

ARCHITECTING FOR OPERATIONS

BORING IS AWESOME!

INTRODUCTION

TWITCH

- ▶ Feel free to ask questions in the chat at anytime!
- ▶ Giving back feedback through the chat helps me read the audience.
- ▶ Please respond to each other in chat as well.
- ▶ Big thanks to the volunteer student moderators:
 - ▶ Wolgo
 - ▶ CptWesley
- ▶ We are going to have a break at 1630±

INTRODUCTION

AUDIENCE

- ▶ Are you working in the industry?
- ▶ Are you operating infrastructure?
- ▶ What do you expect from this lecture?



MINDSET

A photograph of a team of rowers in a long, narrow boat on a lake. The rowers are silhouetted against the bright water, which reflects a warm, golden light from the setting sun. The boat is moving through the water, creating a wake. The rowers are wearing athletic gear, including caps and life jackets. The word "COLLABORATION" is overlaid in large, white, sans-serif capital letters across the bottom of the image.

COLLABORATION

A waiter in a blue shirt is holding a white plate with a vibrant green salad topped with pomegranate seeds and a dollop of white cream. The background is blurred, showing a restaurant interior with warm lighting.

SERVING THE CUSTOMER

An aerial photograph of a large, paved parking lot. On the left side, there are several white delivery trucks parked in a row. To the right, there are a few smaller cars, including a red one and a white one. The ground is a light grey color with some dark, irregular spots. In the top right corner, there is a small green bush. The overall scene suggests a busy industrial or commercial area.

IMPACT

INTRODUCTION

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- ▶ steffan@norberhuis.nl
- ▶ Feel free to contact me!



INTRODUCTION

OVERVIEW

- ▶ Disruption
- ▶ Infrastructure as Code
- ▶ Failure is inevitable
- ▶ Building for Failure



