Bottom Up Adoption of Microservices w/ Kubernetes & Envoy (Service Oriented Development)

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How do I break up my monolith?

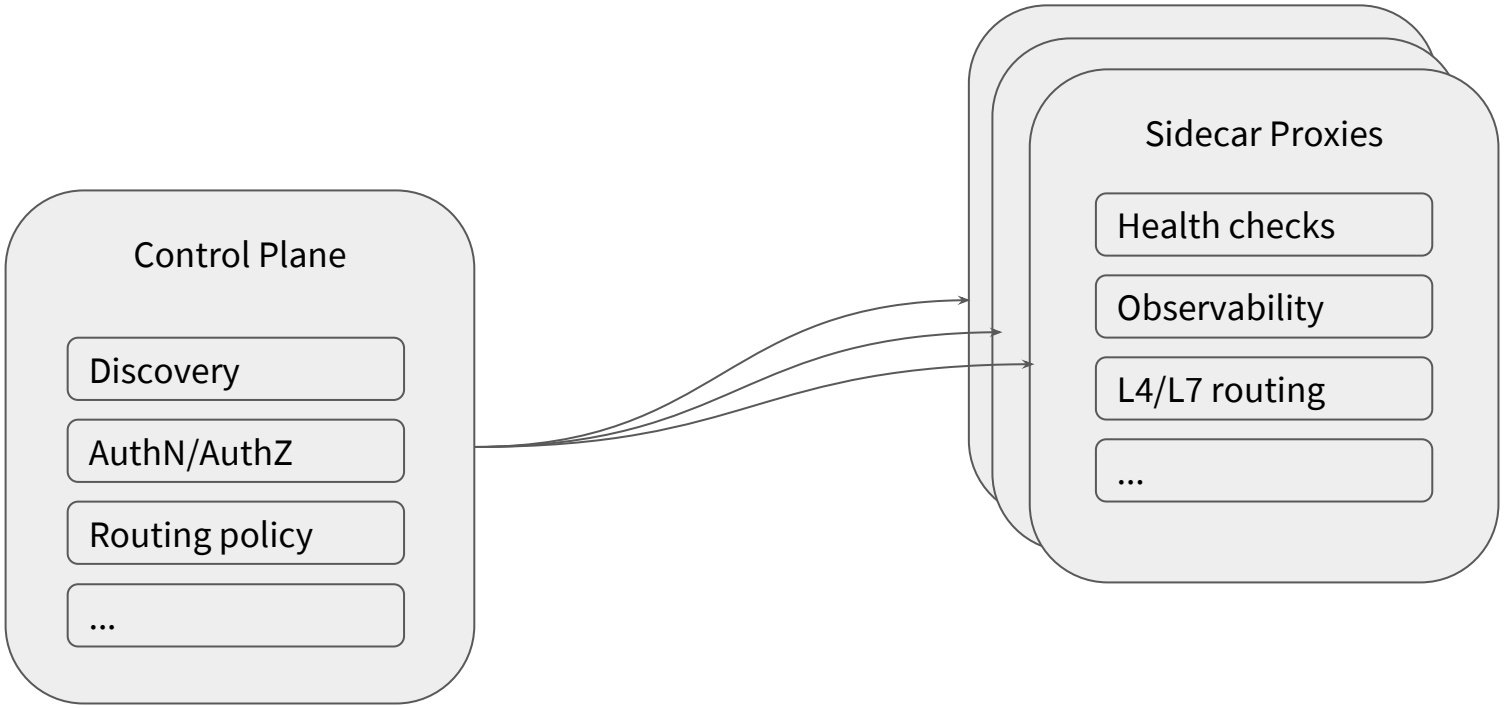
How do I architect my app with microservices?

What infrastructure do I need in place before I can benefit from microservices?

Microservices at Datawire ...

- Building a cloud application using microservices in 2015
- Distributed systems engineers
- Deeply studied microservices Architectures & Technology

Control Plane and Data Plane

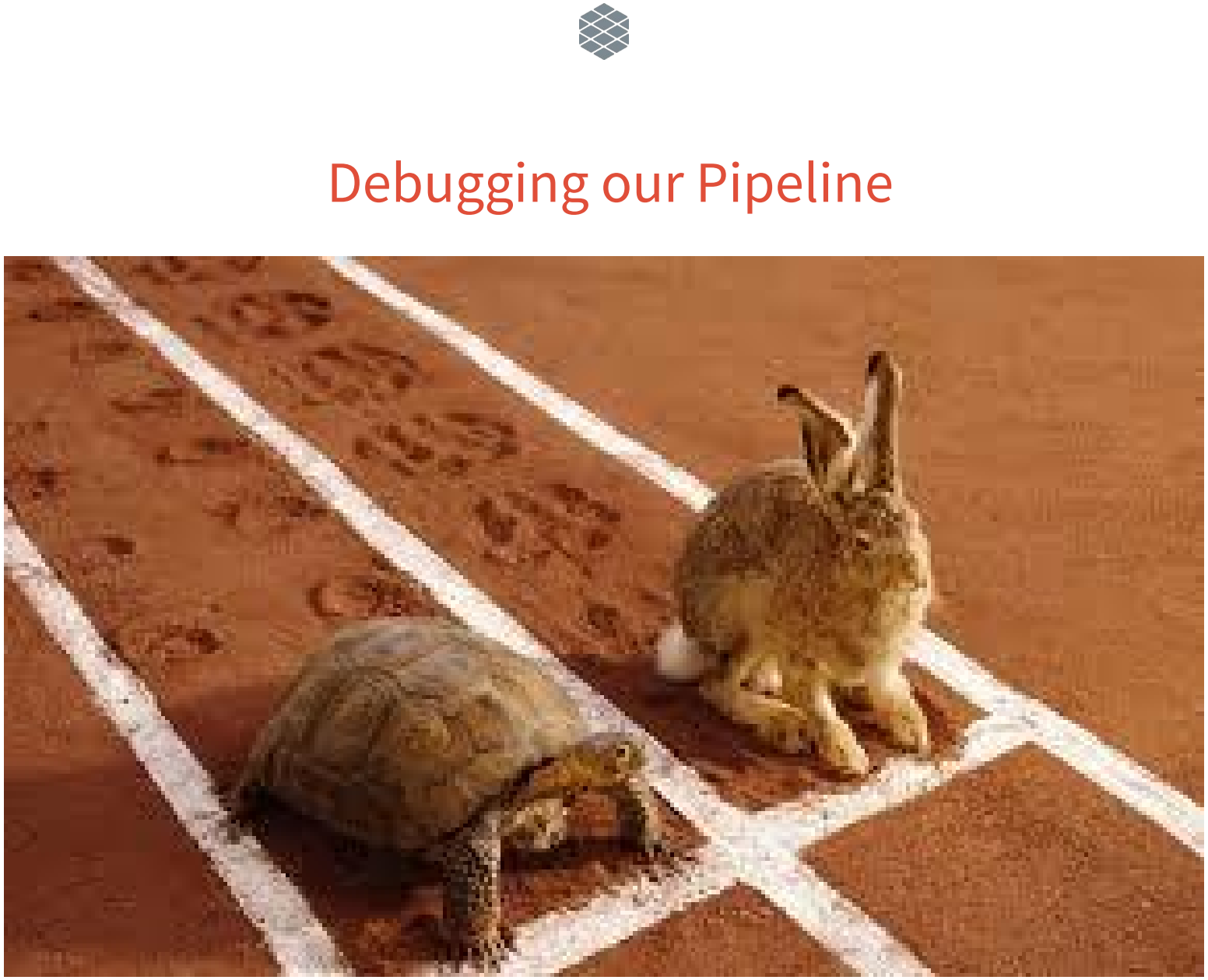


Debugging Velocity (or lack thereof)

~~Tooling~~

~~Architecture~~

Process!!!

