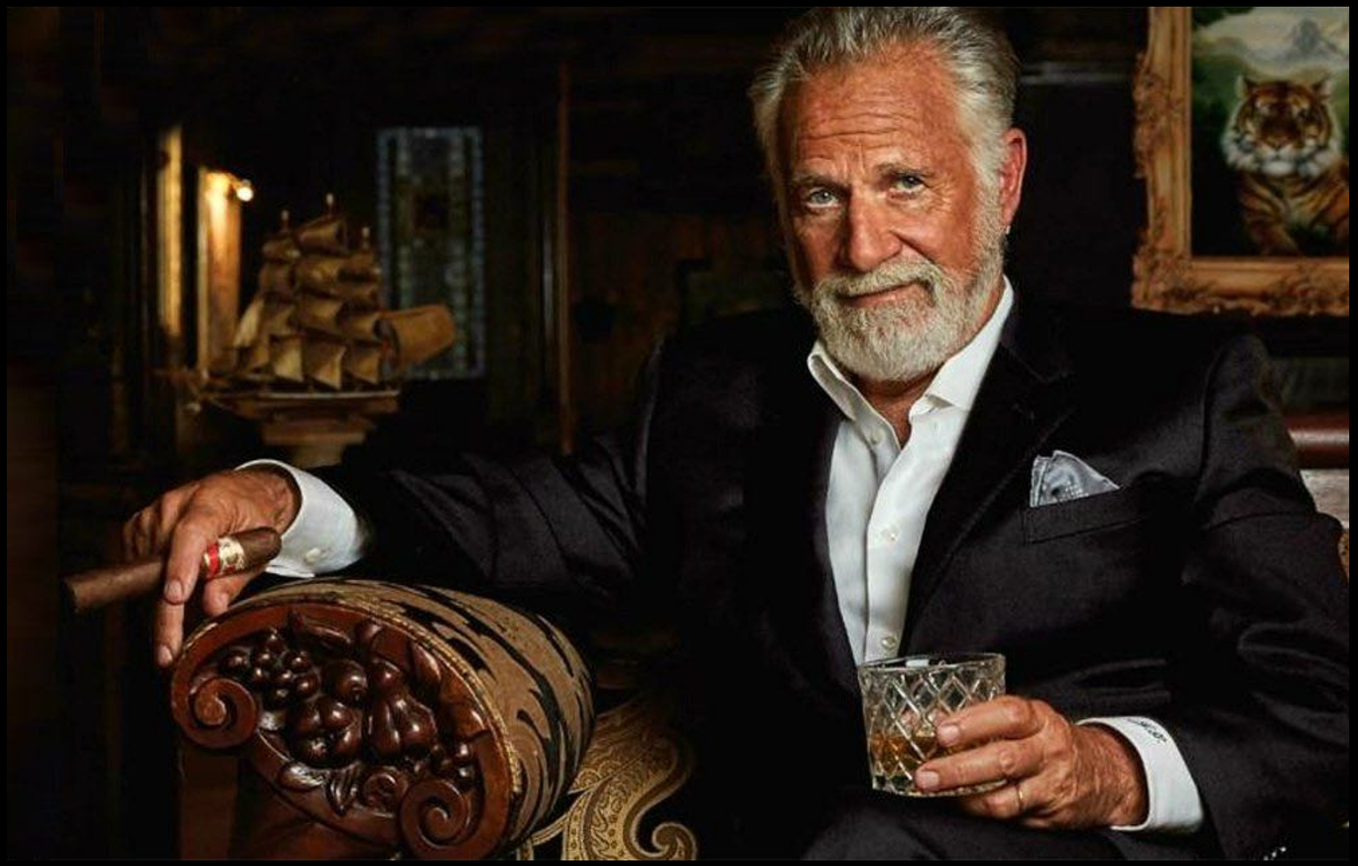
DEPLOYMENTS!

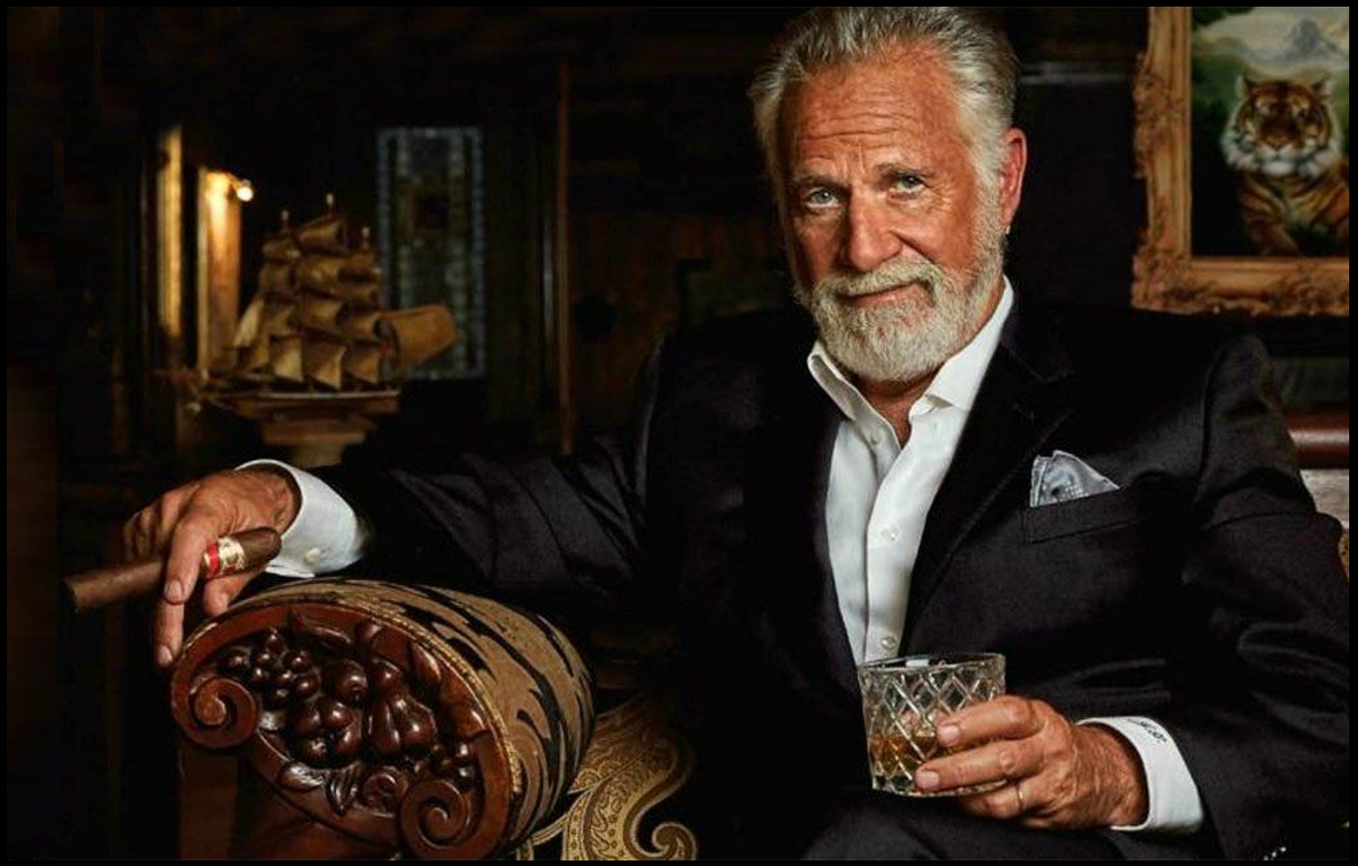
WHAT COULD POSSIBLY GO WRONG?

A LOT!

DUH.



When I _____ … I do it in production.



When I **deploy to prod**… I do it in production.

CANARY DEPLOYS

WITH KUBERNETES AND ISTIO

JASON YEE

Technical evangelist
Nomad & Travel Hacker
Whiskey Hunter
Pokemon Trainer

Tw: @gitbisect
Em: jyee@datadoghq.com

DATADOG

TW: @datadoghq
SaaS-based monitoring, tracing & logging

Trillions of points/day

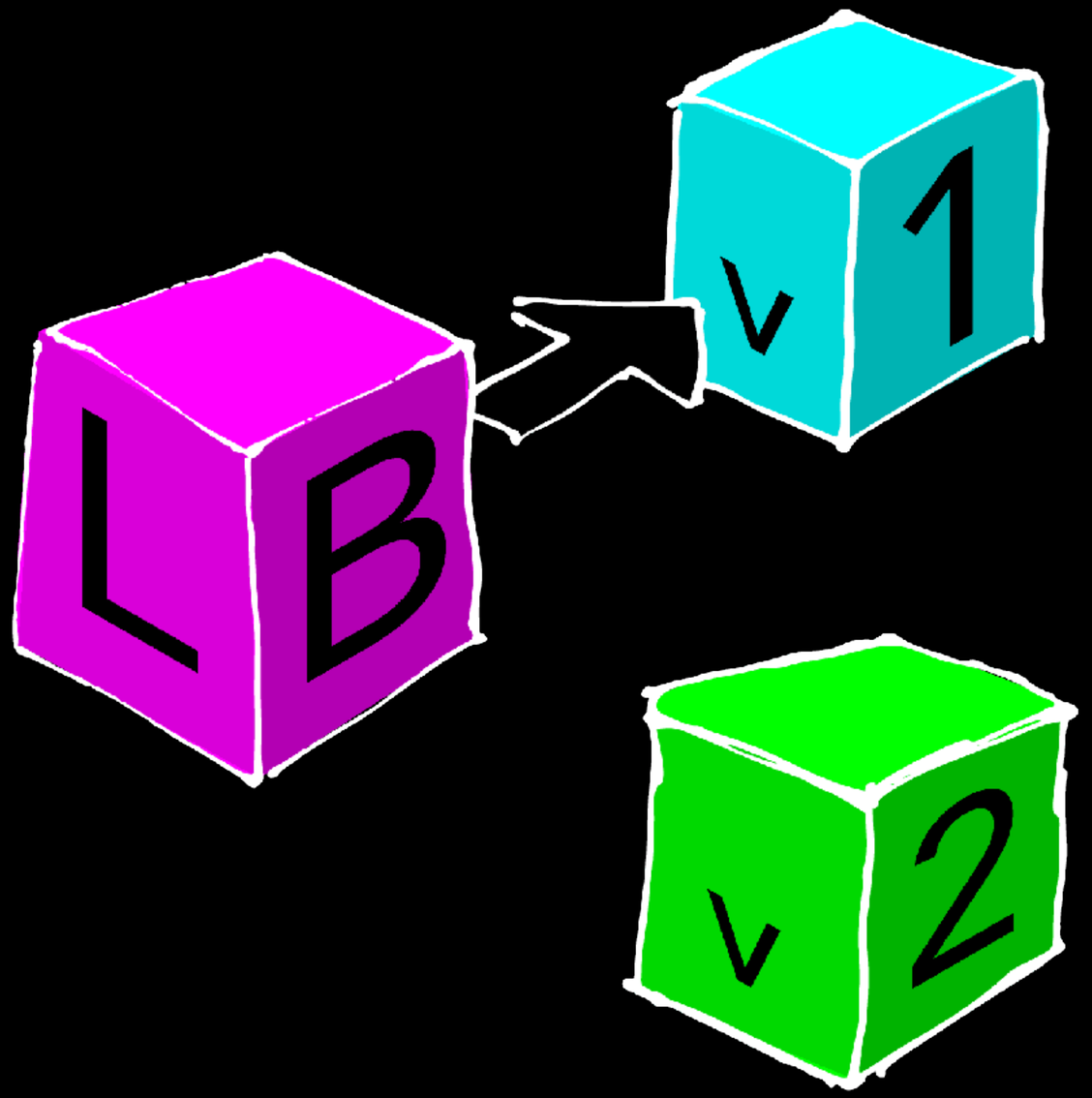
We're hiring:
jobs.datadoghq.com

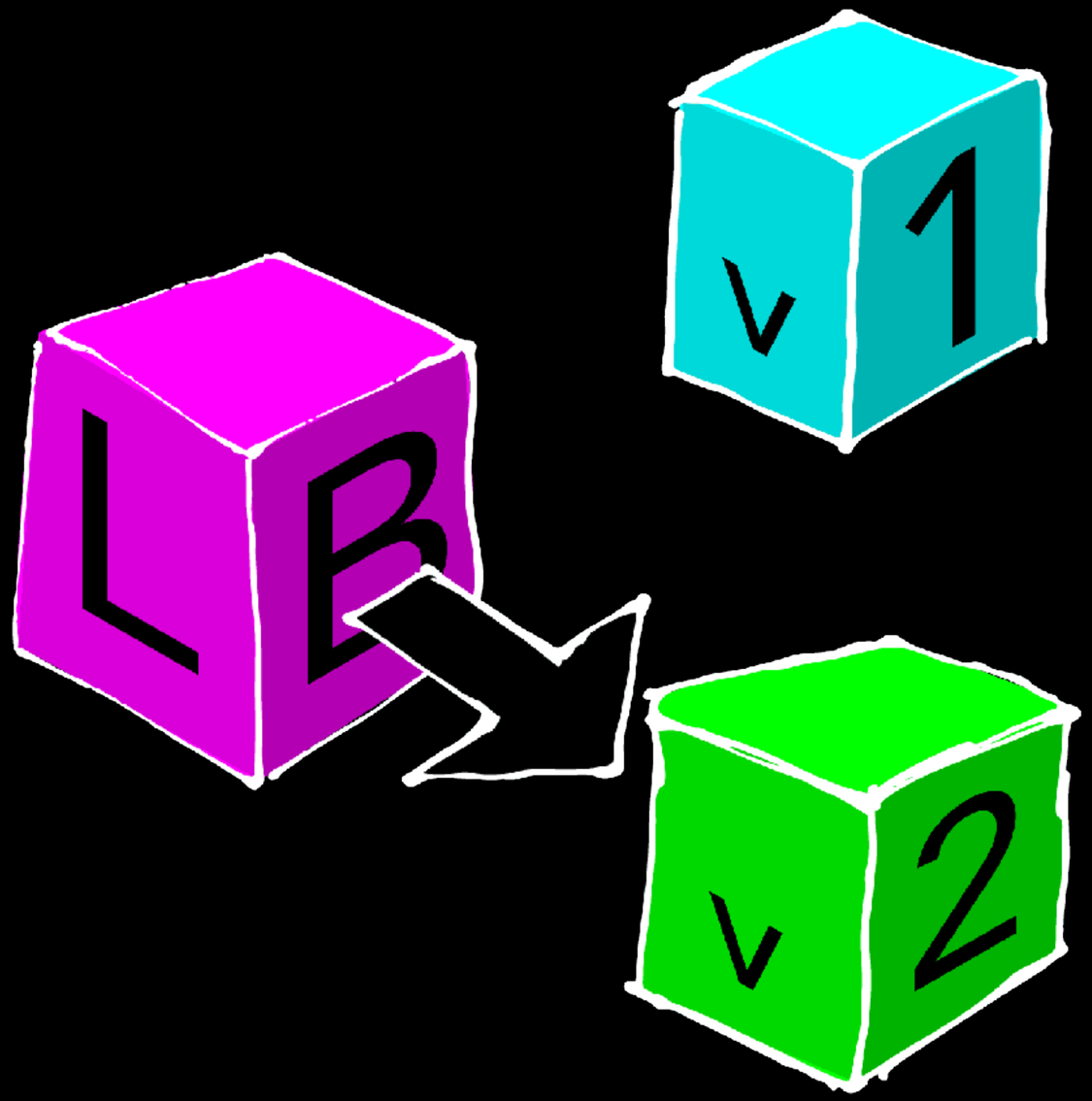
Caveat: We don't run Kubernetes in prod... yet.