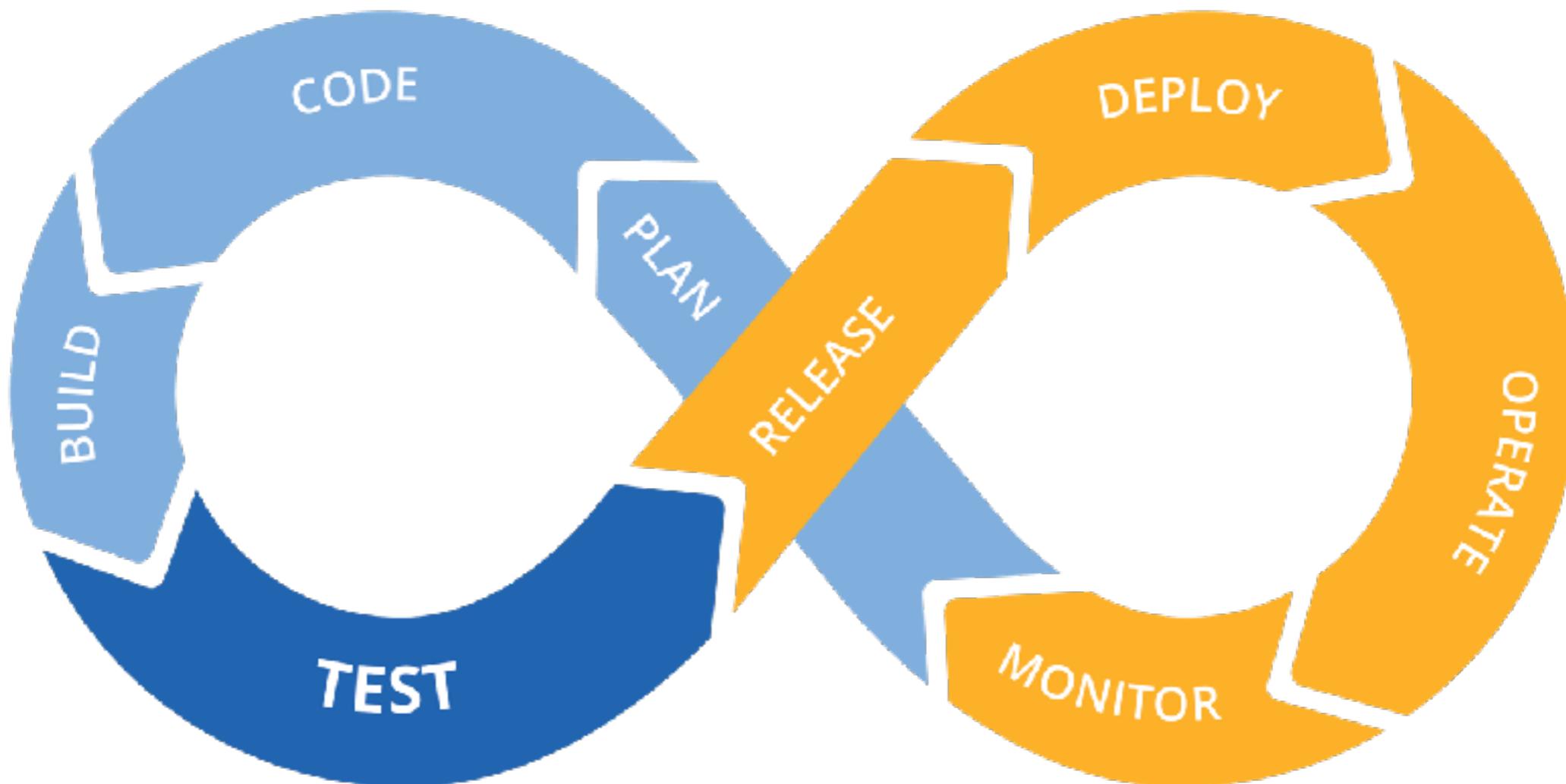
**ARCHITECTING FOR
OPERATIONS**

DISRUPTION



YOU BUILD IT, YOU RUN IT

DEVOPS OWNERSHIP



The background of the image shows a wide, open landscape with rolling green hills under a clear, pale blue sky. The lighting suggests it might be early morning or late afternoon.

CLOUD

DISRUPTION

CLOUD

- ▶ Operate technology without owning technology
- ▶ Agility with no planning
- ▶ Focus on your business



ARCHITECTING FOR OPERATIONS

INFRASTRUCTURE AS CODE

BENEFITS

- ▶ Automation
- ▶ Version control
- ▶ Code Review
- ▶ Testing
- ▶ Documentation
- ▶ Reuse

Source: 5 Lessons Learned From Writing Over 300,000 Lines of Infrastructure Code by Yevgeniy Brickman

<https://www.youtube.com/watch?v=RTEgE2lcyk4> <https://www.youtube.com/watch?v=RTEgE2lcyk4>