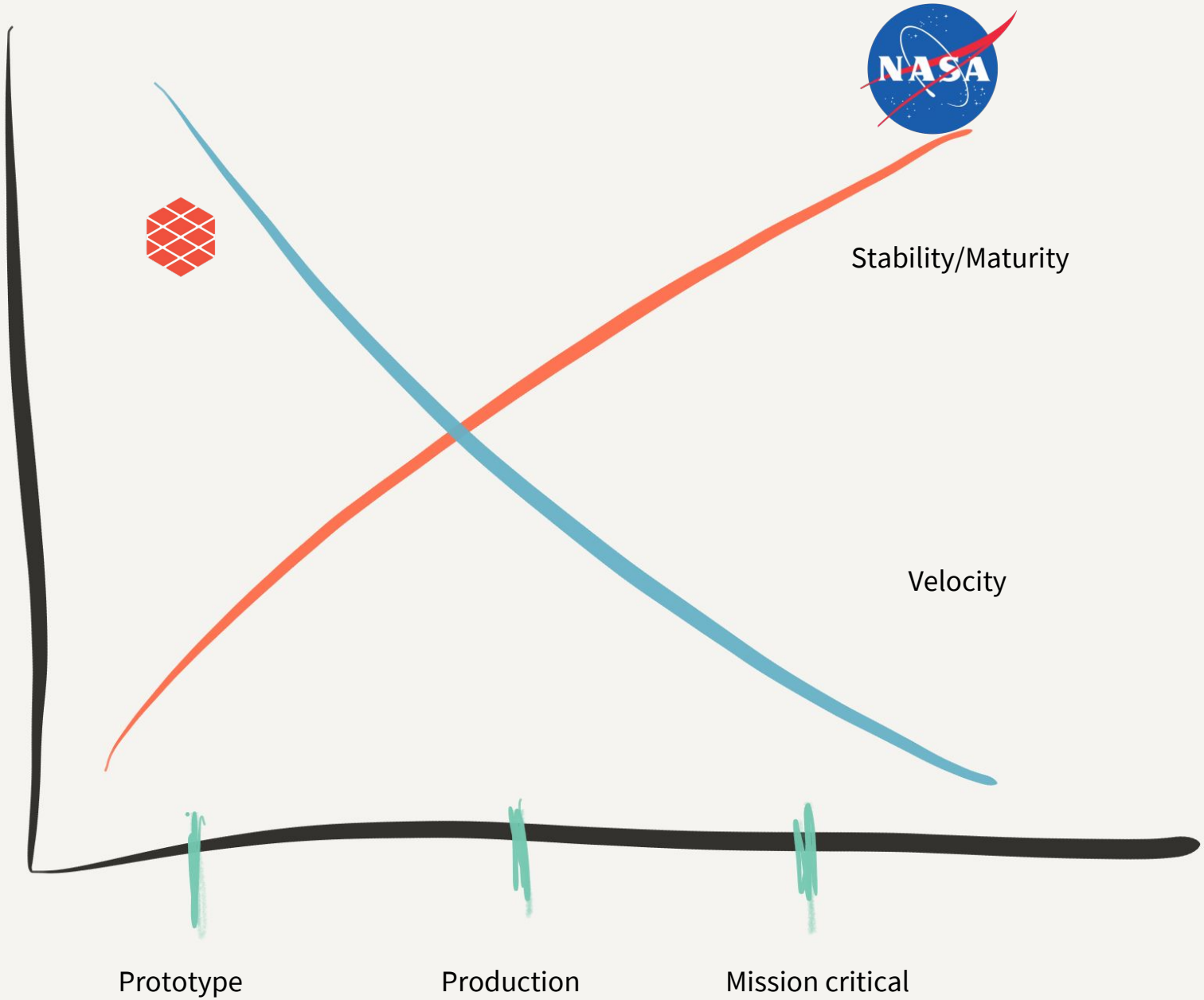


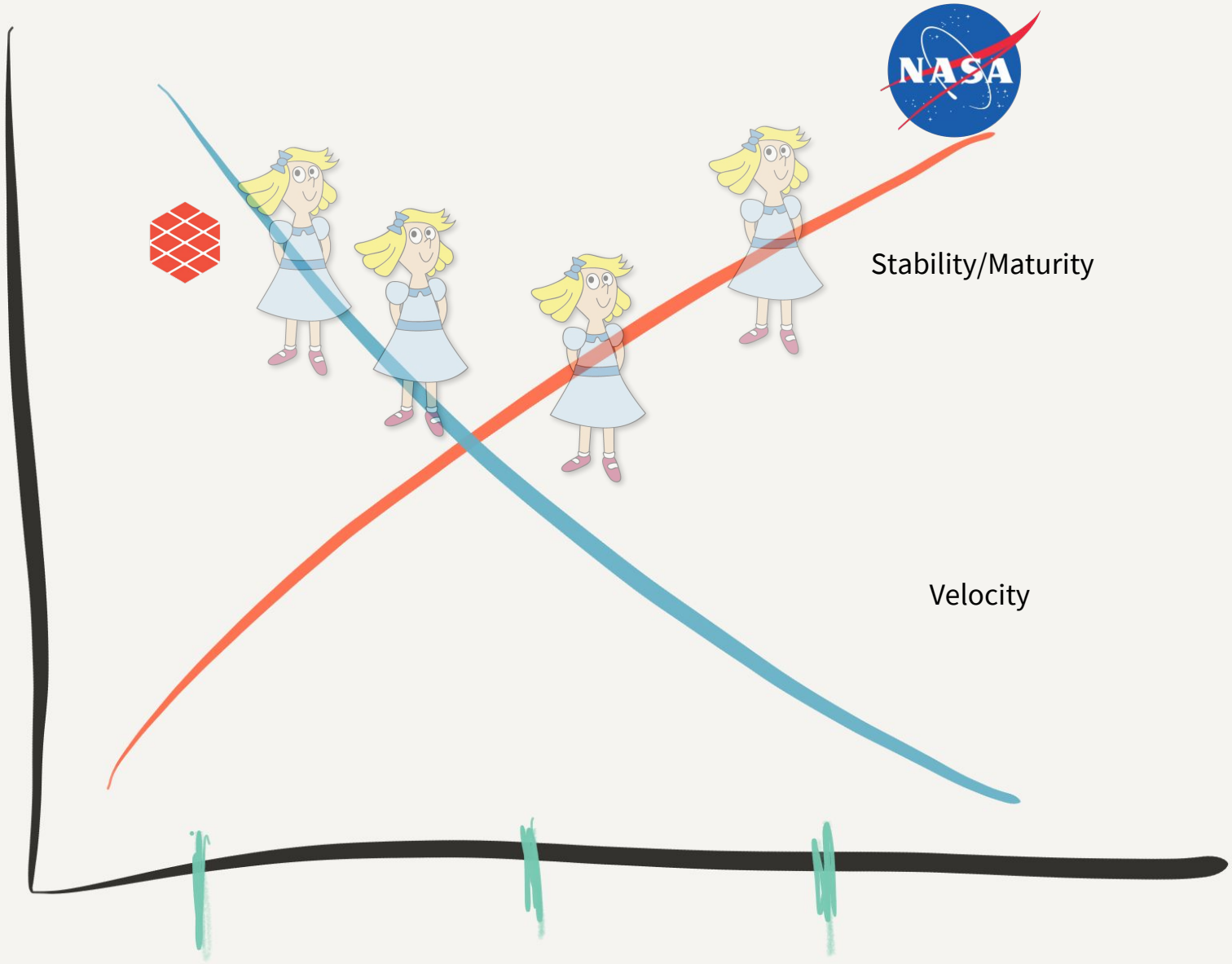
Debugging our Pipeline

Velocity comes from Process, not Architecture

~~Service Oriented Architecture~~

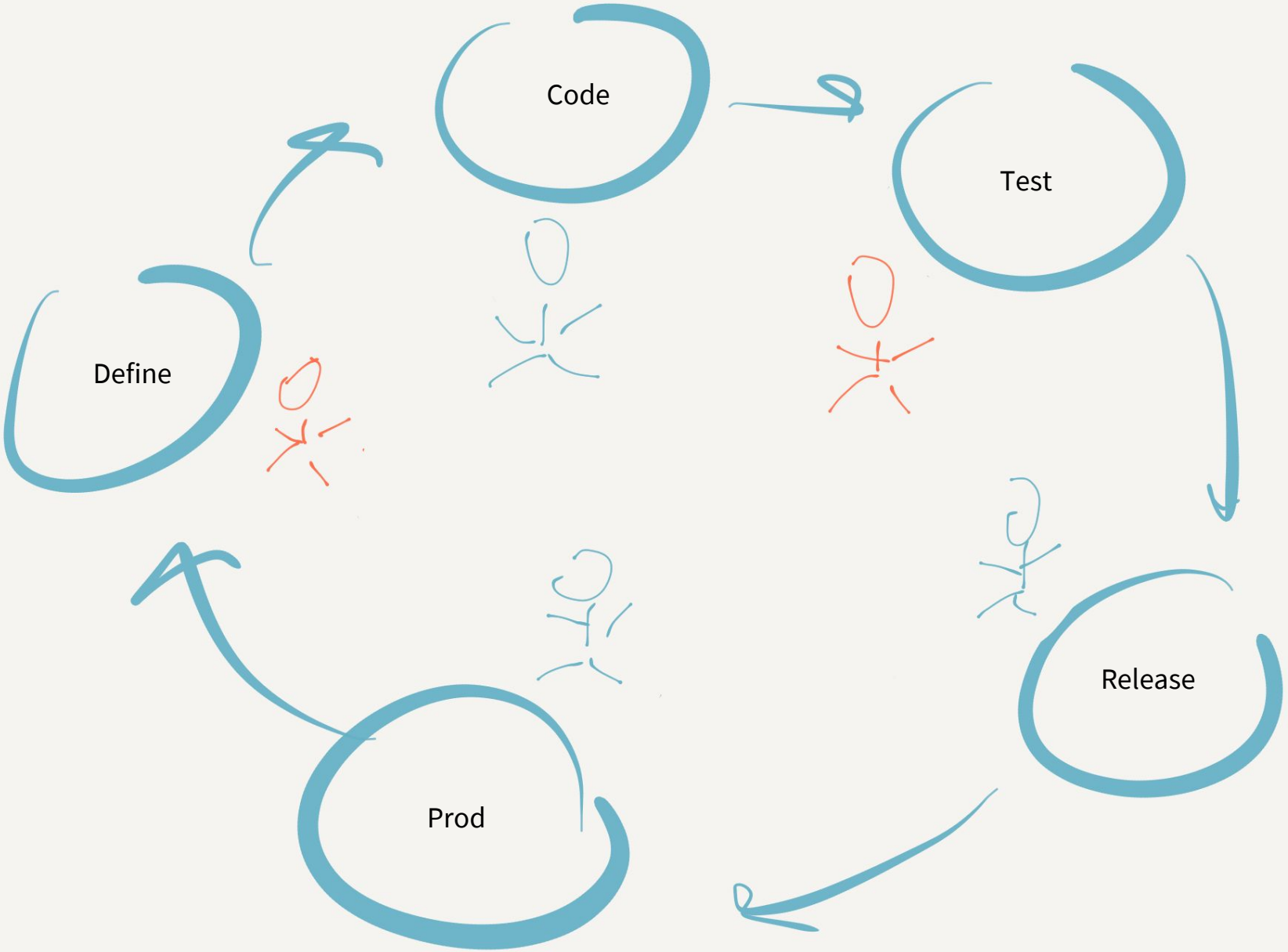
Service Oriented Development