"ISTIO IS A VERY EARLY PROJECT. DON'T RUN OUT OF HERE AND DEPLOY IT IN PRODUCTION; YOU'LL BE ON THE NEWS."

- KELSEY HIGHTOWER (FEB 22, 2018)

BLUE-GREEN DEPLOYMENTS


LB
v1
v2


LB
v1
v2

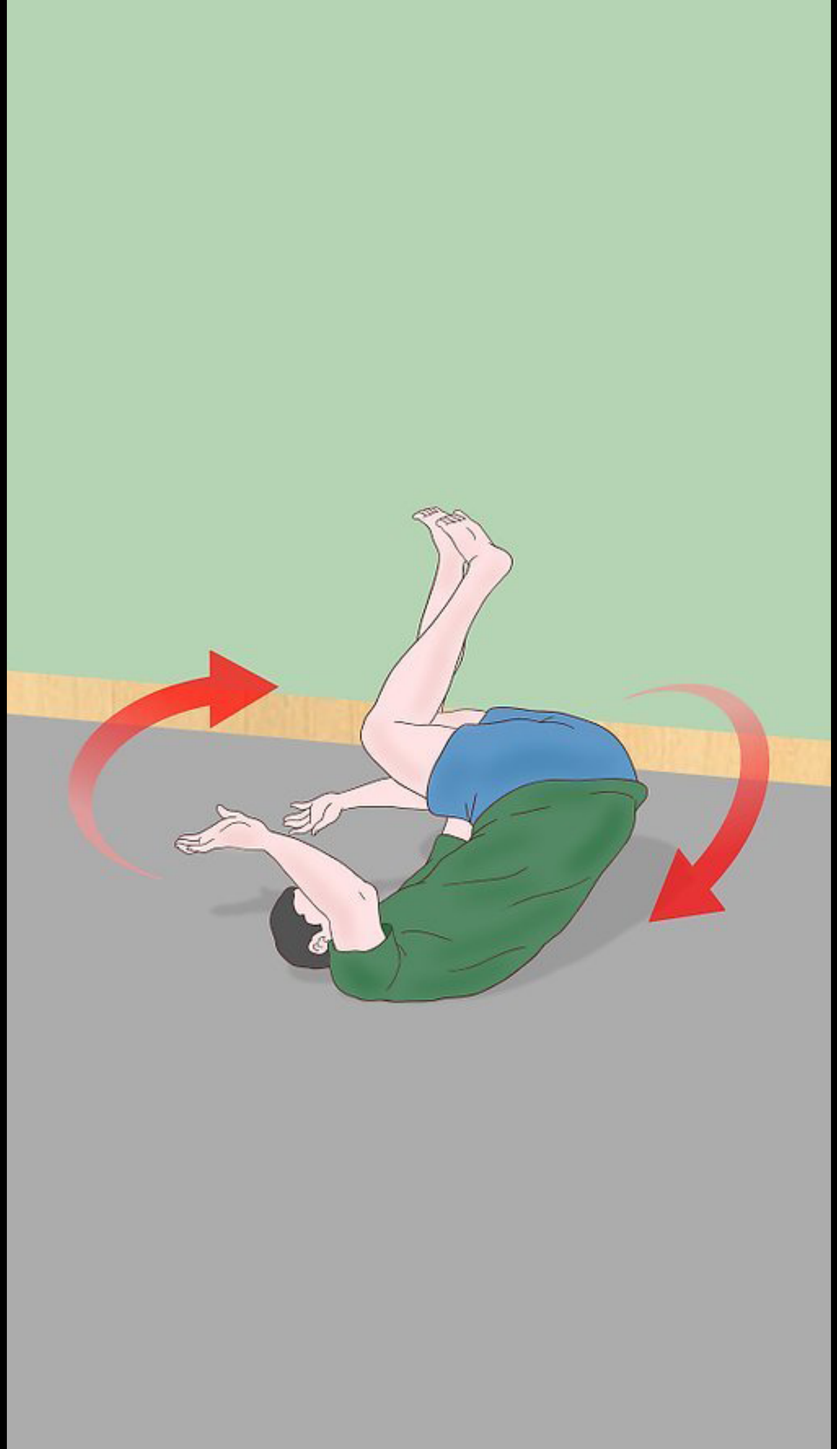
BLUE-GREEN DEPLOYMENTS

- Pros:
  - Zero-downtime deploys
  - Easy rollbacks

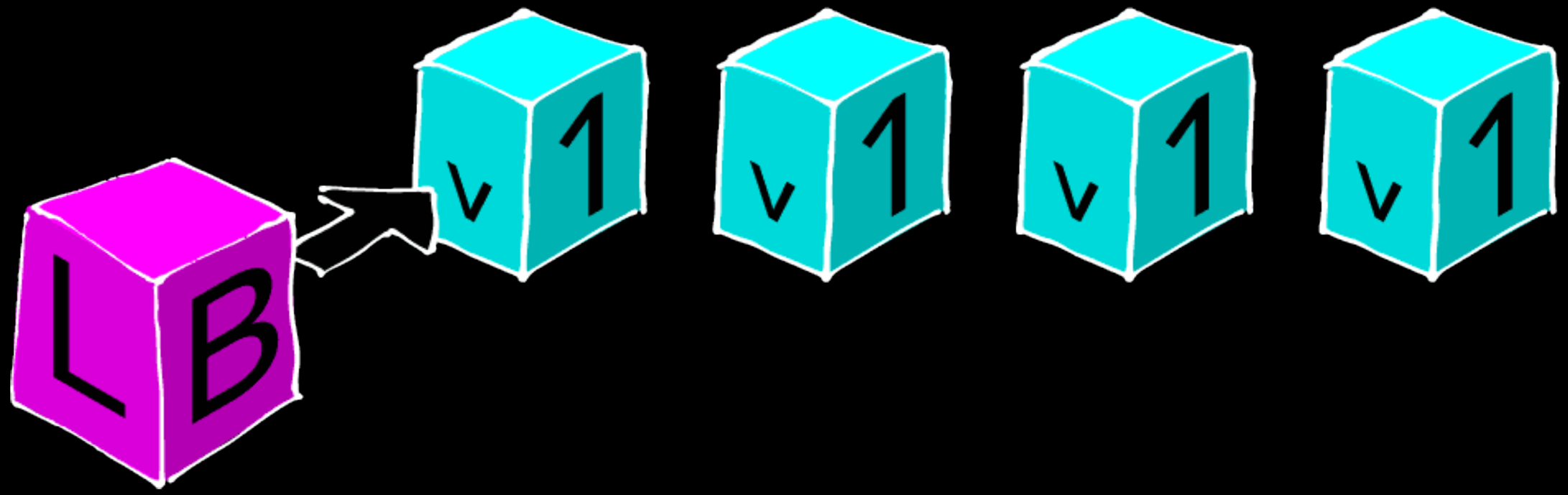
CTRL+Z

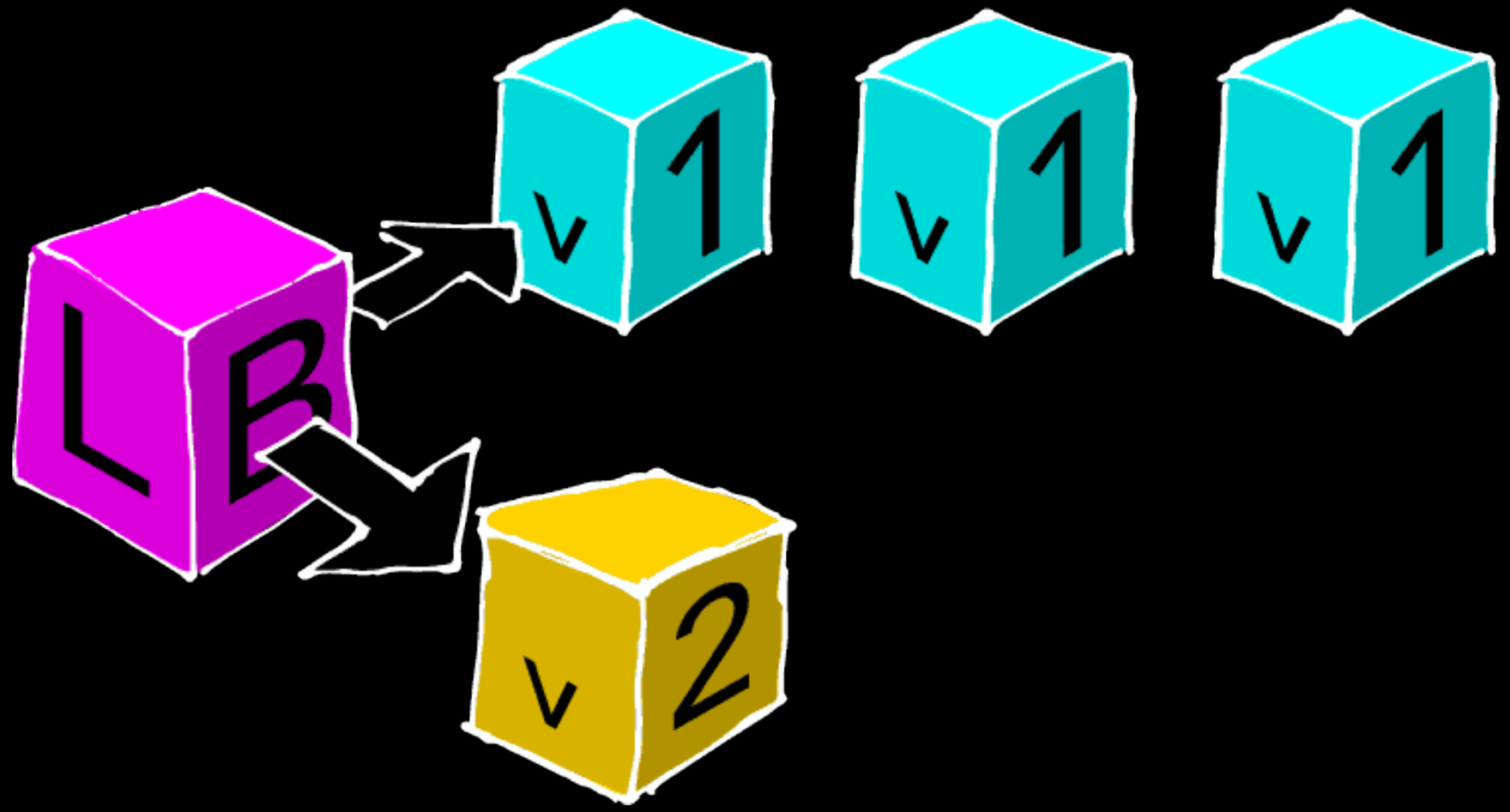
BLUE-GREEN DEPLOYMENTS

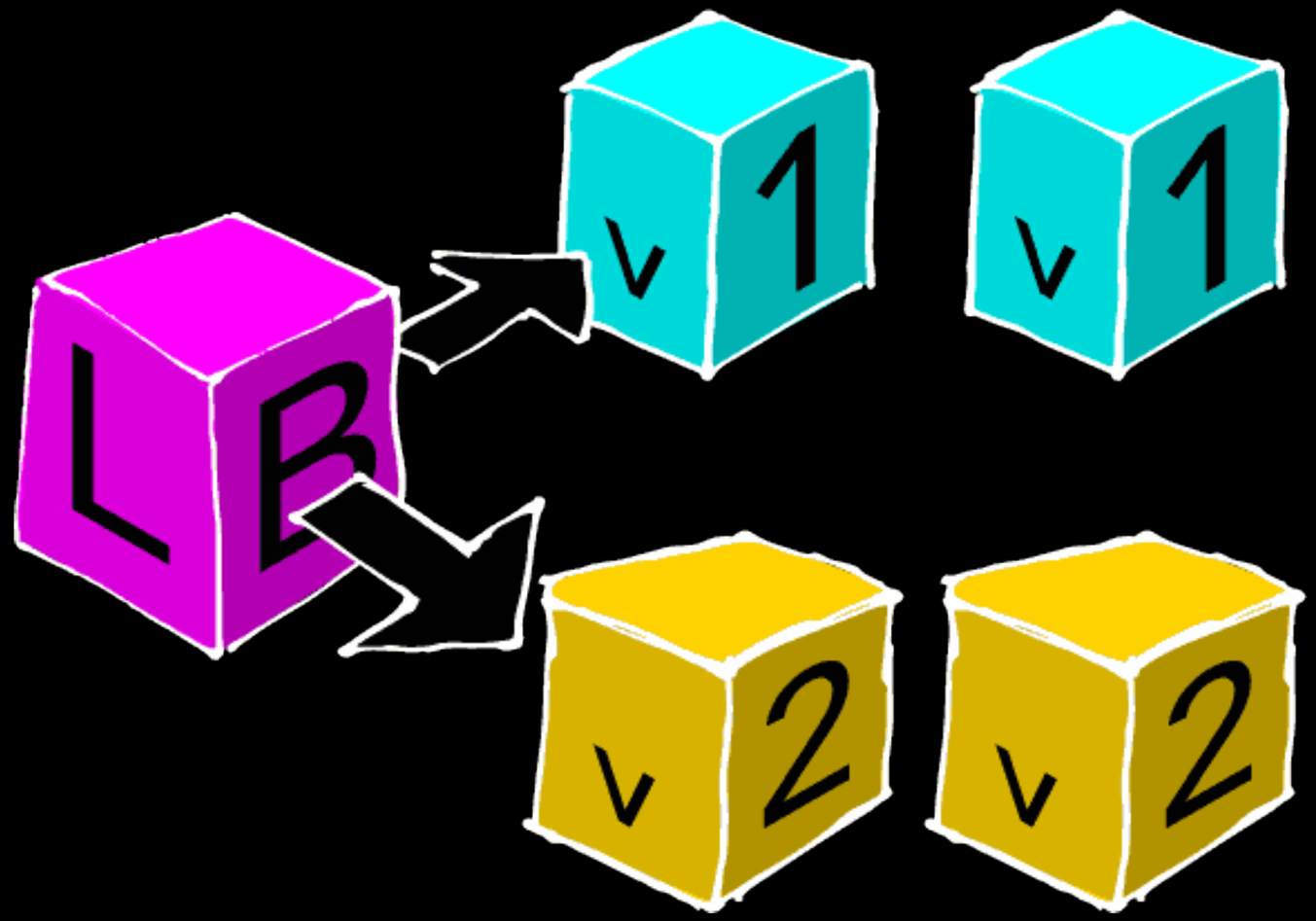
- Cons:
  - ✌️Easy✌️ rollbacks… 🤞😬

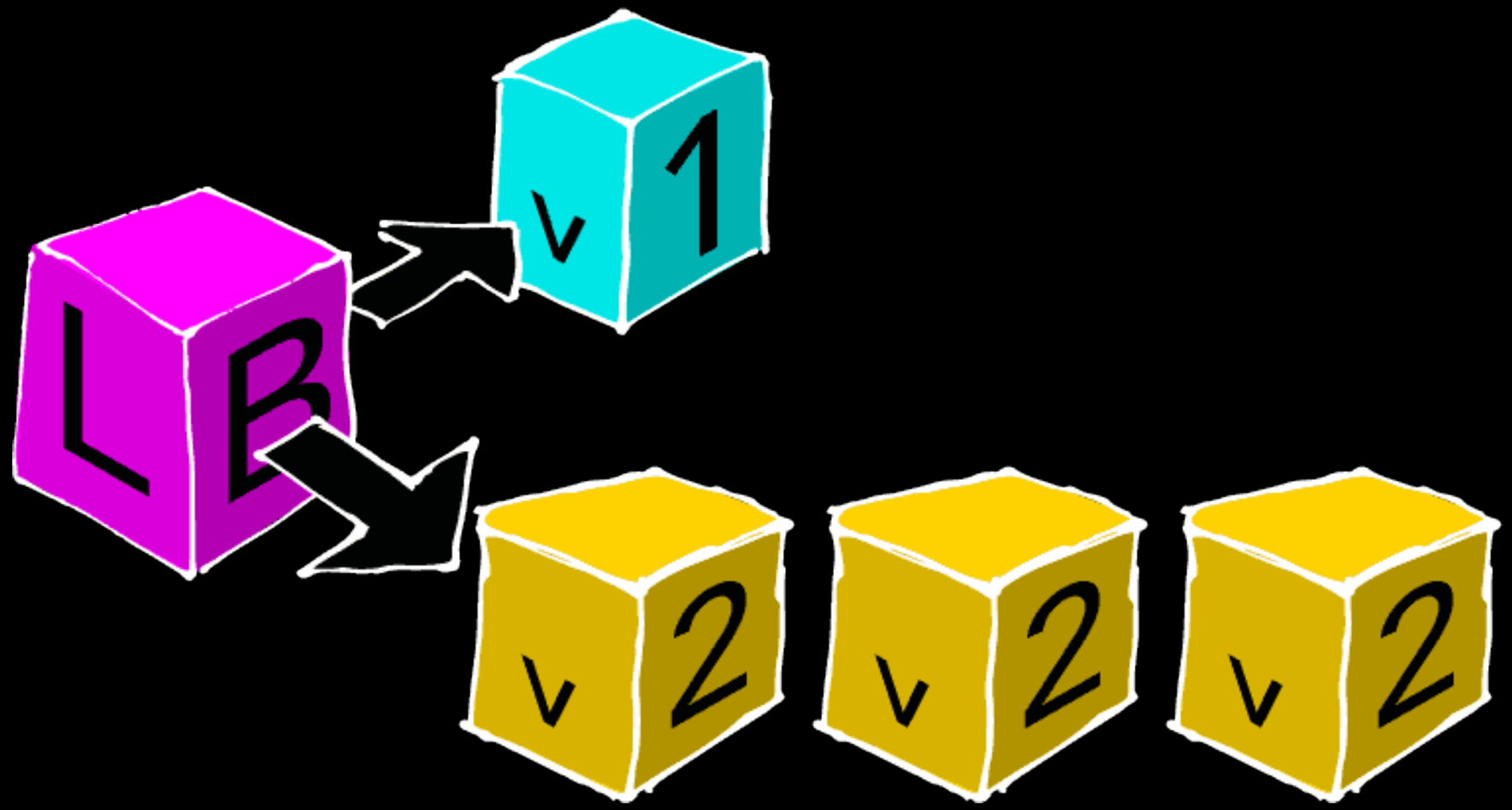