INFRASTRUCTURE AS CODE



AWS CloudFormation



HashiCorp Terraform



Azure Resource Manager

JSON / YAML

Declarative



Troposphere



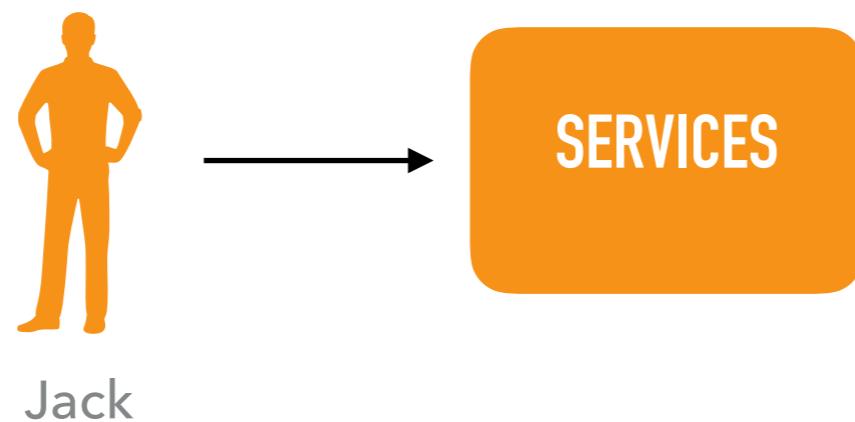
Pulumi



AWS Cloud Development Kit

Componentized

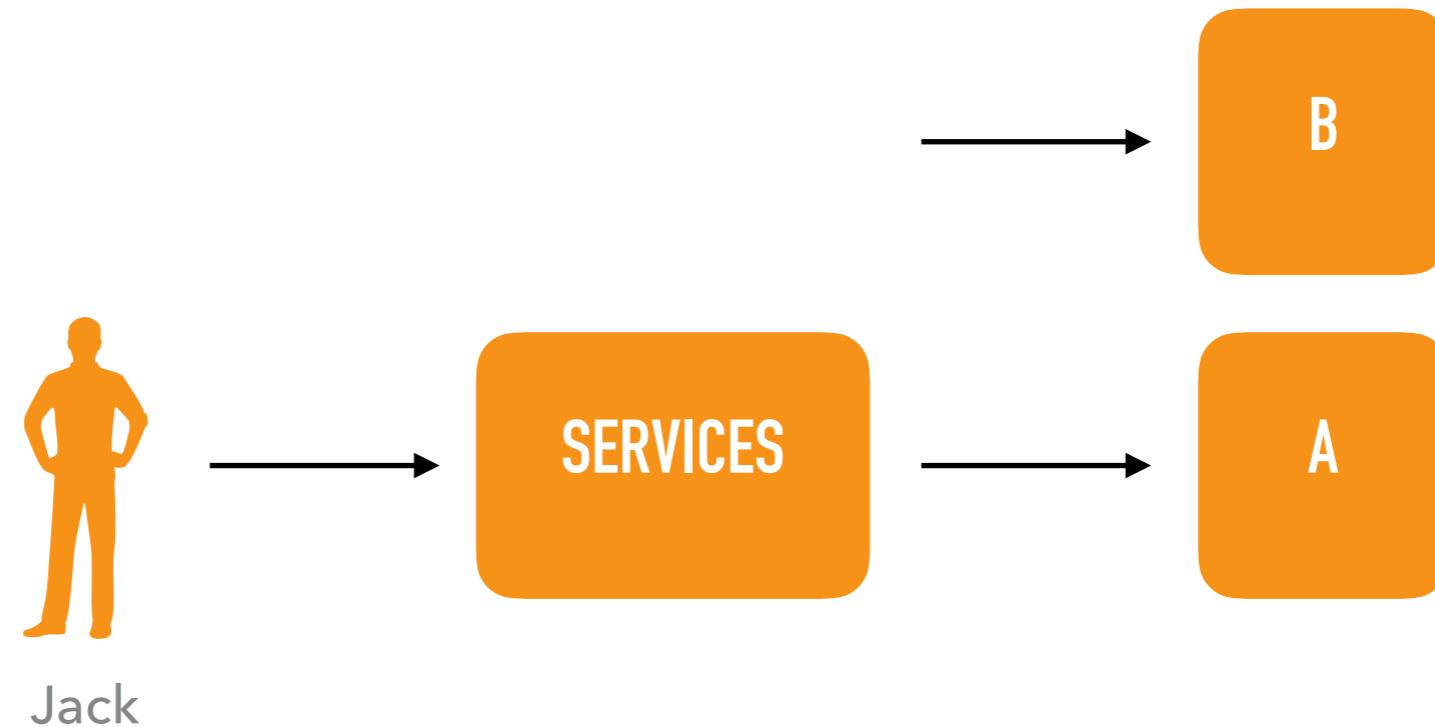
SLOW FEEDBACK LOOP