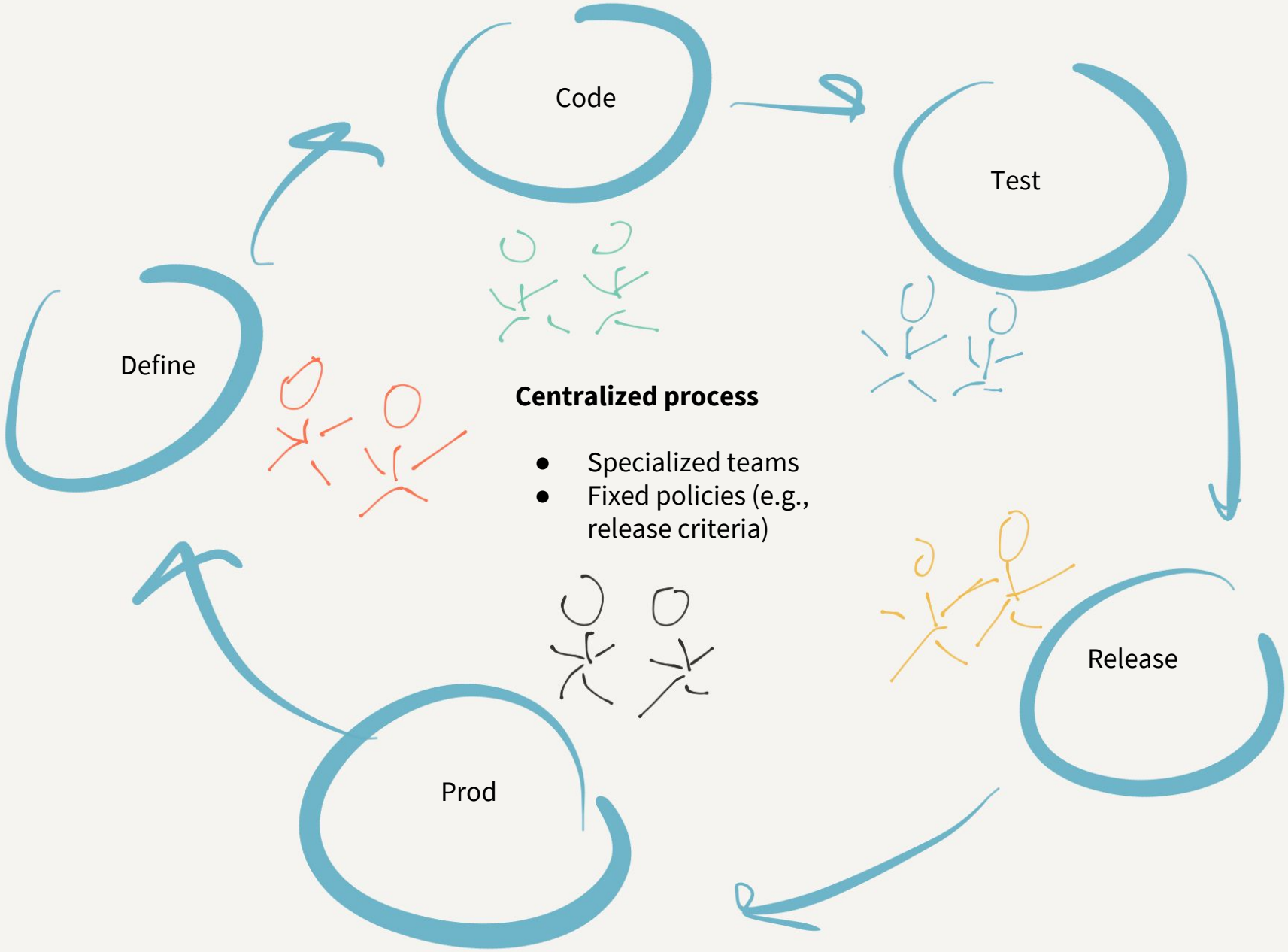

Stability/Maturity
Velocity
Prototype
Production
Mission critical


Stability/Maturity
Velocity
Prototype
Production
Mission critical

A single process is inefficient

(Forces a single Stability vs Velocity Tradeoff)