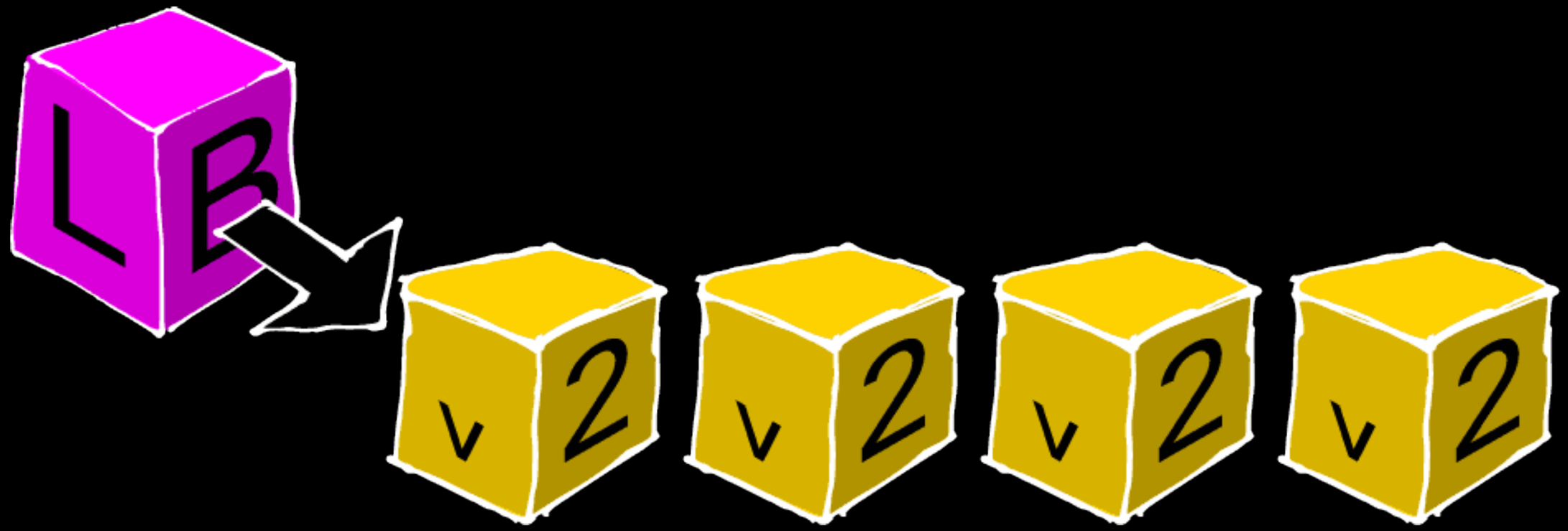
ROLLING DEPLOYMENTS

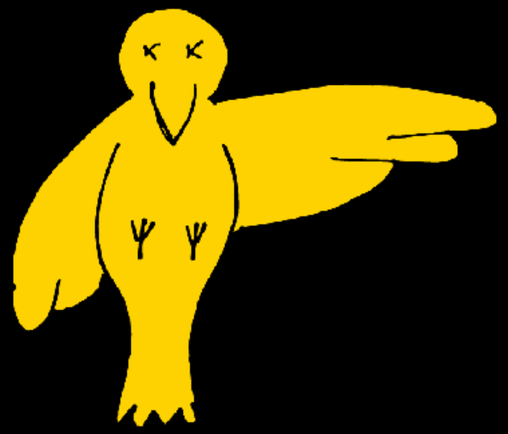

LB
v 1
v 1
v 1
v 1


LB
v 1
v 1
v 1
v 2


LB
v1
v1
v2
v2

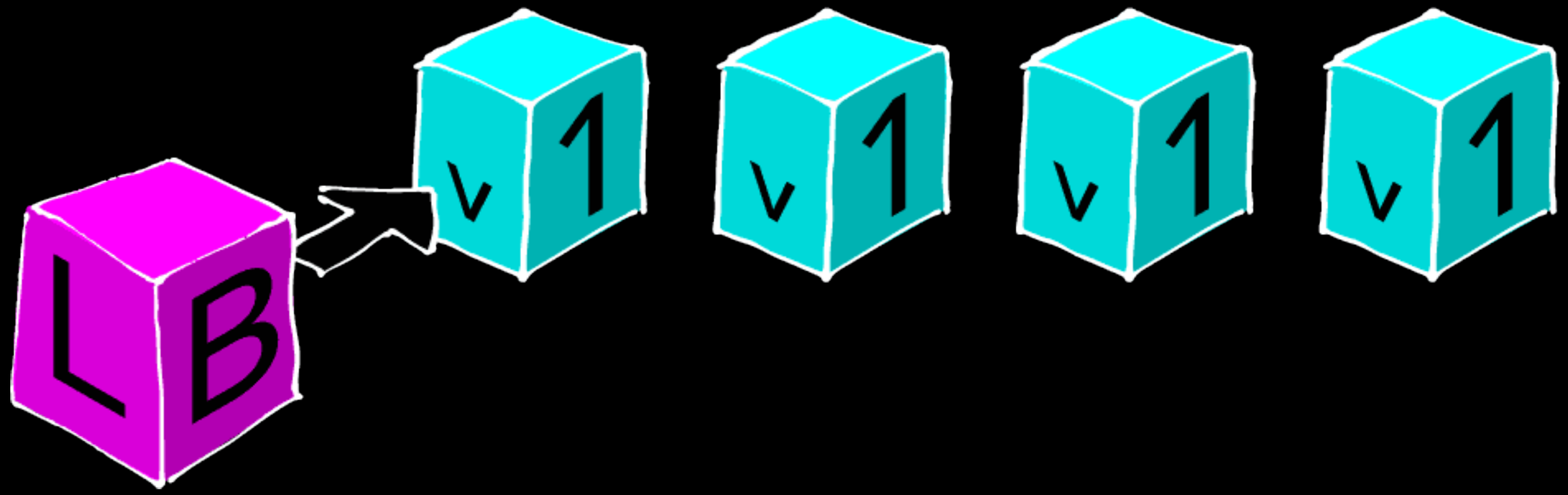

LB
v1
v2
v2
v2

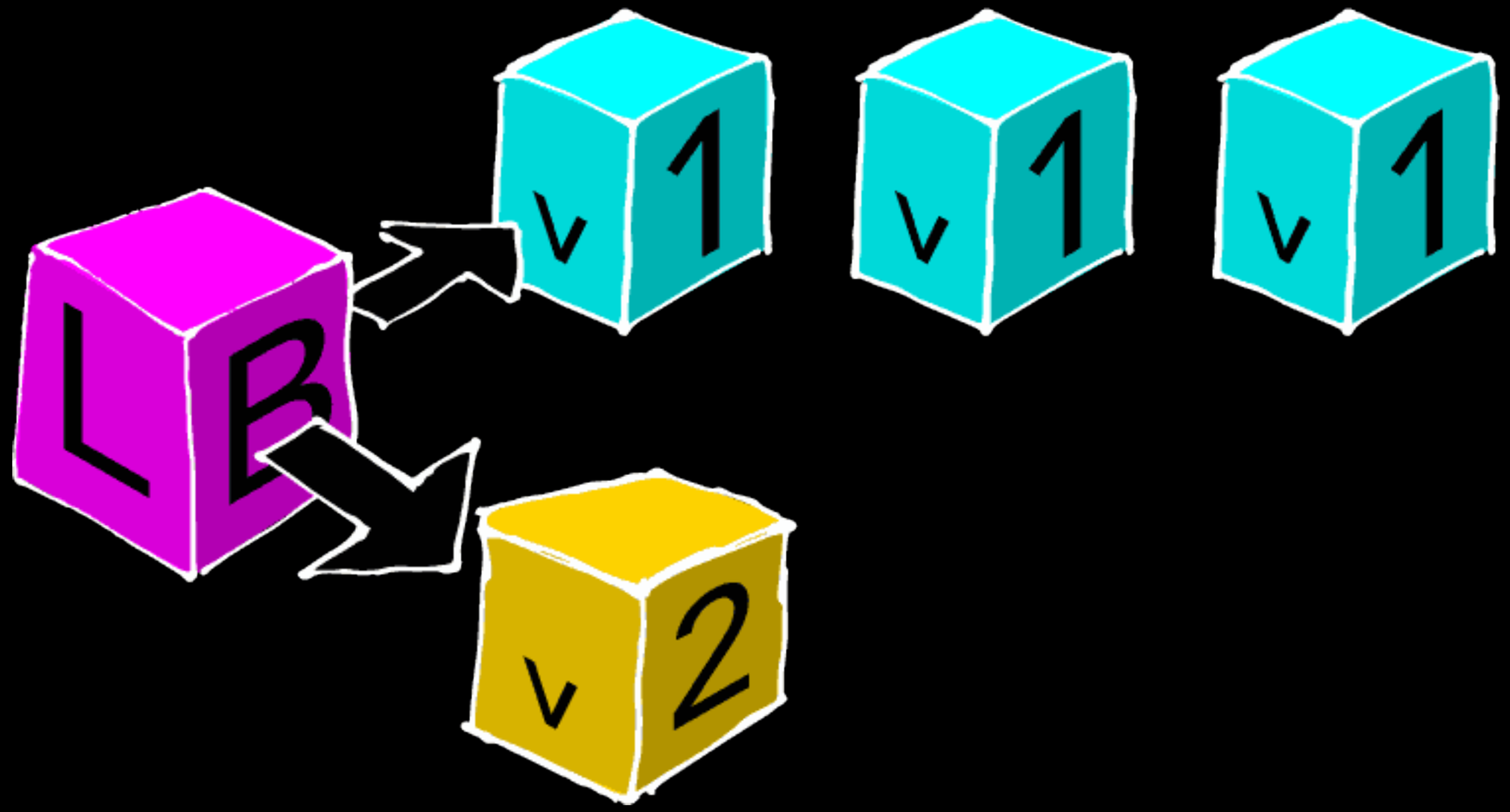

LB
v2
v2
v2
v2



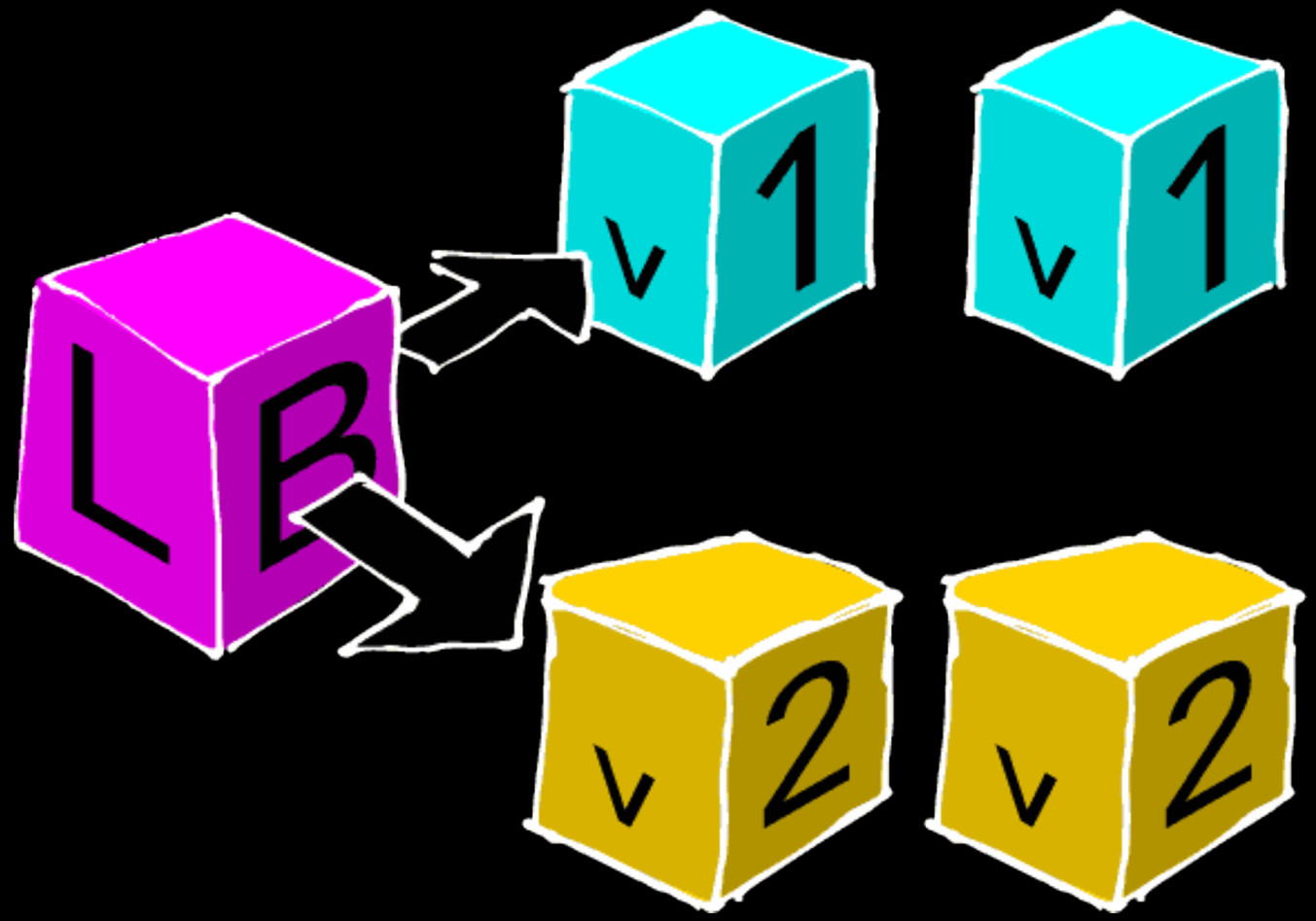
CANARY DEPLOYMENTS

or

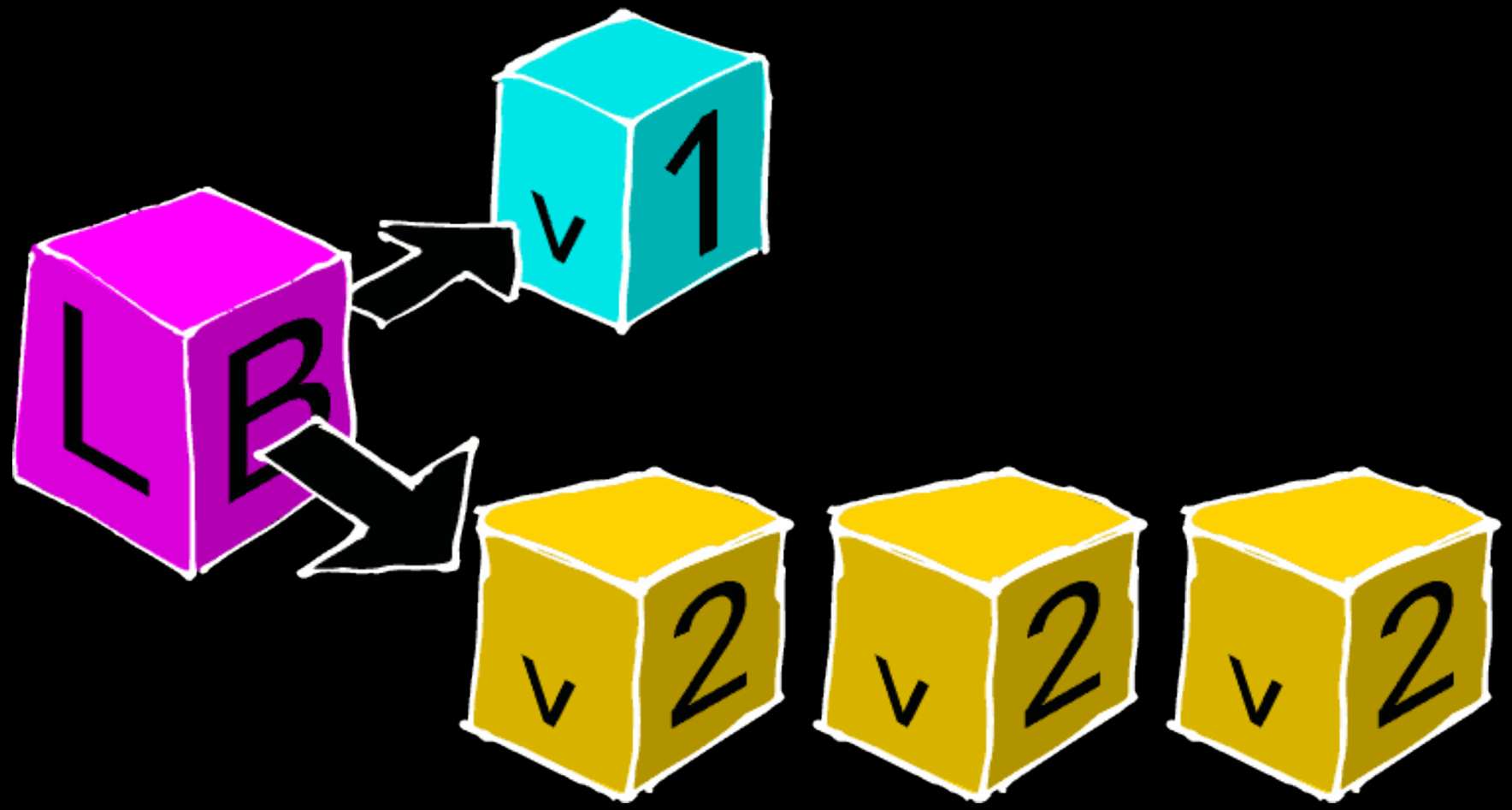

LB
v 1
v 1
v 1
v 1


LB
v 1
v 1
v 1
v 2

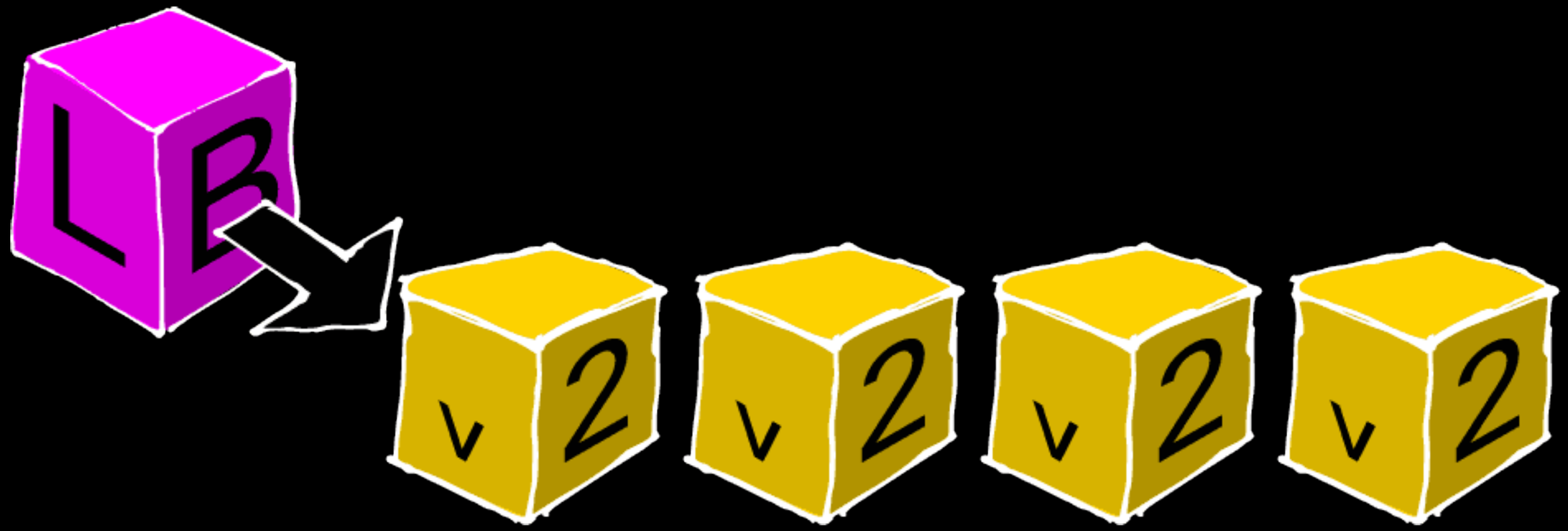
PAUSE. MONITOR.

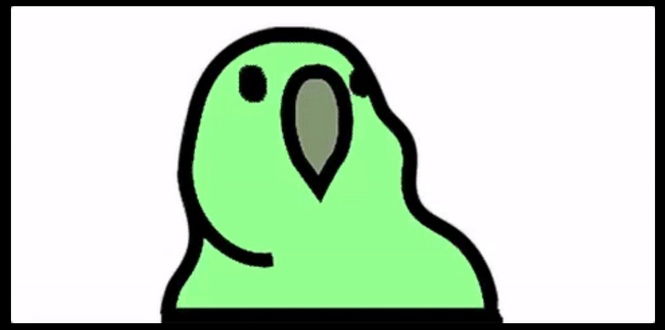

LB
v1
v1
v2
v2

DOUBLE CHECK.


LB
v1
v2
v2
v2

MAYBE ONE MORE TIME,
JUST TO BE CERTAIN.


LB
v2
v2
v2
v2



PARTY!

CANARY DEPLOYMENTS

- **Small scope**

CANARY DEPLOYMENTS

- Small scope
- **Limited ramifications**

CANARY DEPLOYMENTS

- Small scope
- Limited ramifications
- **Easier rollbacks**

CANARY DEPLOYMENTS

- Small scope
- Limited ramifications
- Easier rollbacks
- **Load tolerant**

CANARY DEPLOYMENTS

- Small scope
- Limited ramifications
- Easier rollbacks
- Load tolerant
- **Concurrency**

WHAT DOES KUBERNETES HAVE TO DO WITH ANY OF THIS?