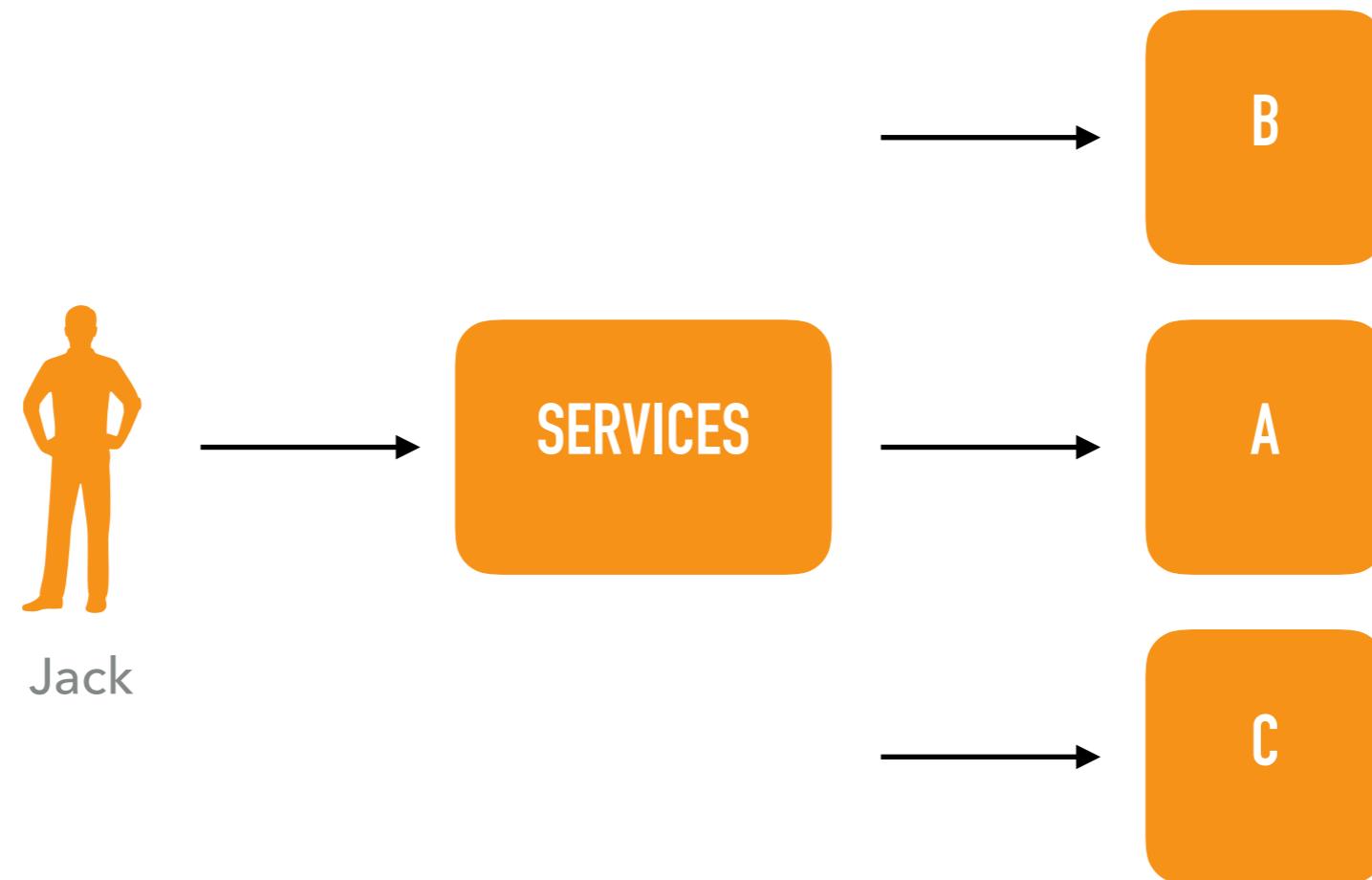
SLOW FEEDBACK LOOP



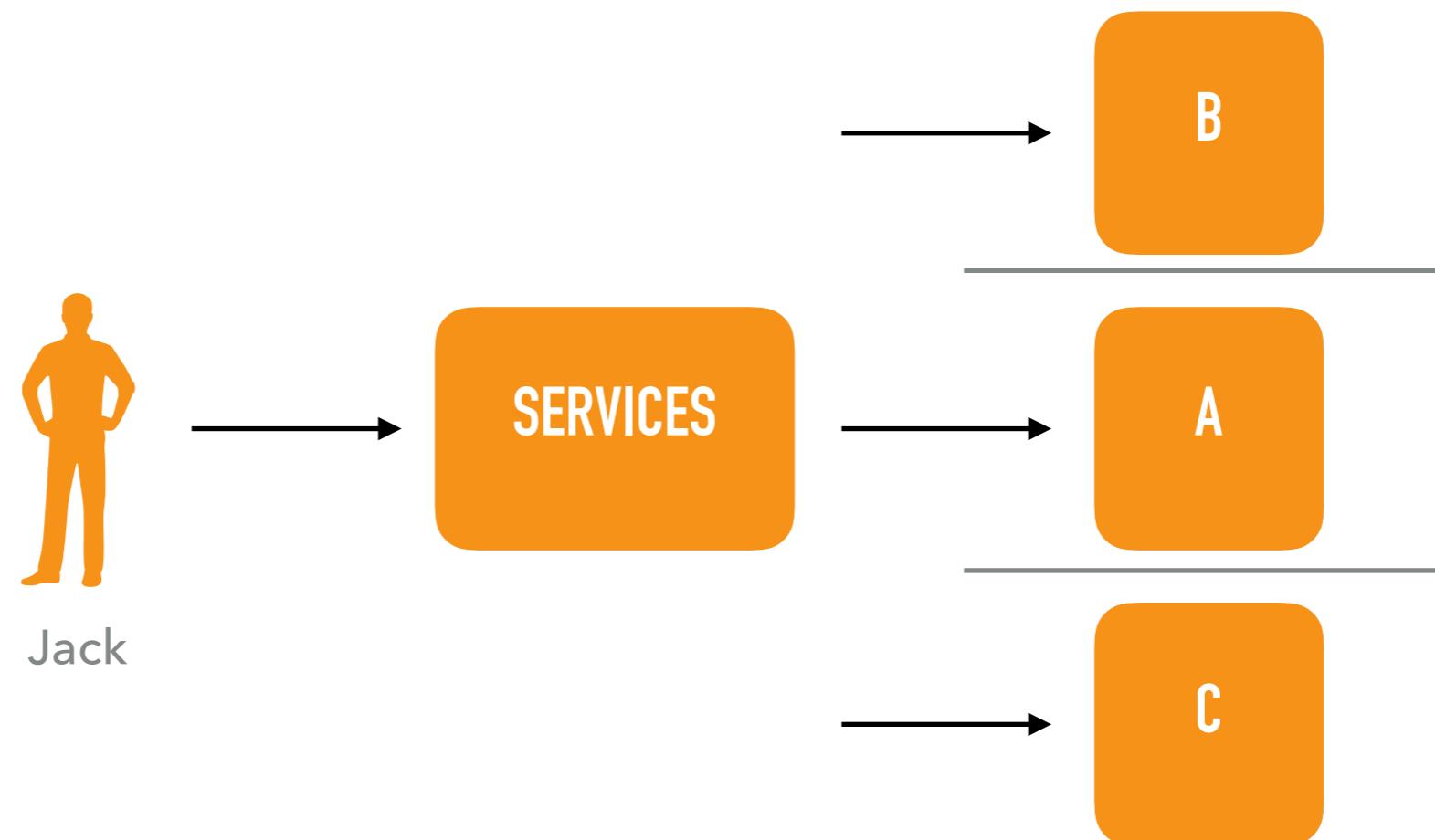
SLOW FEEDBACK LOOP



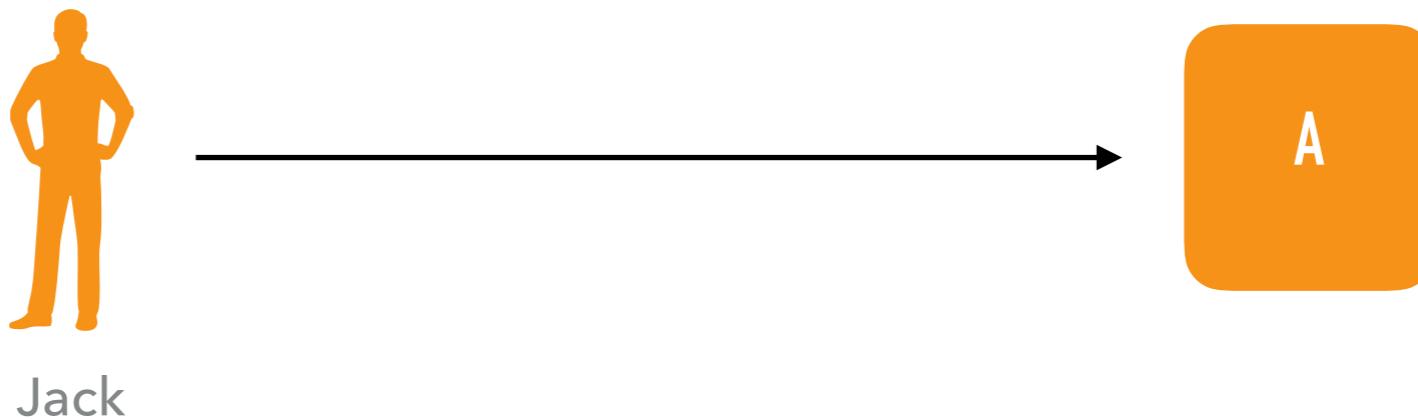