Code
Test
Release
Prod
Define



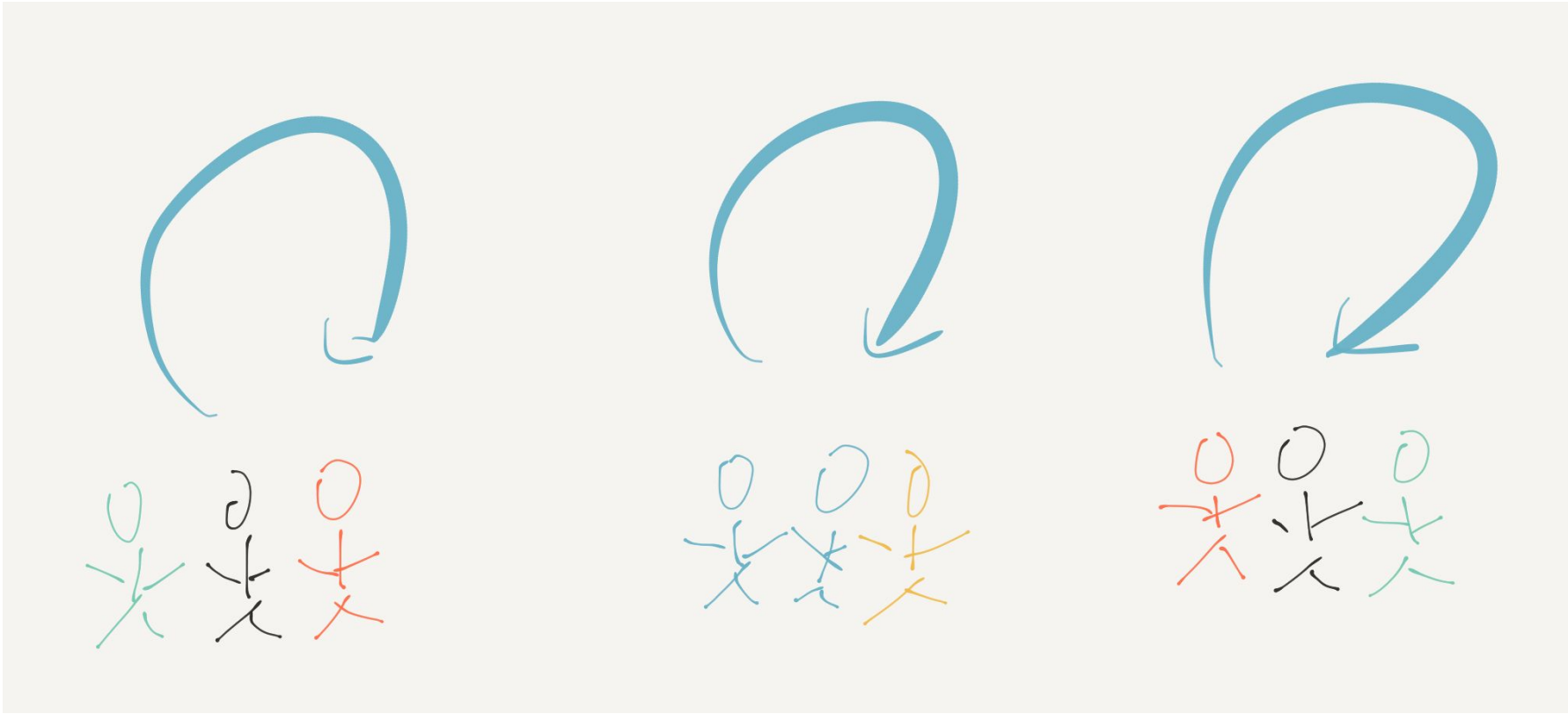
Centralized process

- Specialized teams
- Fixed policies (e.g., release criteria)

A single process doesn’t scale

~~How do I break up my monolith?~~

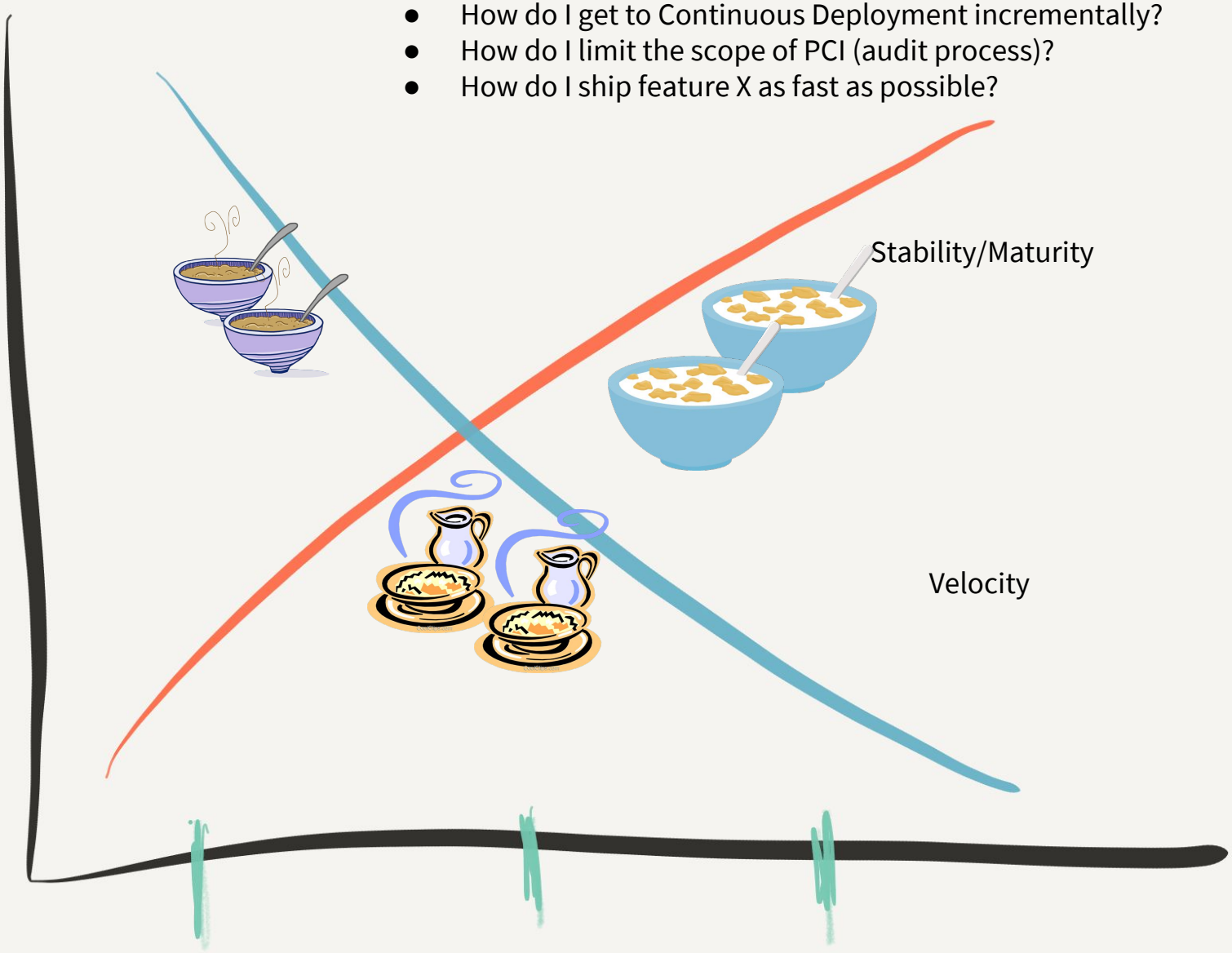
How do I break up my *process*?