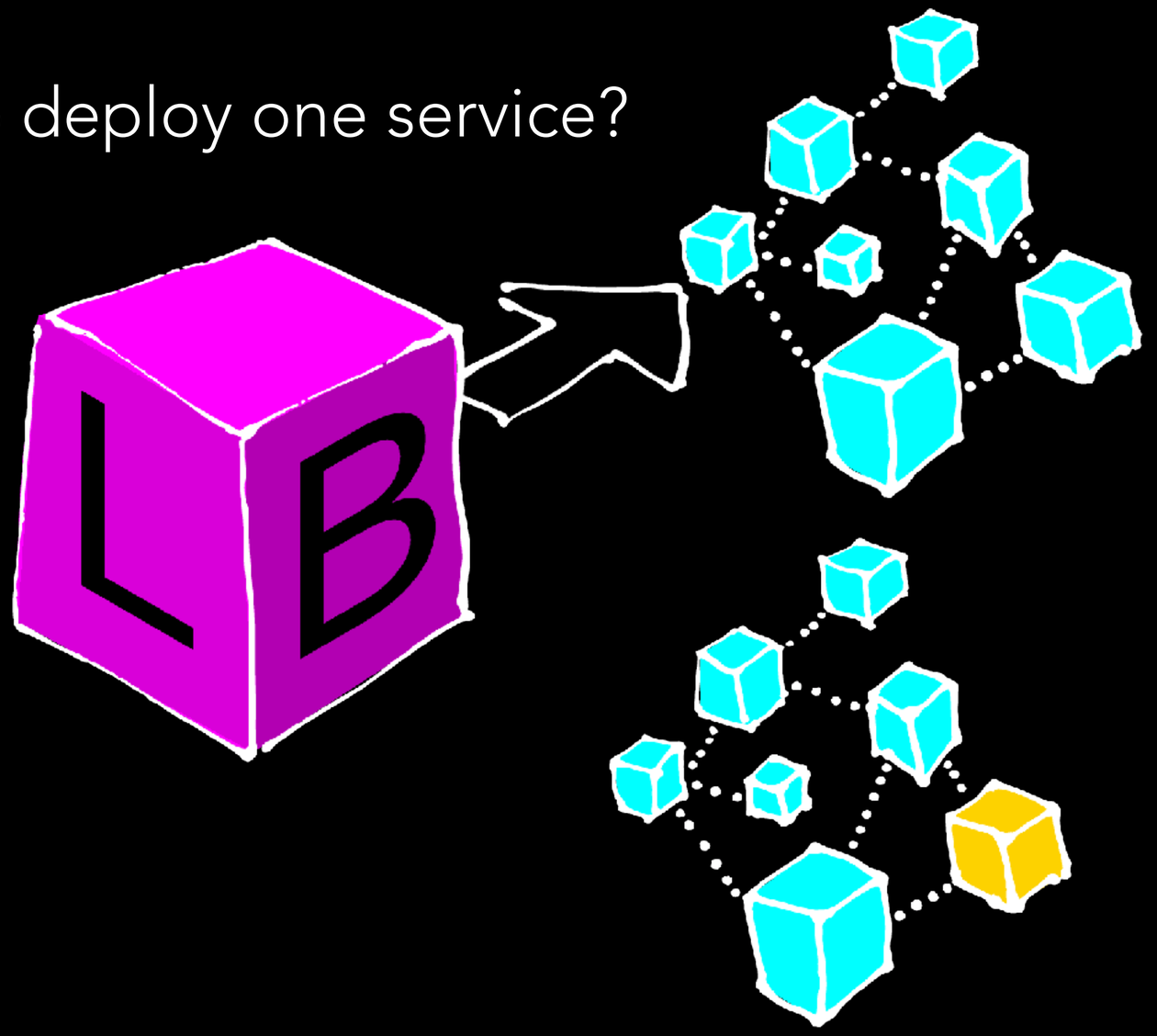
CONTAINER
ORCHESTRATOR

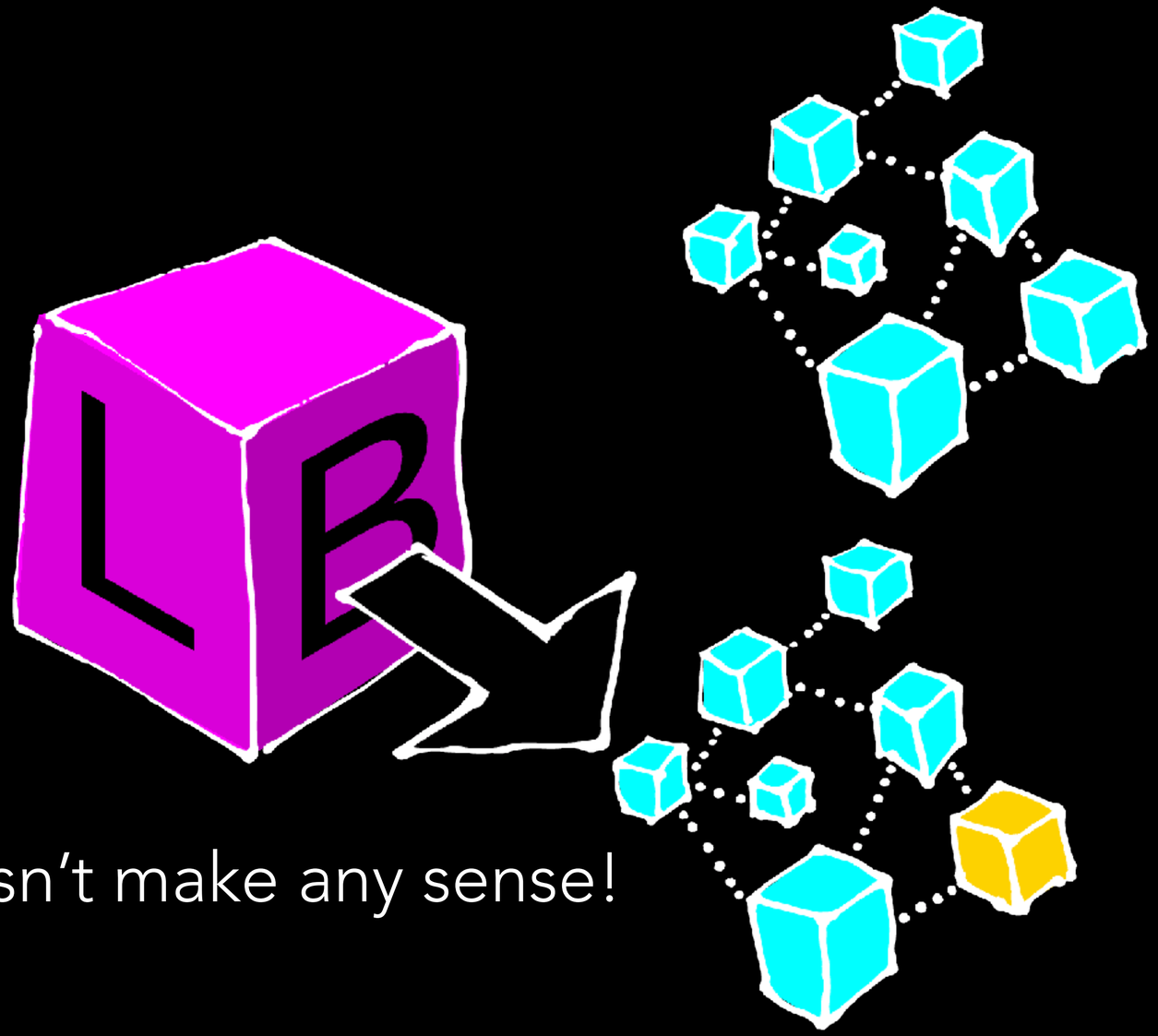
~~CONTAINER~~ **SERVICE**

ORCHESTRATOR

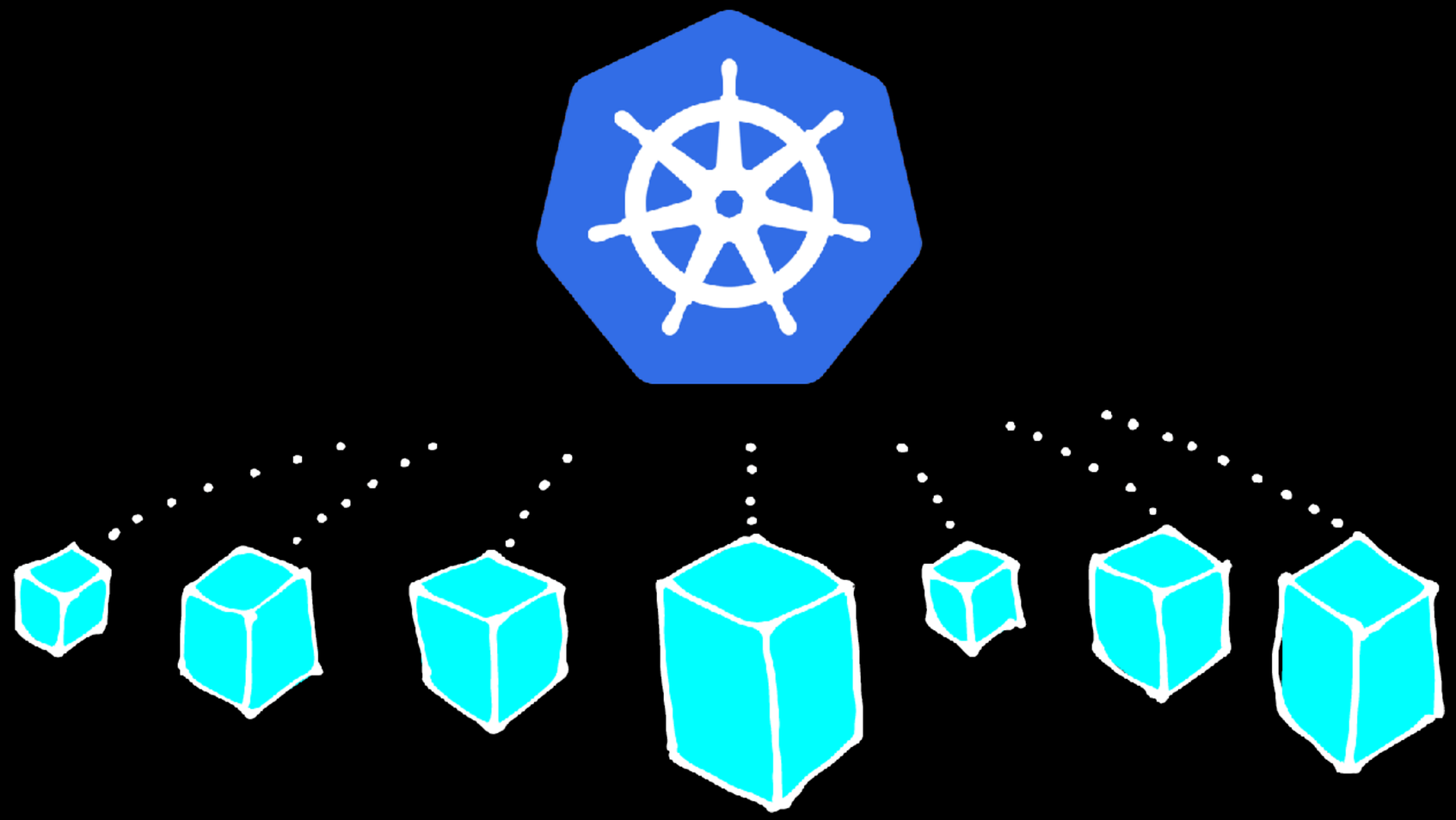
p.s. - Maybe a Squirtle orchestrator? Talk to me later if you want a sticker.

So what if we want to deploy one service?

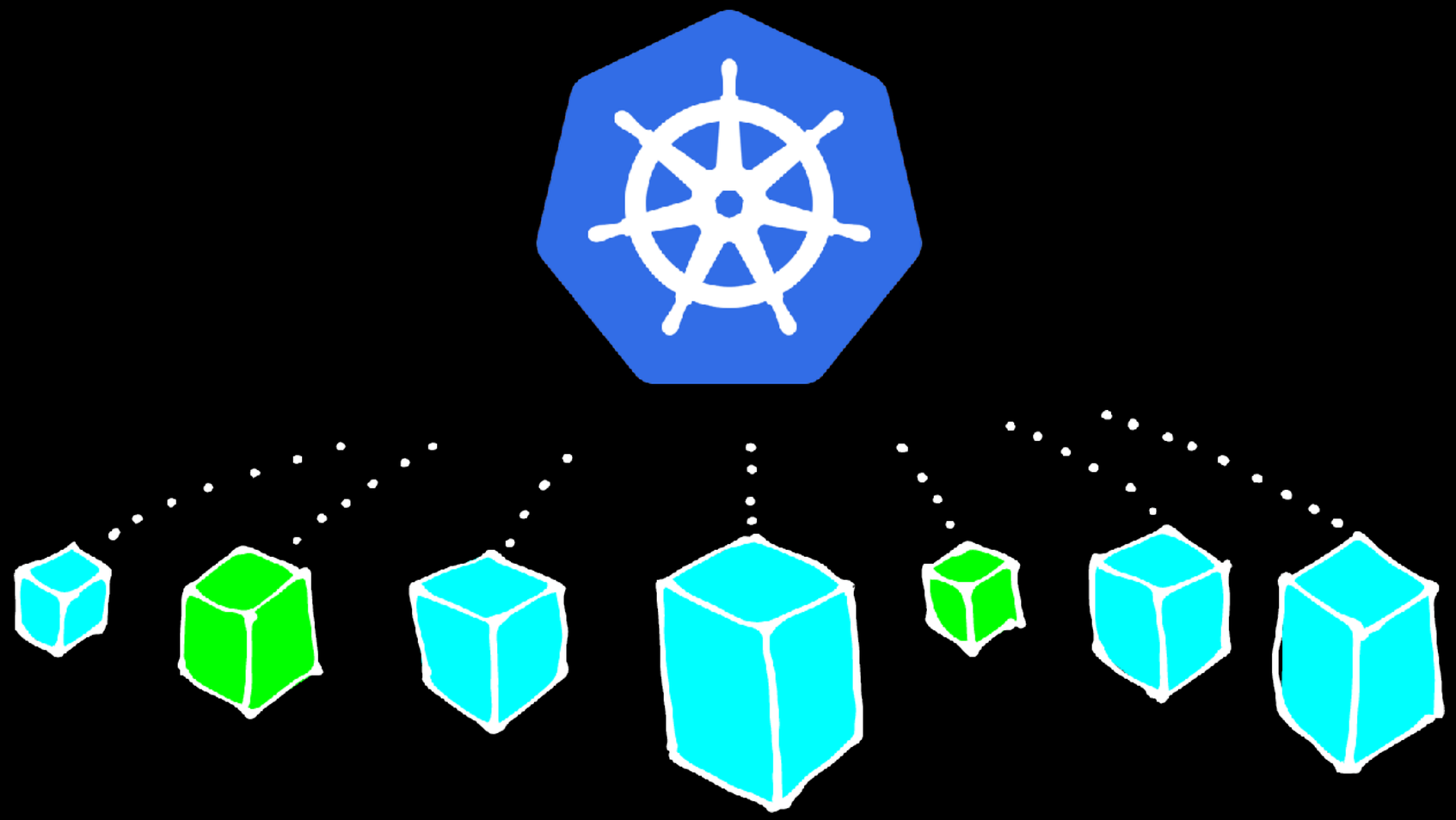




Blue-green doesn’t make any sense!