SLOW FEEDBACK LOOP



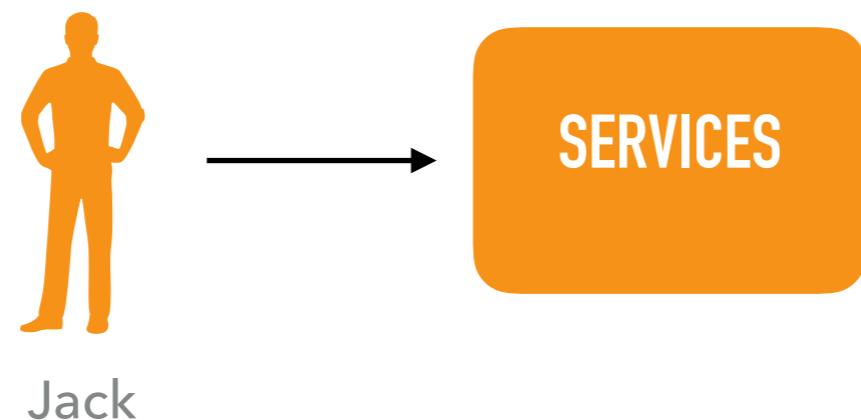
SLOW FEEDBACK LOOP



SLOW FEEDBACK LOOP



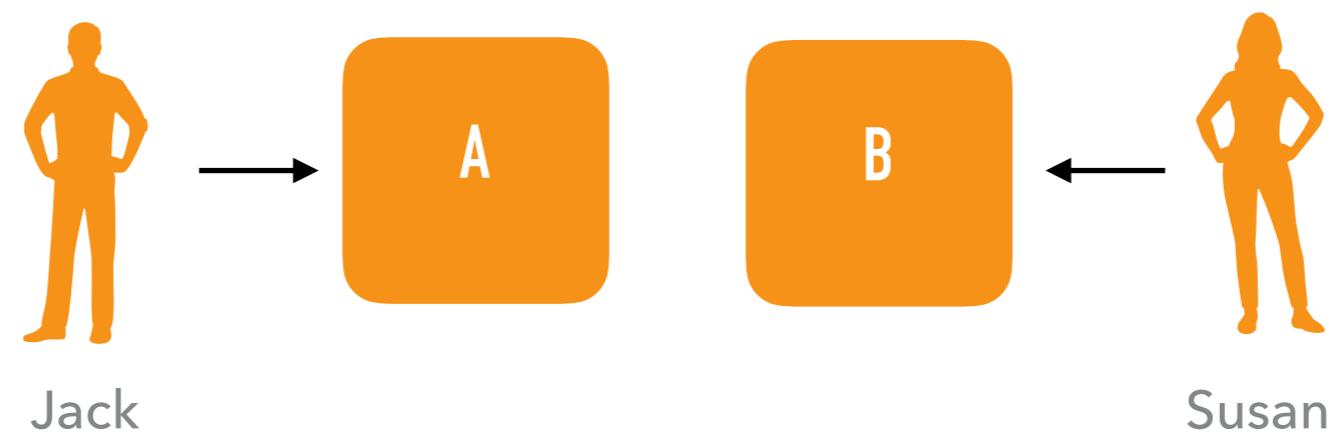