Microservices lets you run multiple processes!

Microservices is a distributed development ~~architecture~~ workflow.

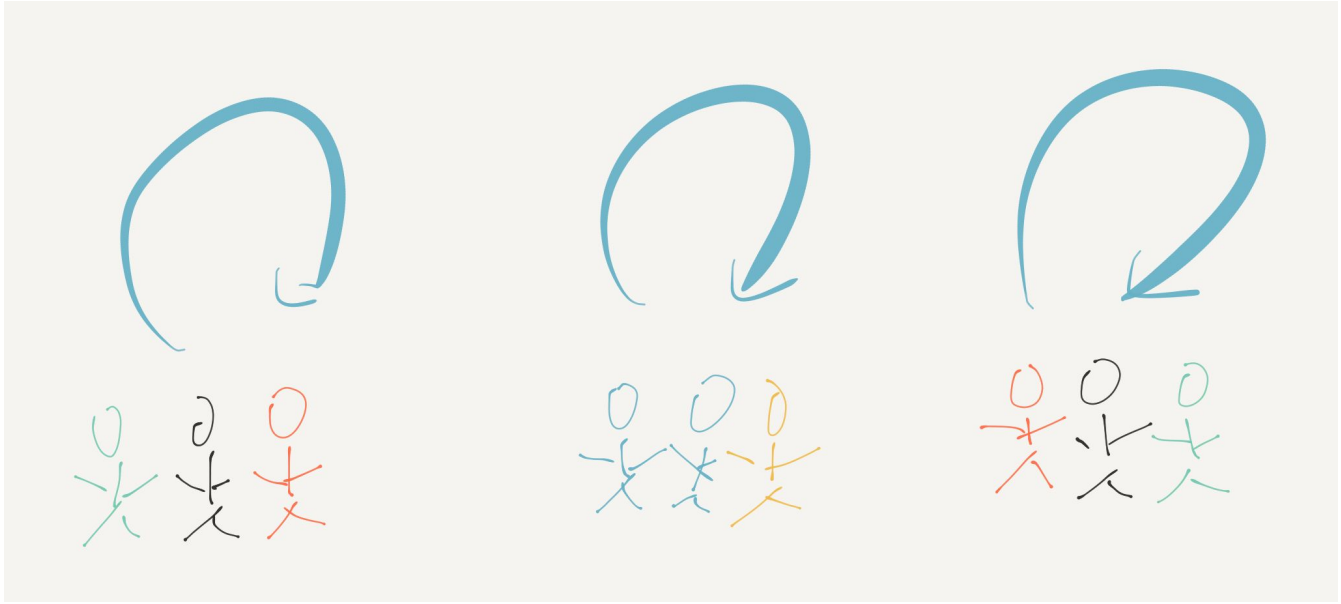
- How do I get to Continuous Deployment incrementally?
- How do I limit the scope of PCI (audit process)?
- How do I ship feature X as fast as possible?



Microservices is ...

- **Multiple** processes
  - Including your existing process!
  - Processes designed for different stability/velocity tradeoffs
- **Simultaneous** processes

Doing things this way shifts how people operate!



- Requires *both* **organizational** and **technical** changes

Organizational Implementation

You gotta give in order to get

Education

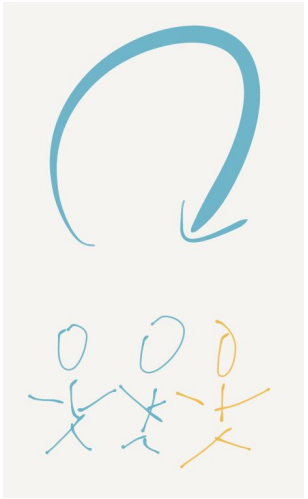
- Everyone exposed to full dev cycle

Communication

- Nobody speaks the same language

Delegation

- Small teams own big important parts



But you get a lot

Education

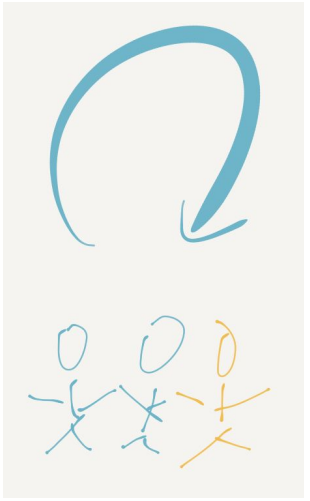
- Specialists become generalists -> Better holistic systems
- Learning, personal growth -> Job satisfaction

Communication

- Conflict -> Collaboration

Delegation

- Massive organizational scale



Create self-sufficient, autonomous software **teams**.

Why self-sufficiency and autonomy?

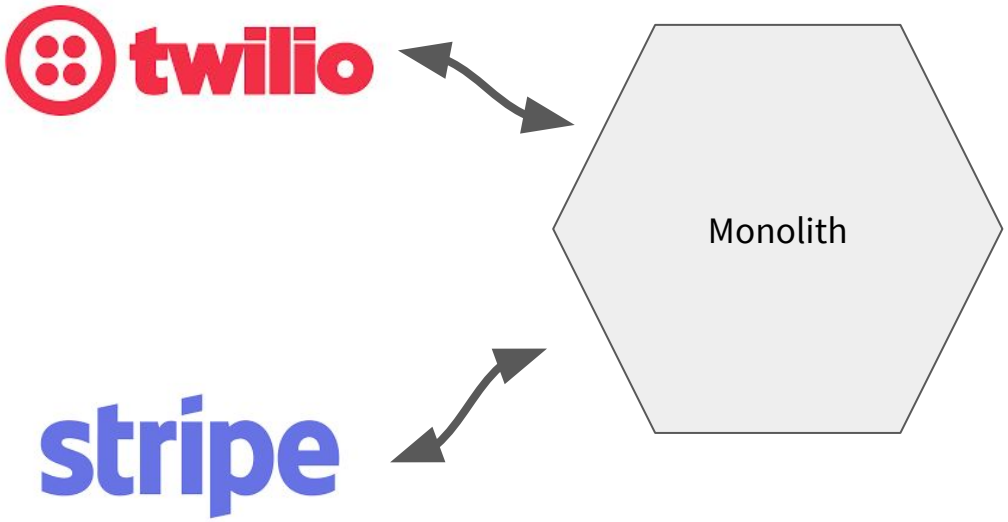
- Self-sufficient
  - Team does not need to rely on other teams to achieve its goals
- Autonomy
  - Team is able to independently make (process) decisions on how to achieve its goals