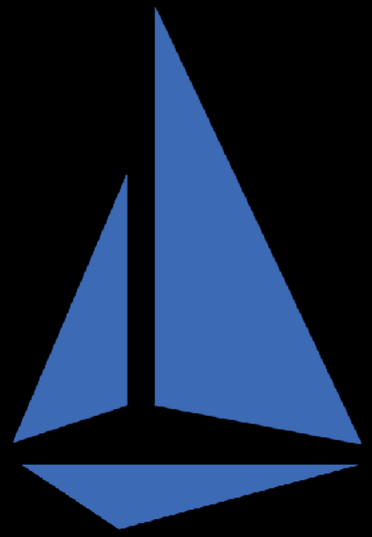


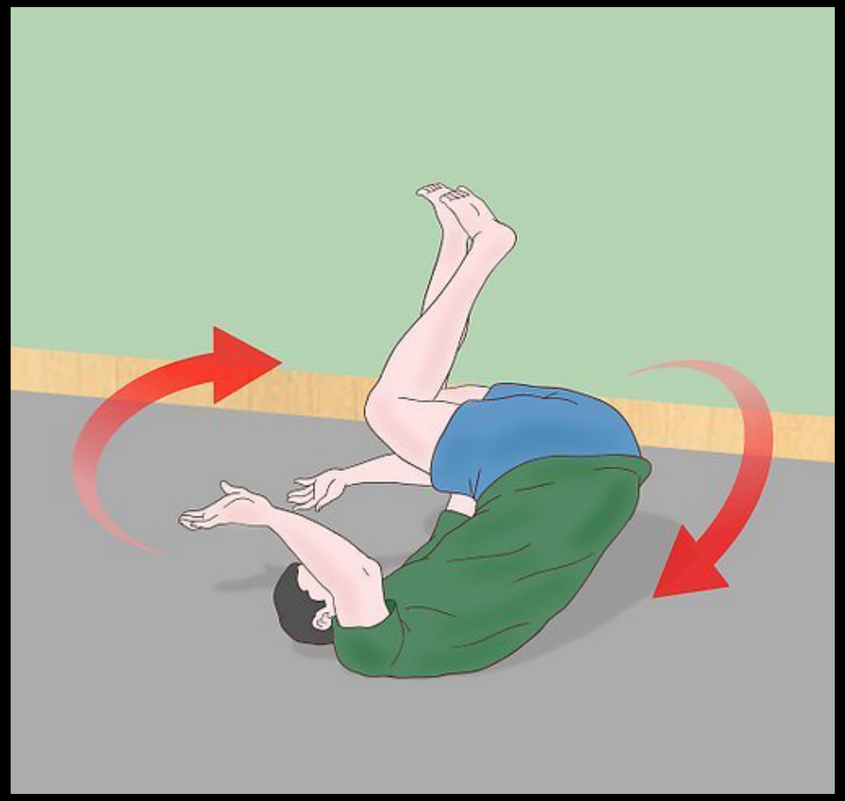
Kubernetes handles service deployments



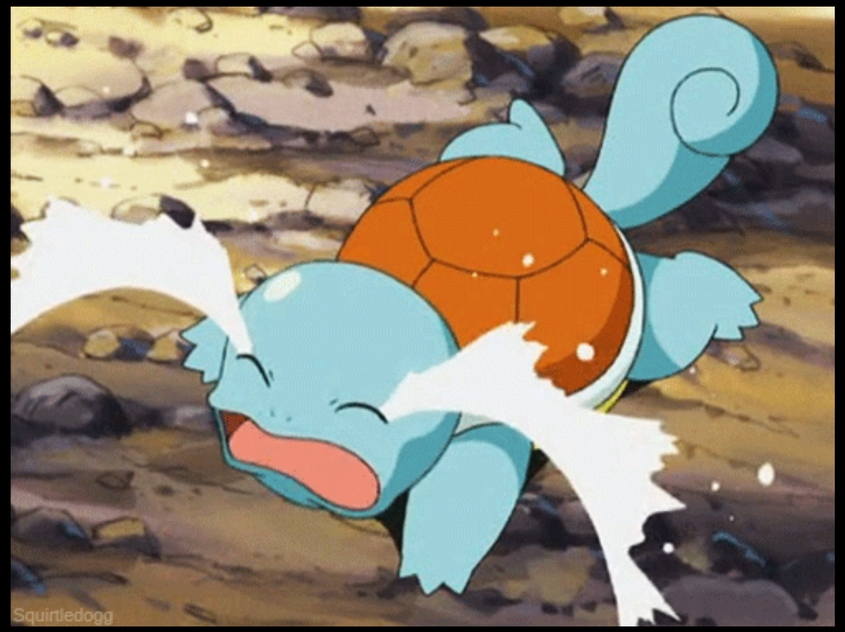
Kubernetes handles service deployments. YAY!

WHY DO I NEED A SERVICE MESH?





Kubernetes does rolling deploys really well!



Canary deploys,
not so much.

SERVICE MESHES

- **Routing & load balancing**

SERVICE MESHES

- Routing & load balancing
- **Service discovery**

SERVICE MESHES

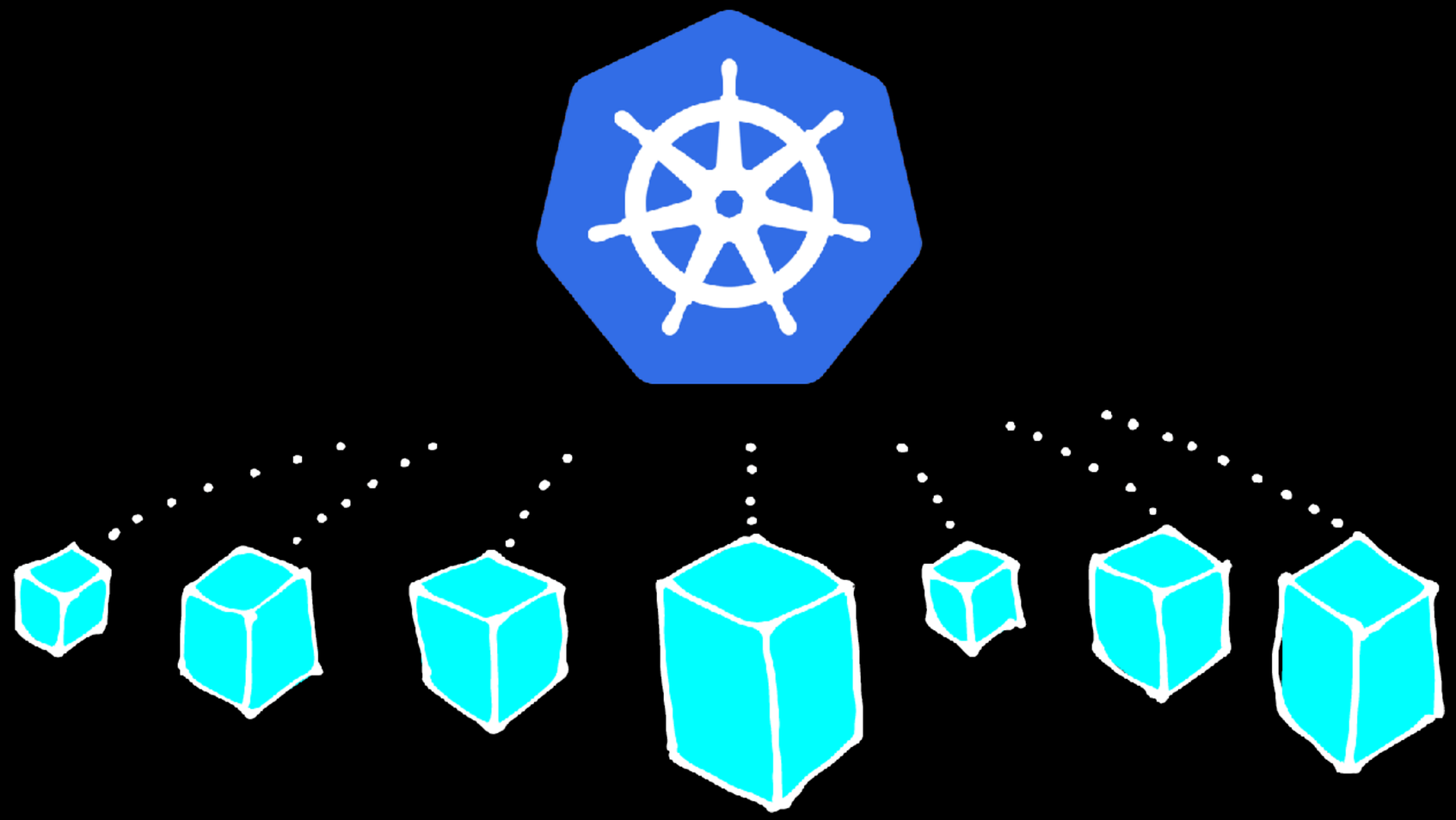
- Routing & load balancing
- Service discovery
- **Timeouts & retries**

SERVICE MESHES

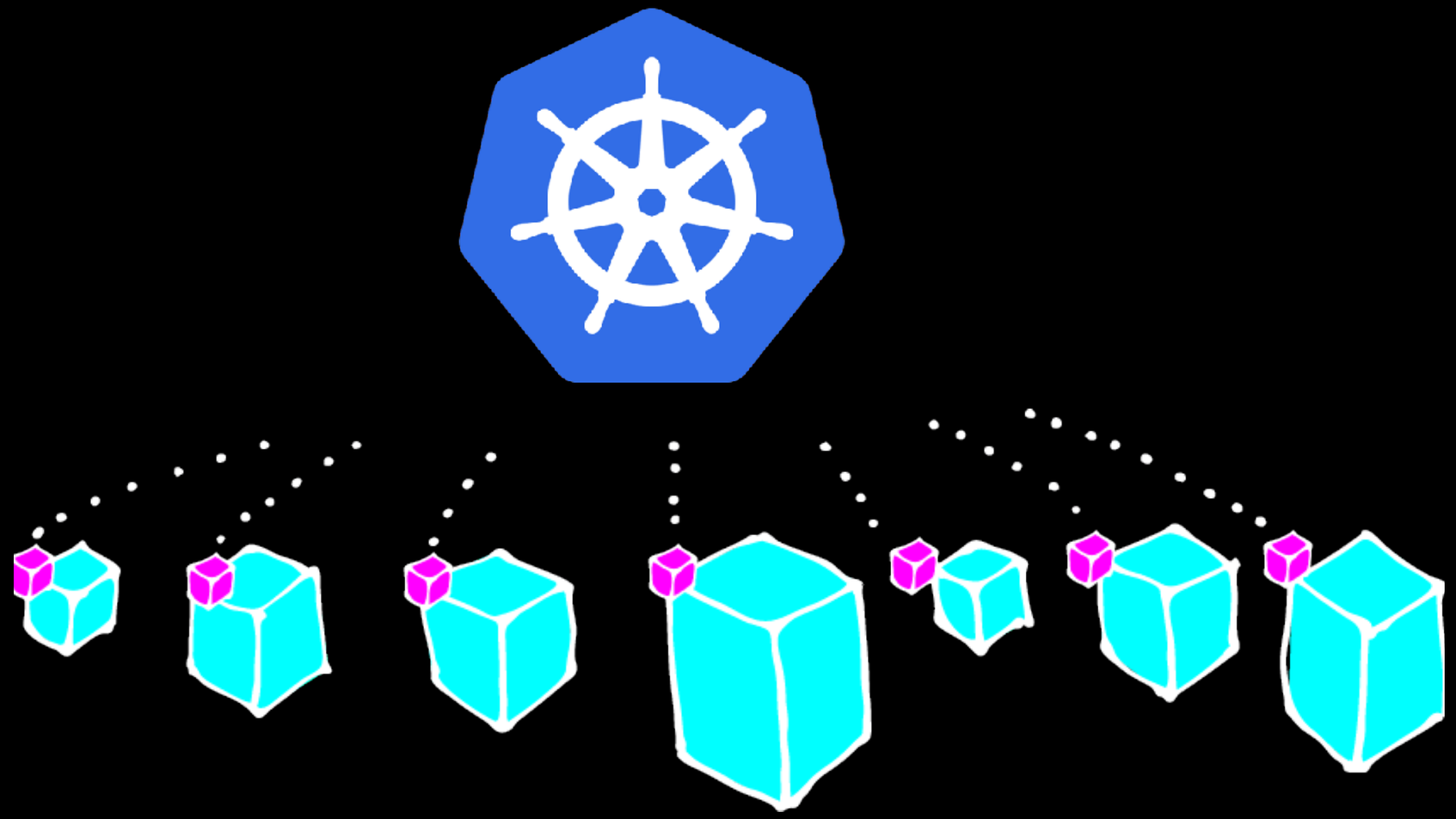
- Routing & load balancing
- Service discovery
- Timeouts & retries
- **Policy enforcement**

SERVICE MESHES

- Routing & load balancing
- Service discovery
- Timeouts & retries
- Policy enforcement
- **Monitoring & tracing**

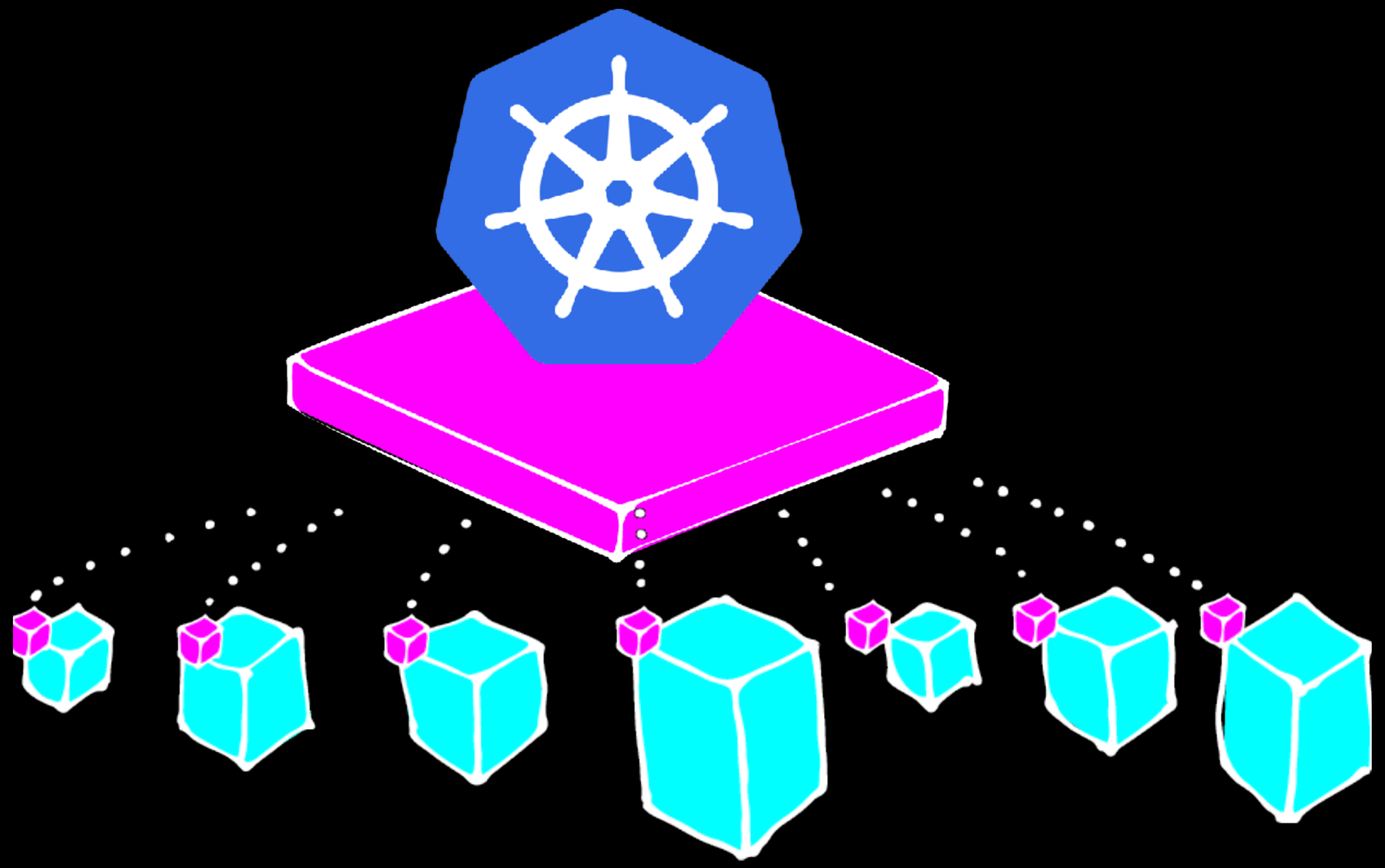


How does it work?