COLLISIONS DURING DEVELOPMENT



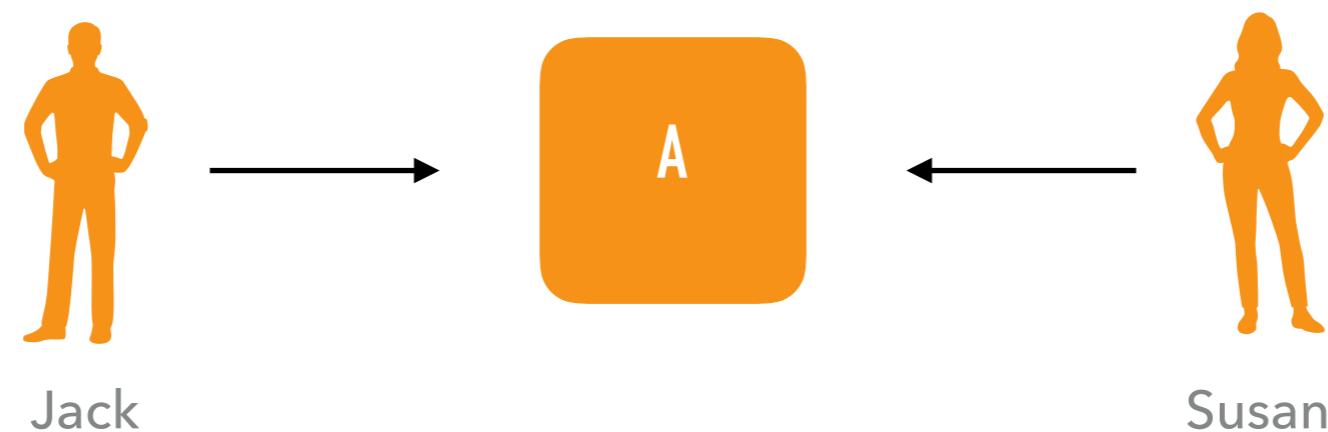
COLLISIONS DURING DEVELOPMENT



COLLISIONS DURING DEVELOPMENT