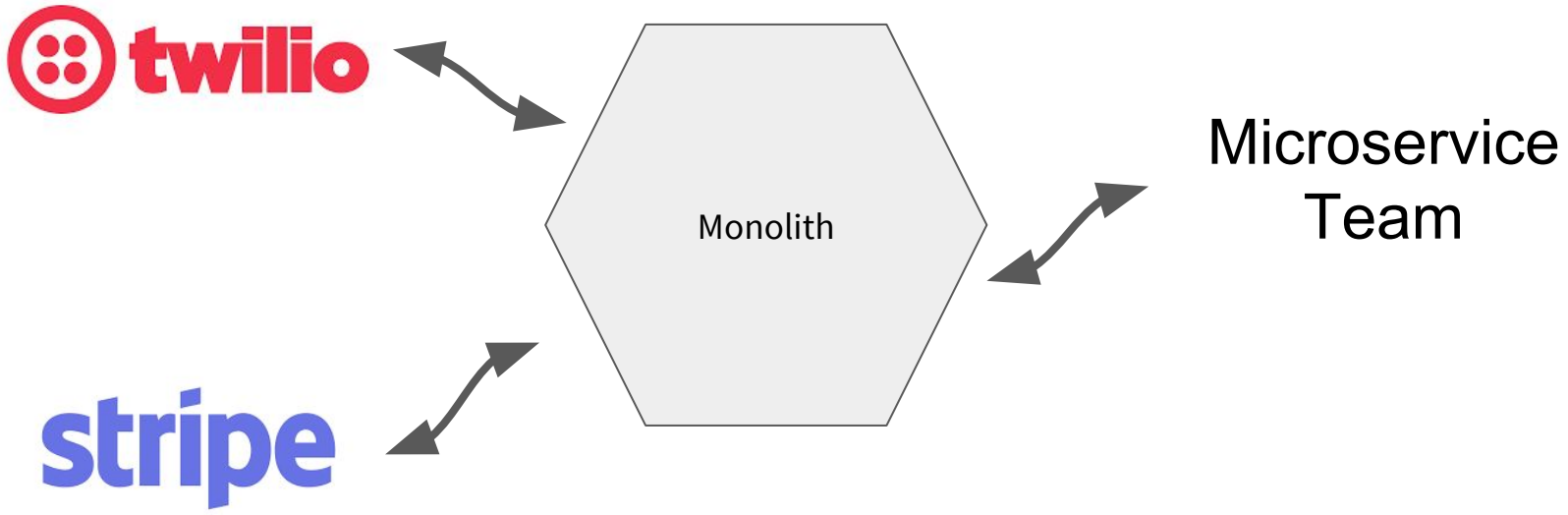
Eliminate centralized specialist functions

Centralized architecture

Centralized infrastructure / ops*
(You might need a platform team)