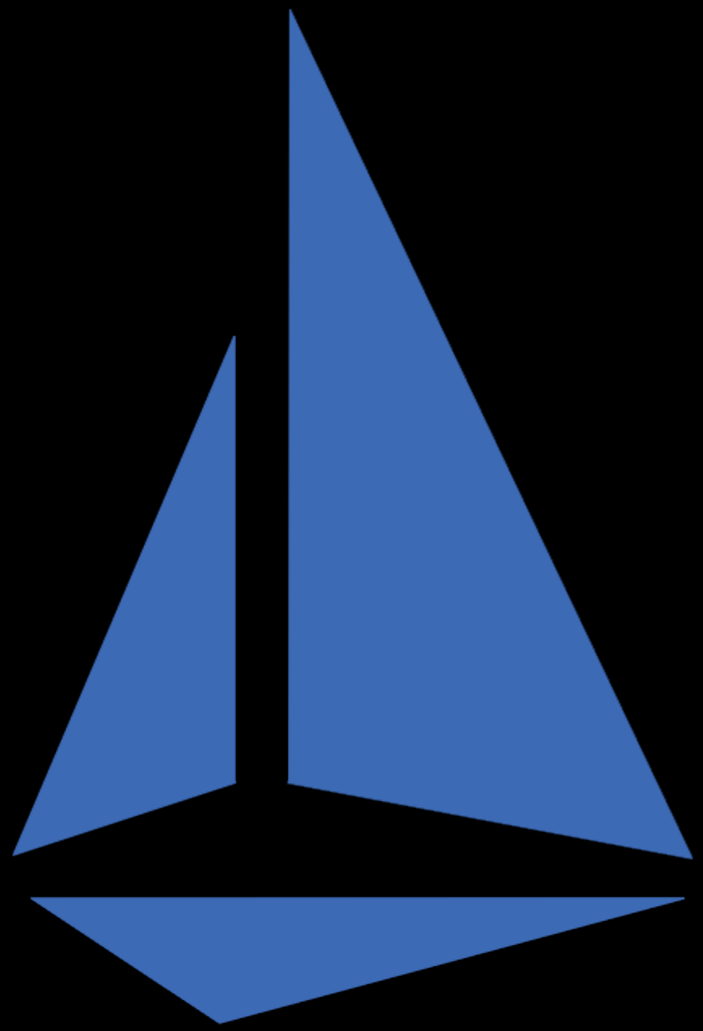


1. Add a data plane

envoy



2. Add a control plane



MIXER

- **Precondition checking**

MIXER

- Precondition checking
- **Quota management**

MIXER

- Precondition checking
- Quota management
- **Telemetry reporting**

ADAPTERS

Precondition checking

- Denier (just say no!)
- List (white/blacklist)
- OPA
- RBAC

ADAPTERS

Quota management

- Mem Quota
- Redis Quota

ADAPTERS

Telemetry reporting

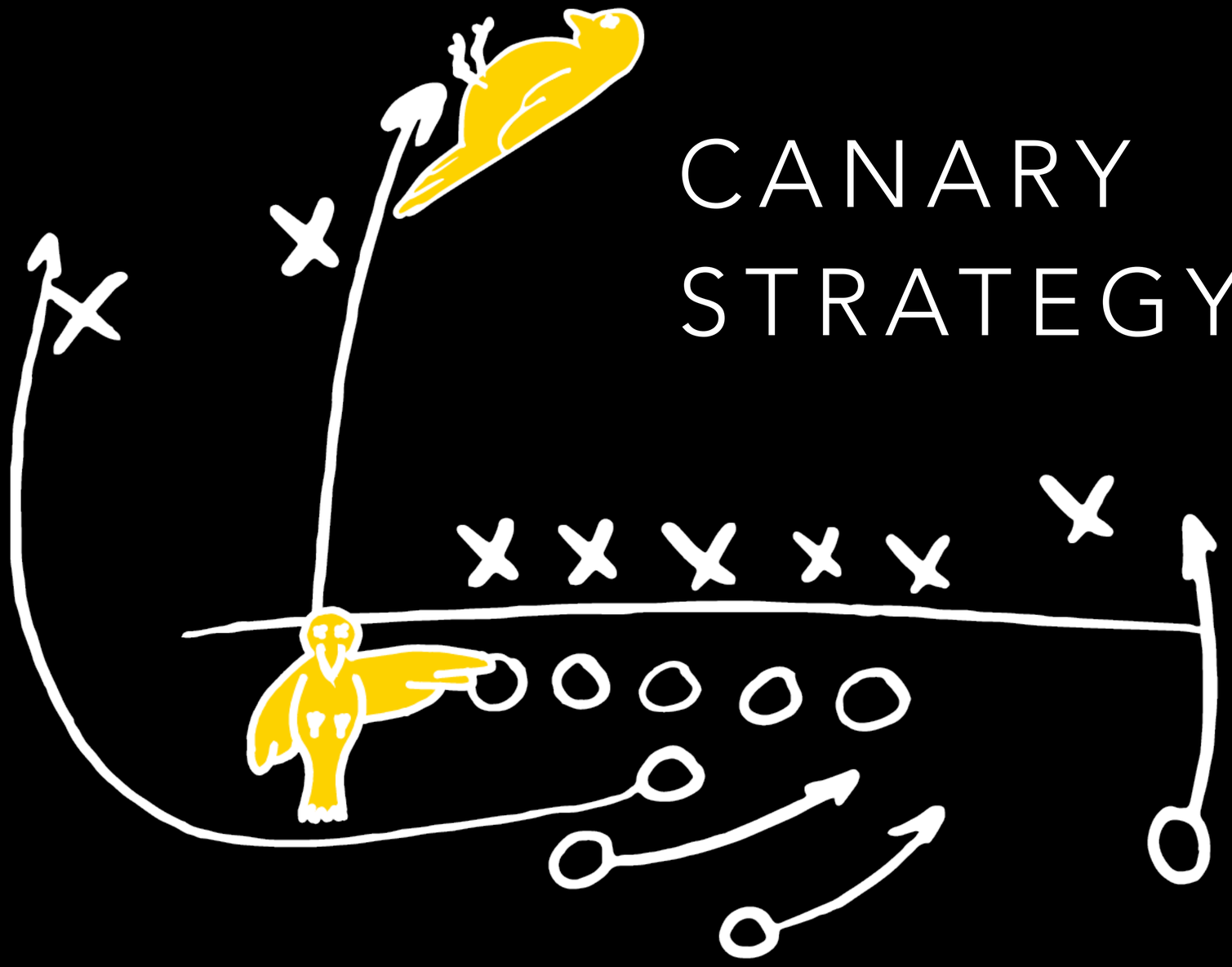
- Prometheus
- StatsD
- DogStatsD
- Many more

ADAPTERS

See them all at:

https://github.com/istio/istio/tree/master/mixer/adapter

CANARY STRATEGY



CANARY STRATEGY

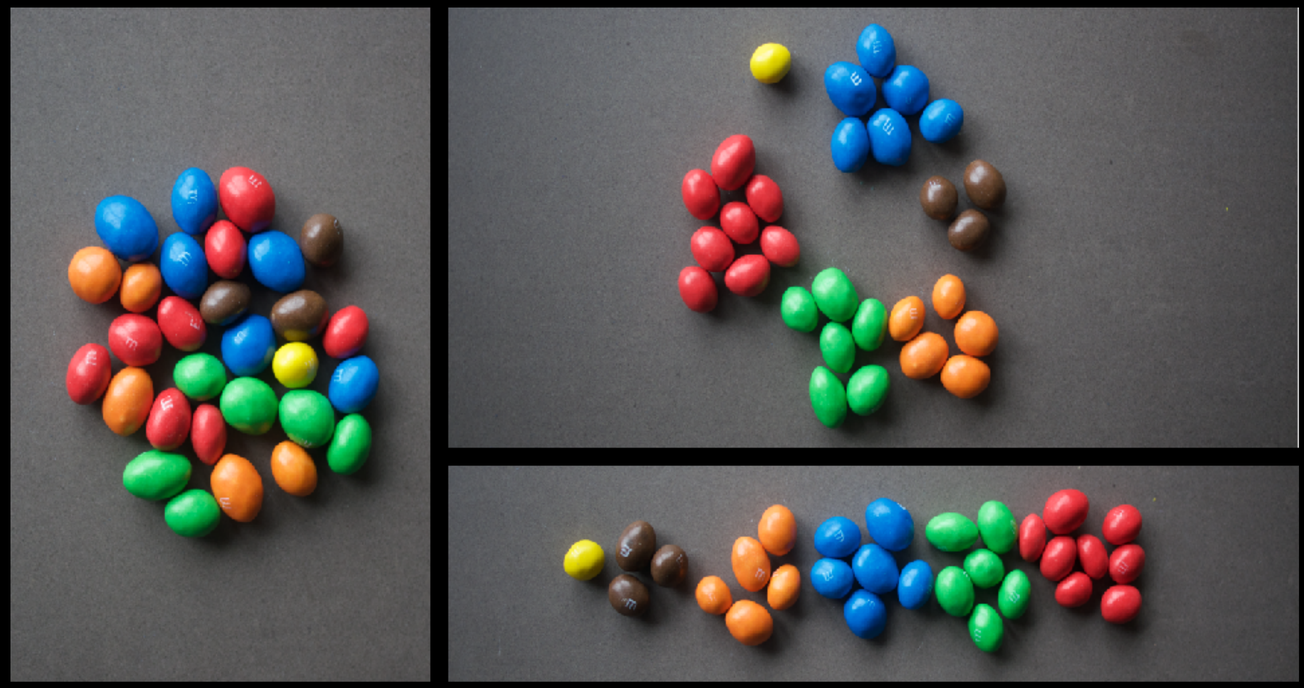
How do you choose your sample set?

- **Random**

CANARY STRATEGY

How do you choose your sample set?

- Random
- **Representative**



CANARY STRATEGY

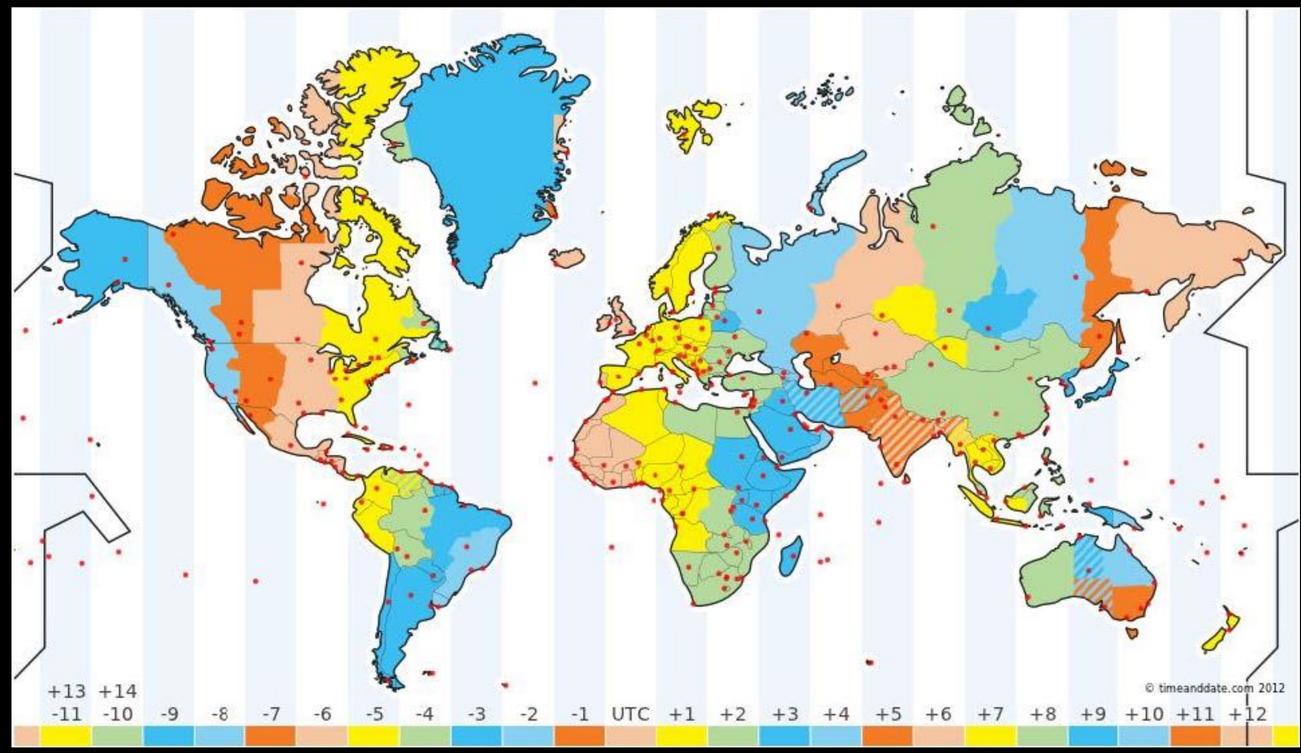
How do you choose your sample set?

- Random
- Representative
  - **Geography**

CANARY STRATEGY

How do you choose your sample set?

- Random
- Representative
  - Geography
  - **Time**



CANARY STRATEGY

How do you choose your sample set?