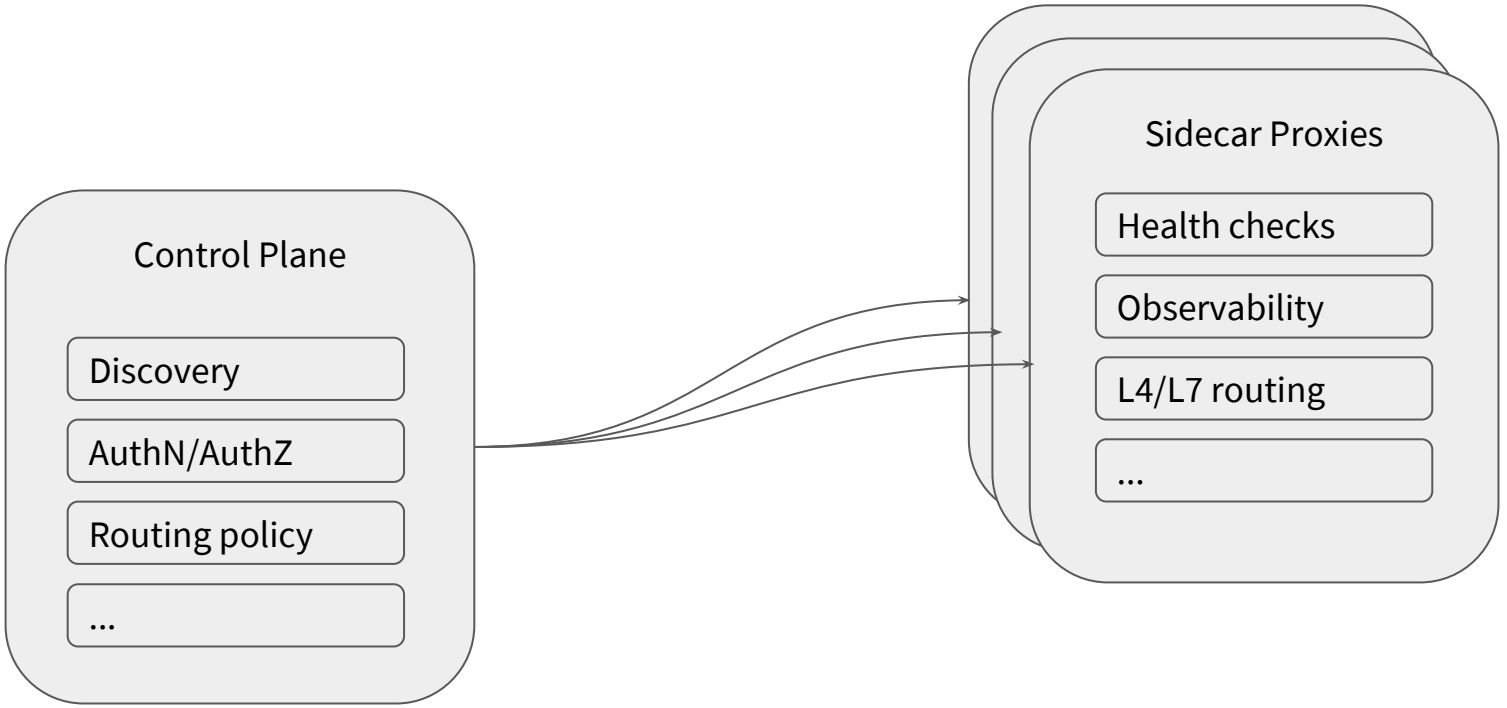
Think Spinoff


twilio
Monolith
stripe

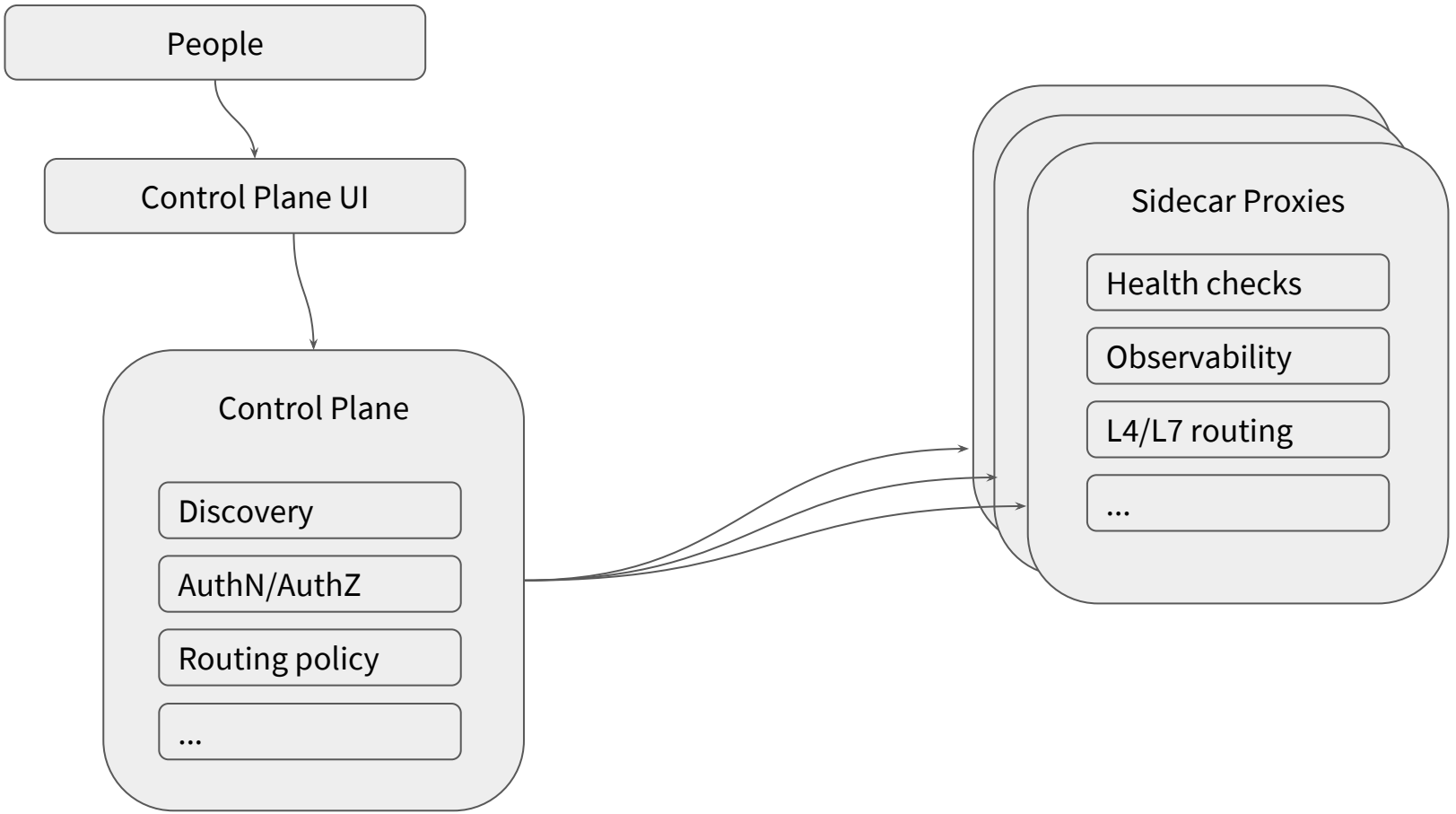

twilio
Monolith
Microservice
Team
stripe

Technical Implementation

Control Plane and Data Plane



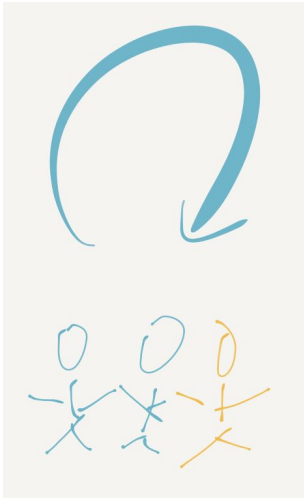
People operate the control plane



Guiding goal: make our team productive

Tools for Generalists

- Generalist UX != Specialist UX
- Specialist: All the things
- Generalist: Simple, Complete, Discoverable



Tools for Education

- Build on familiar concepts
- Safe defaults
- Great feedback

Tools for Autonomous Developers

- Fit multiple processes

The Datawire Story...

- We have been building cloud apps as microservices since 2015

- Way too small to have an actual dedicated ops / platform engineer

The Datawire Story...

- **But...!** Good news I did that in a previous life.

- **Problem...!** I’m supposed to be writing product code.

The Datawire Story...

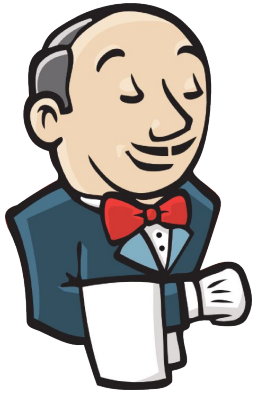
I wanted to do self-service so any developer could scratch their own itch without bugging me.

Some design considerations...

- Polyglot programming shop
- Lots of different toolchains
- Distributed-ish engineering organization
- Not everyone has a strong background in microservices and infrastructure
- Several mission critical services

The Datawire Story...

Also I wanted to do it “right”... so I architected the shit out the problem with tools!



Expected Reaction… :D

… Actual Reaction D:

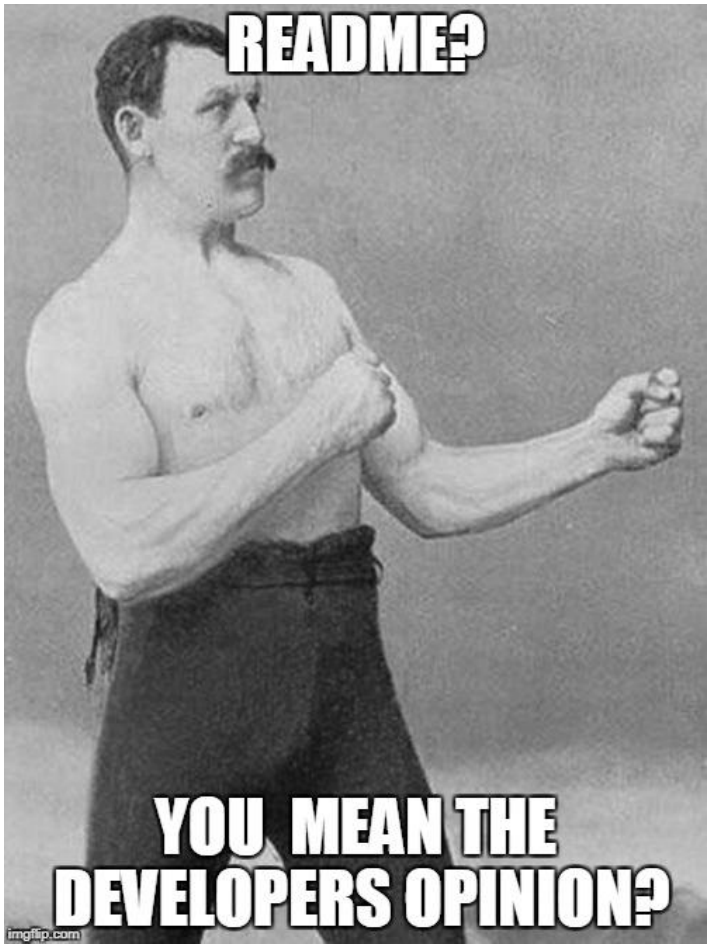
Late 2015… 2016...

Change was slow and painful before adopting better starting principles...

It’s about the people and process, dummy

- Turns out it is not a tooling problem…
- It is a people and process problem…
- Engineers hate adopting new tools when the reason is not compelling… especially if the new tools make their life harder.
- All the tooling in the world does not stop people from continuing their existing behaviors…
- Every tool has a cost because every tool can and will be used slightly differently by different people.

“Did you read the README?” ~ “No, but...”



- A README isn’t enough.
- Developers are bad at RTFM and WTFM.
- Lots of arguments over people doing things differently from how the README stated…
- Lots of arguments also over people not knowing how to do things because the README did not state anything about <X>.

Back to the drawing board...

- We wanted a common build/deployment mechanism that would work for everyone and anything (including CI, multiple languages, etc.)

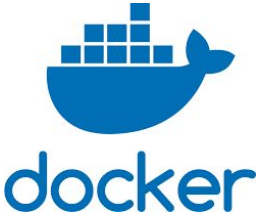
- Started with Docker as it gave a common way to package and ship code.

- Kubernetes had been on my radar since 2014 but seemed finally ready for mass adoption at this point so we picked that to run containers.

Our Kubernetes Journey...