- Random
- Representative
  - Geography
  - Time
  - **Use patterns**

CANARY STRATEGY

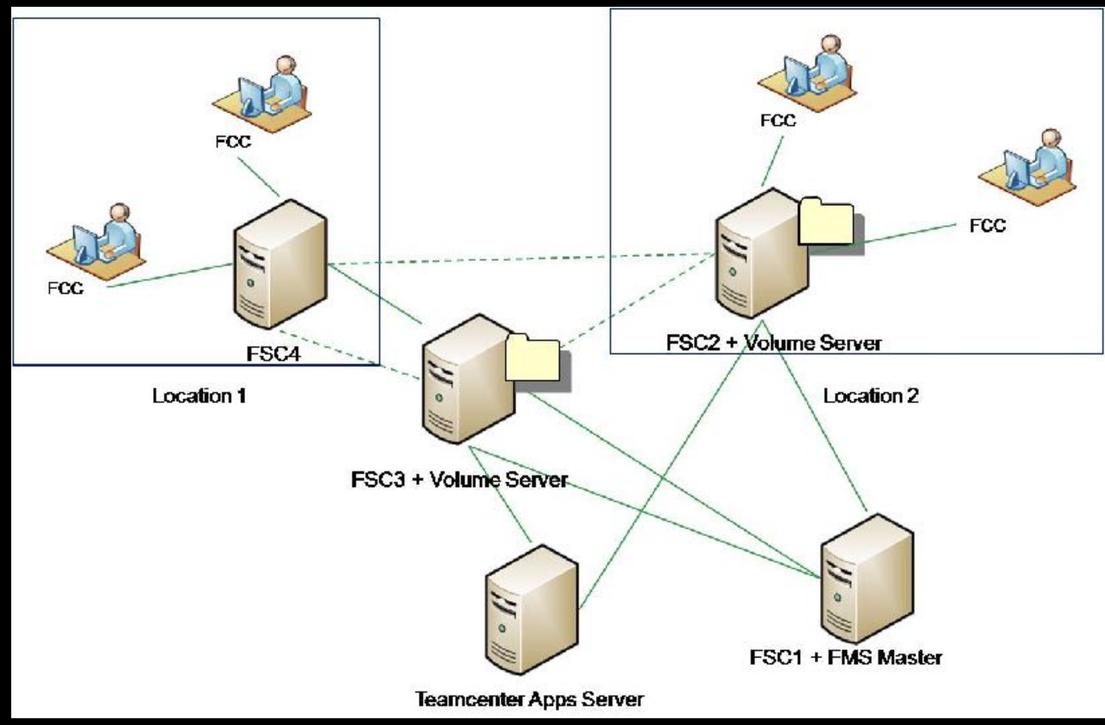
How do you choose your sample set?

- Random
- Representative
  - Geography
  - Time
  - Use patterns
- **Granularity**

CANARY STRATEGY

How do you choose your sample set?

- Random
- Representative
  - Geography
  - Time
  - Use patterns
- Granularity
- **Resource mapping**



MONITORING STRATEGY

MONITORING STRATEGY

How do you evaluate your deployment?

- **Tags! Tags! Tags! Tags! Tags!**

DATAPOINT

SYSTEM.NET.BYTES_RCVD 4 2016-03-02 15:00:00

METRIC NAME: WHAT?

METRIC VALUE: HOW MUCH?

TIMESTAMP: WHEN?

DATAPOINT

SYSTEM.NET.BYTES_RCVD 4 2016-03-02 15:00:00 [DEPLOYMENT]

METRIC NAME: WHAT?

METRIC VALUE: HOW MUCH?

TIMESTAMP: WHEN?

TAGS: WHERE?

MONITORING STRATEGY

How do you evaluate your deployment?

- Tags!
- **p90, p95, p99**

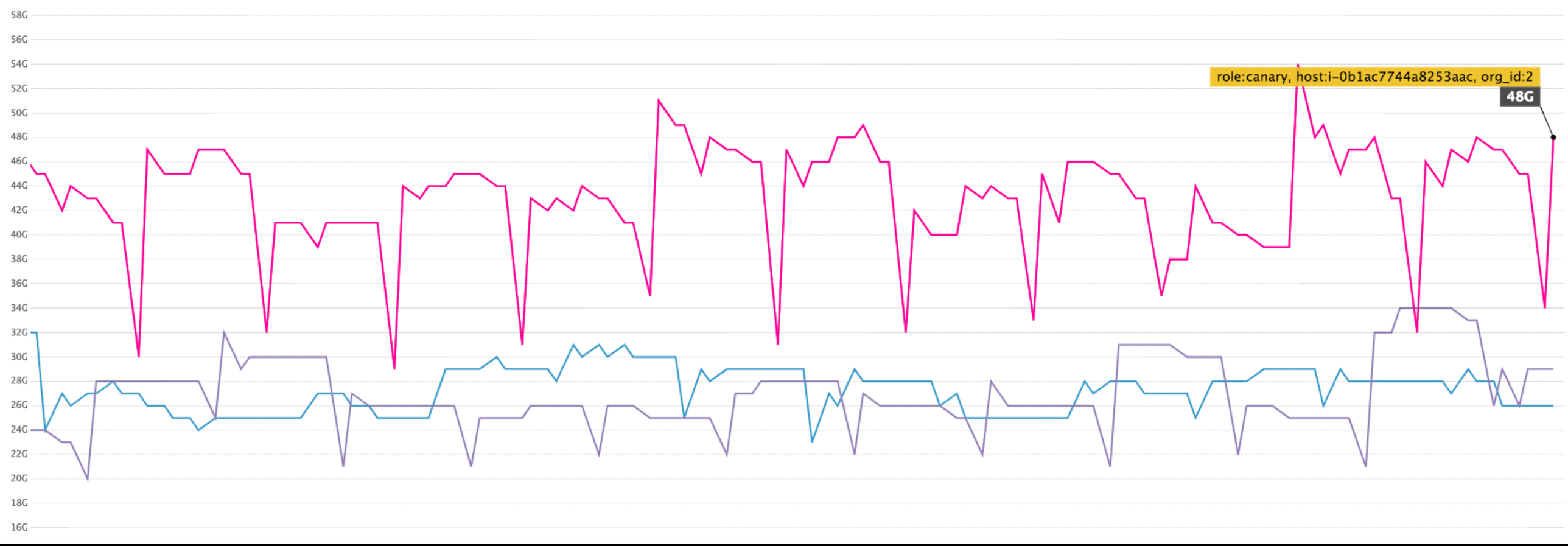
MONITORING STRATEGY

How do you evaluate your deployment?

- Tags!
- p90, p95, p99
- **Outliers**

SADANDUSELESS.COM
DAY 14
THEY STILL SUSPECT NOTHING

Outliers: one of these things is not like the others

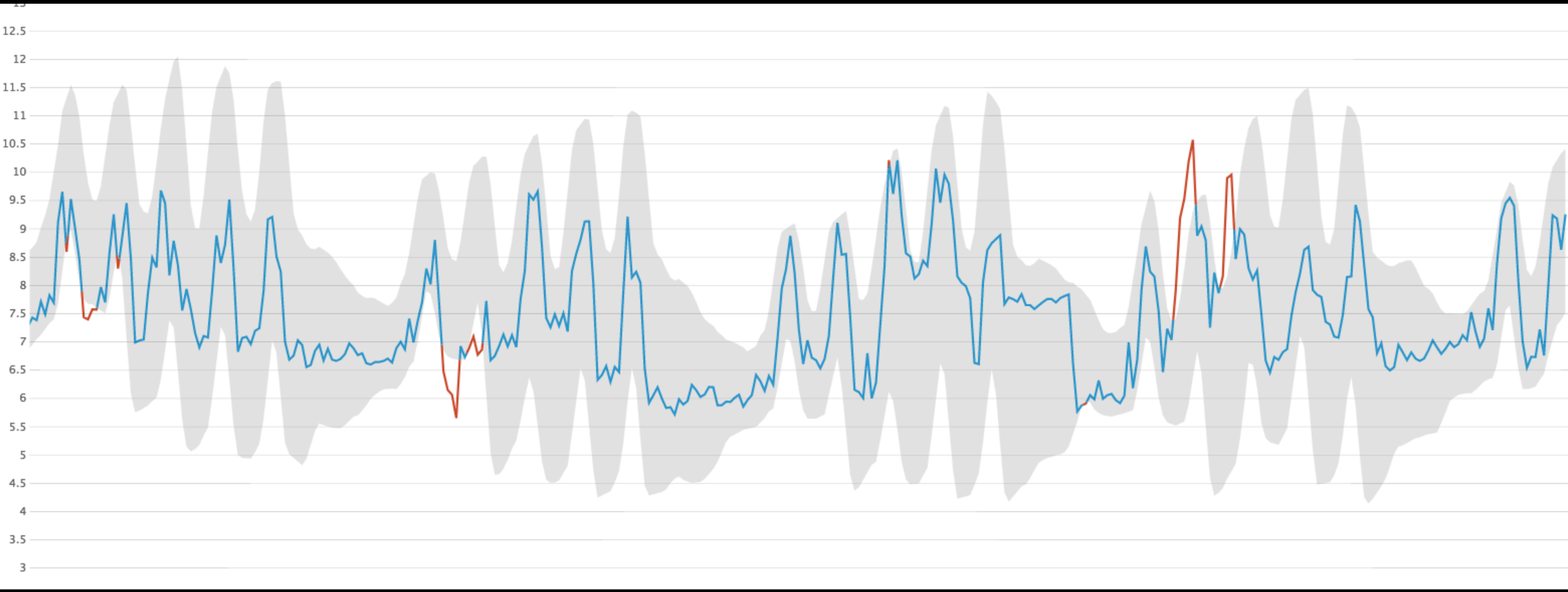


MONITORING STRATEGY

How do you evaluate your deployment?

- Tags!
- p90, p95, p99
- Outliers
- **Anomalies**

Anomalies: It wasn’t like this before



SIGNALS TO WATCH

Latency

SIGNALS TO WATCH

Latency

Errors

SIGNALS TO WATCH

Latency

Errors

Traffic

SIGNALS TO WATCH

Latency

Errors

Traffic

Saturation

INSTALLING ISTIO

1. Download from github.com/istio/istio/releases

INSTALLING ISTIO

1. Download from github.com/istio/istio/releases
2. Unpack

INSTALLING ISTIO

1. Download from github.com/istio/istio/releases
2. Unpack
3. Add istio `/bin` to your path

INSTALLING ISTIO

1. Download from github.com/istio/istio/releases
2. Unpack
3. Add istio `/bin` to your path
4. `kubectl apply -f install/kubernetes/istio.yaml`

ISTIO SERVICES

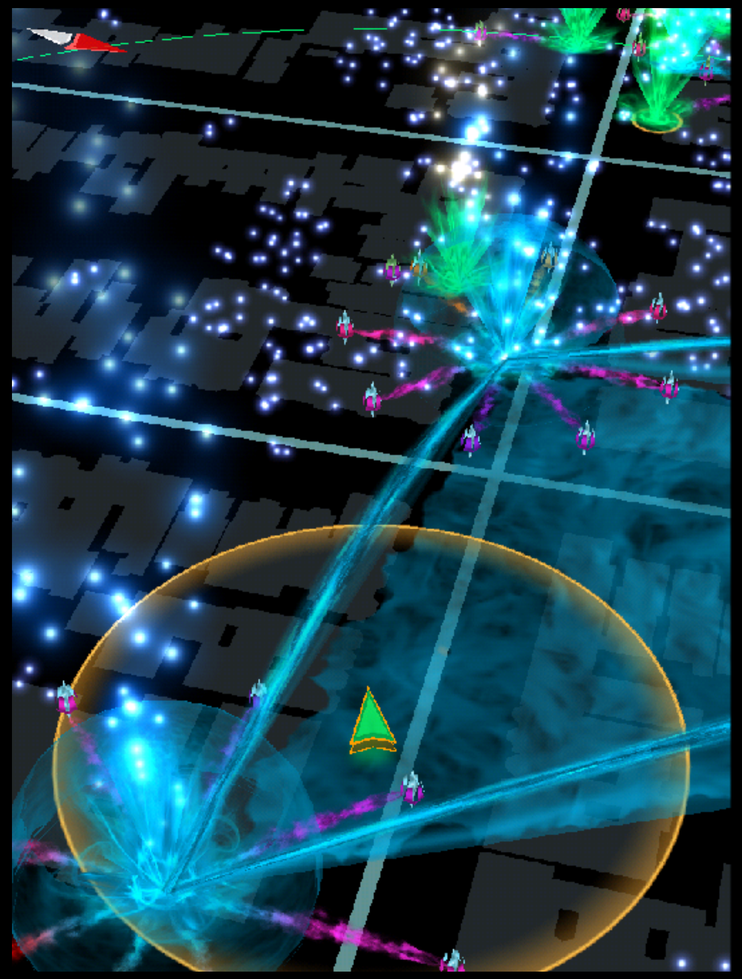
- **Istio Pilot**

ISTIO SERVICES

- Istio Pilot
- **Istio Mixer**

ISTIO SERVICES

- Istio Pilot
- Istio Mixer
- **Istio Ingress**



Istio Pokemon Go is next!

```
kubectl create -f \
<(istioctl kube-inject -f your_k8s.yaml)
```

KUBE-INJECT

```yaml
initContainers:
- args:
  image: docker.io/istio/proxy_init:0.6.0
  imagePullPolicy: IfNotPresent
  name: istio-init
```

TEENAGE MUTATING WEBHOOK ADMISSION CONTROLLERS!

AKA AUTO-SIDECAR INJECTION

CANARY DEPLOYING WITH ISTIO

SERVICE

```yaml
apiVersion: v1
kind: Service
metadata:
  name: process
  labels:
    app: process
spec:
  ports:
  - port: 80
    name: http
  selector:
    app: process
```

DEPLOYMENT

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: process
  labels:
    app: process
spec:
  replicas: 3
  selector:
    matchLabels:
      app: process
  template:
    metadata:
      labels:
        app: process
        version: v1
    spec:
      containers:
      - name: pull
        image: jyee/process:v1
        imagePullPolicy: Always
```

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: process
  labels:
    app: process
spec:
  replicas: 3
  selector:
    matchLabels:
      app: process
  template:
    metadata:
      labels:
        app: process
        version: v2
    spec:
      containers:
      - name: pull
        image: jyee/process:v2
        imagePullPolicy: Always
```

ISTIO ROUTE RULES

```yaml
apiVersion: config.istio.io/v1alpha2
kind: RouteRule
metadata:
  name: process-routing
spec:
  destination:
    name: process
  precedence: 1
  route:
  - labels:
      version: v1
    weight: 100
```

ISTIO ROUTE RULES

```yaml
apiVersion: config.istio.io/v1alpha2
kind: RouteRule
metadata:
  name: process-routing
spec:
  destination:
    name: process
  precedence: 1
  route:
  - labels:
      version: v1
    weight: 80
  - labels:
      version: v2
    weight: 20
```

ISTIO ROUTE RULES

```yaml
apiVersion: config.istio.io/v1alpha2
kind: RouteRule
metadata:
  name: process-routing
spec:
  route:
  …
  - labels:
      version: v2
    request:
      headers:
        cookie:
          regex: “^(.*?;)?(region=us-west)(;.*)?”
```

WHAT ELSE CAN IT DO?

LOTS!

https://istio.io/docs/reference/config/

RECAP

- **Service meshes give you more control**

RECAP

- Service meshes give you more control
- **Canary deploys: Representative & Granular**

RECAP

- Service meshes give you more control
- Canary deploys: Representative & Granular
- **Monitoring: Tags, Outliers, Anomalies**

RECAP

- Service meshes give you more control
- Canary deploys: Representative & Granular
- Monitoring: Tags, Outliers, Anomalies
- **What to watch: Latency, Errors, Traffic, Saturation**

QUESTIONS?

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