- We built tools based on two things:
  a. Pain
  b. Common patterns we discovered across all our repositories

Step 1: Provide fast repeatable builds for everyone

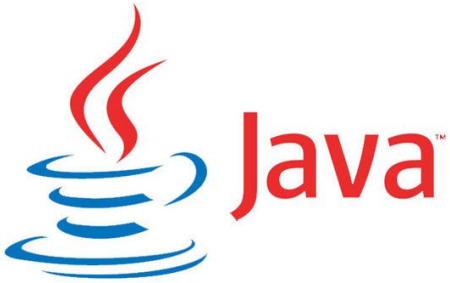


1. Code a change on a branch (e.g. `dev/awesome-feature`)

2. Package the build toolchain into the Docker image itself!

3. Run a single command and a new Docker image is built… no need to setup tools on developers machines. Build process is codified into `Dockerfile`.

Step 1: I said everyone and I meant everyone...



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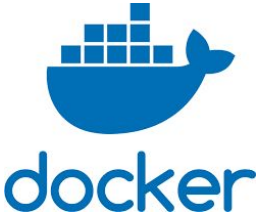


1. Tools often forget about making compiled languages compile quickly…

2. Forge assists Docker and ensures things like build caches and incremental compilation work across multiple runs :)

Step 2: Provide fast self-service deploy

- Commit (or don't commit) a change on a branch (e.g. `dev/awesome-feature`)
- Run command and presto…! Updated code is running on the cluster without disturbing any other deployment.
- Support any number of parallel deployments of the same codebase

Step 1 + 2 Recap

- Docker and Kubernetes provide the backbone of build and deployment.

- We found ourselves mostly doing the same thing (`docker build ...`, `kubectl [apply|create] ...`) so we codified it into tools that work fast and have a small learning surface area for devs.

- Nothing “magical” about what the tools do and they can be easily bypassed if necessary.

Step 3: Make it easy to reach the changed code

- Add a little metadata to a Kubernetes service manifest
- Ambassador listens and picks up change and configures Envoy
- Makes it super easy to do stuff like expose a branch (`dev/awesome-feature`) as https://dev-awesome-feature.datawire.io

Perfect?

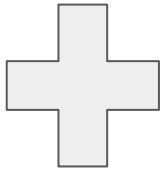
Hell no.

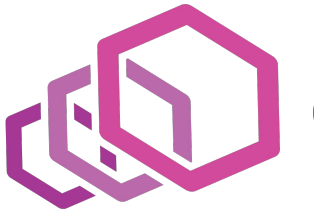
(But it’s soooooo much better than before)

What's left?

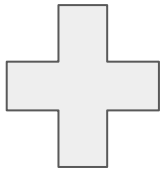
- Self-service bootstrapping
- Self-service stateful infrastructure
- Self-service external to Kubernetes infrastructure (e.g. Amazon RDS)
- Monitoring And Logging

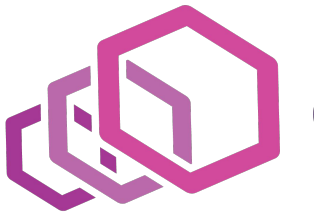
All the Things

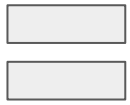




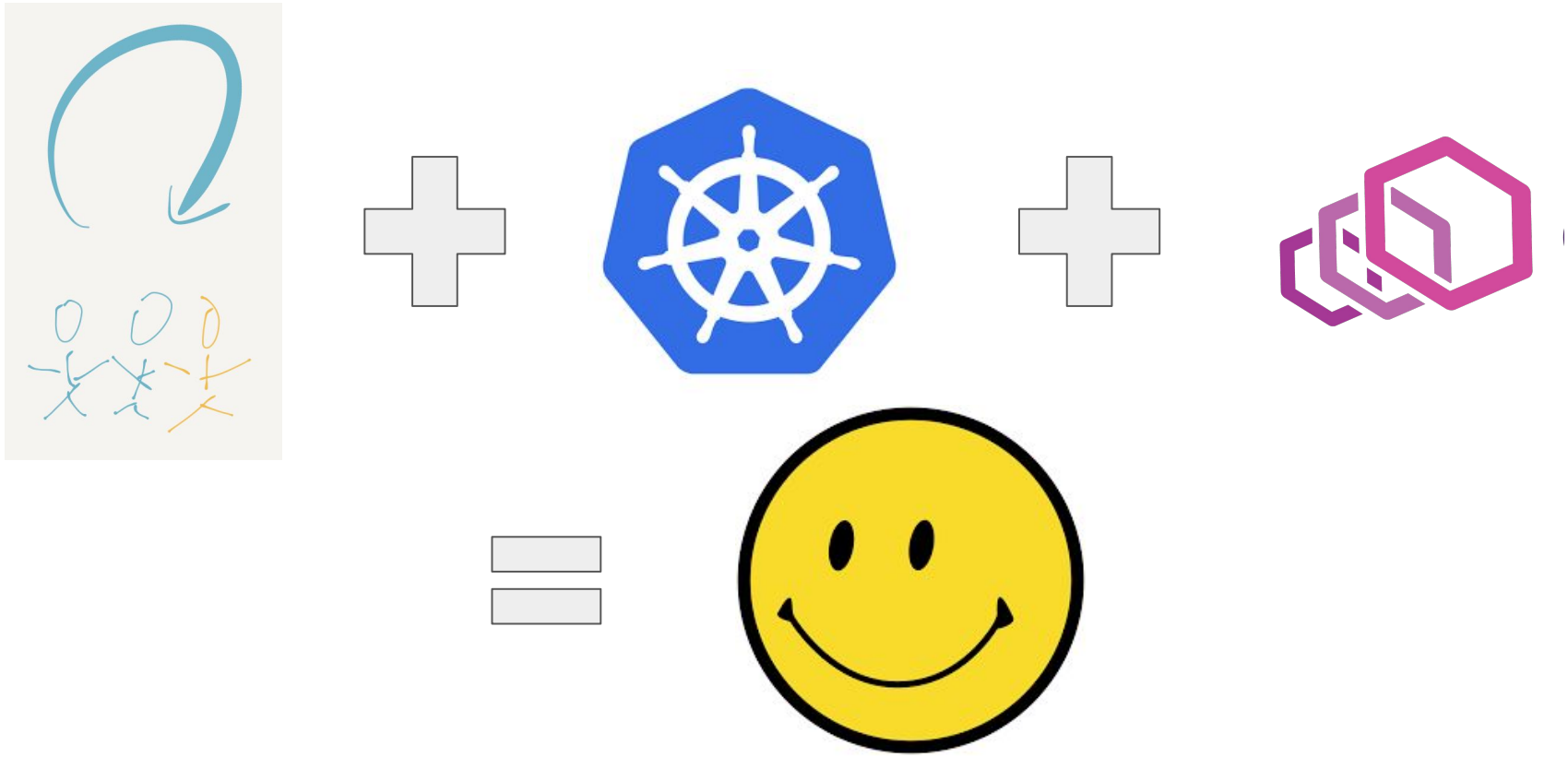
Capabilities aren’t Enough, UX Matters







Process and People factors drive the UX



Build the tools your teams need **now**

Tools for Generalists

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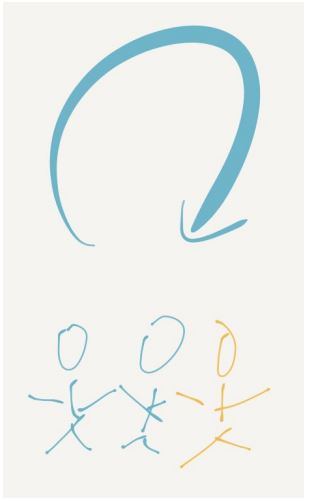
- Generalist: Simple, Complete, Discoverable



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Tools for Autonomous Developers

- Fit multiple processes

Thank you!

Visit us at booth S58

- Cool swag
- Chat about development UX and workflow

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