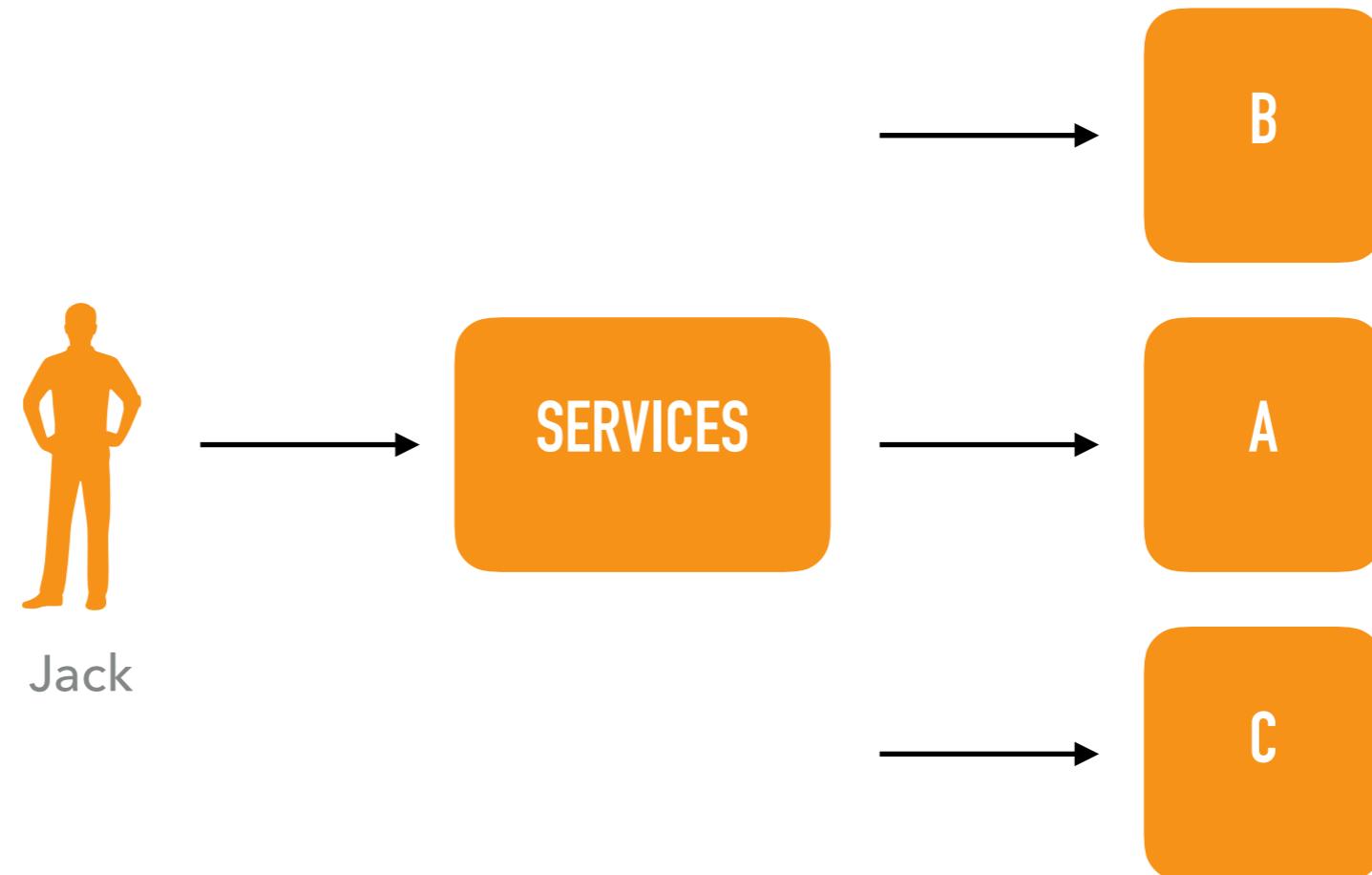
COLLISIONS DURING DEVELOPMENT



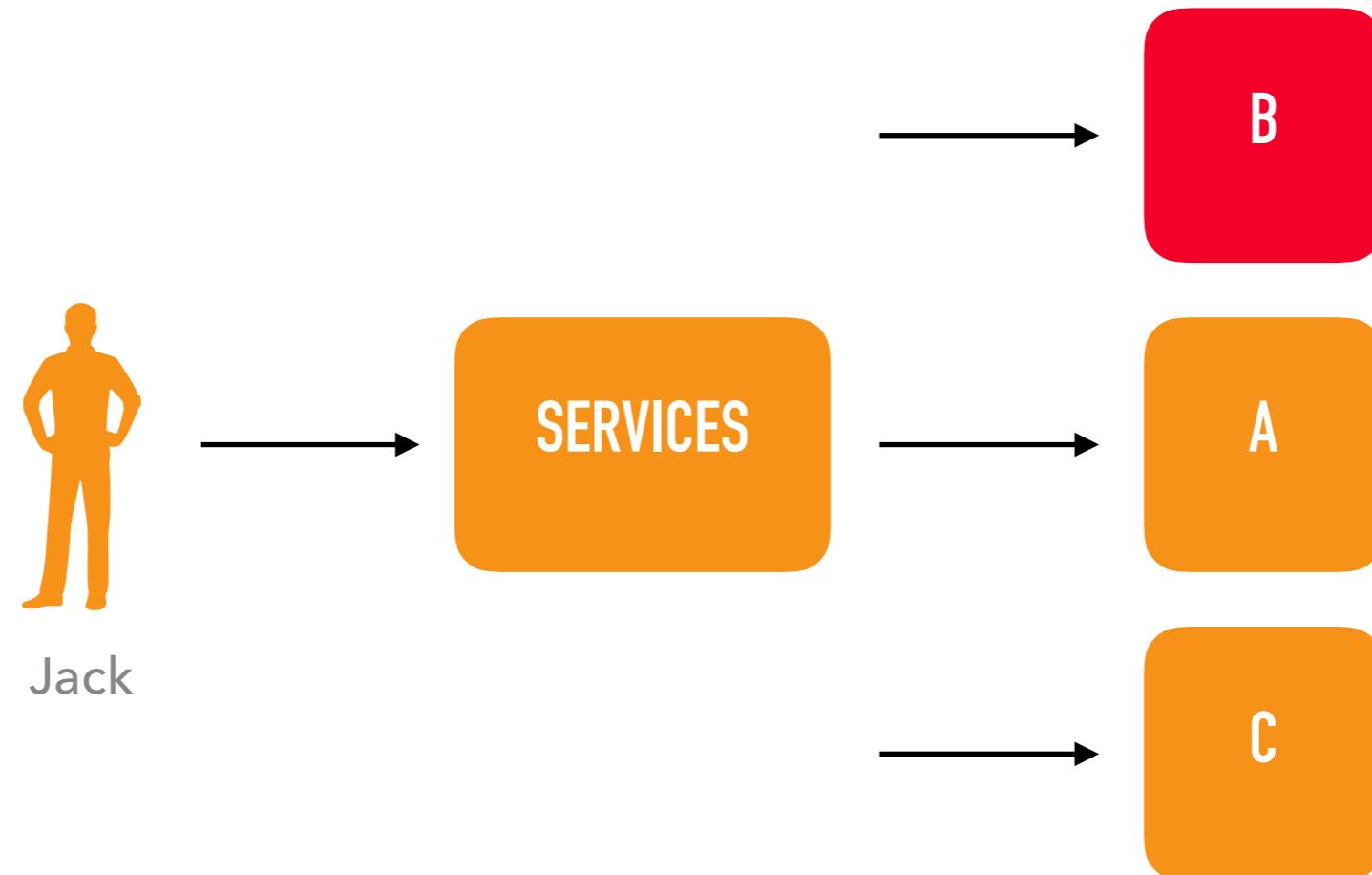
COLLISIONS DURING DEVELOPMENT



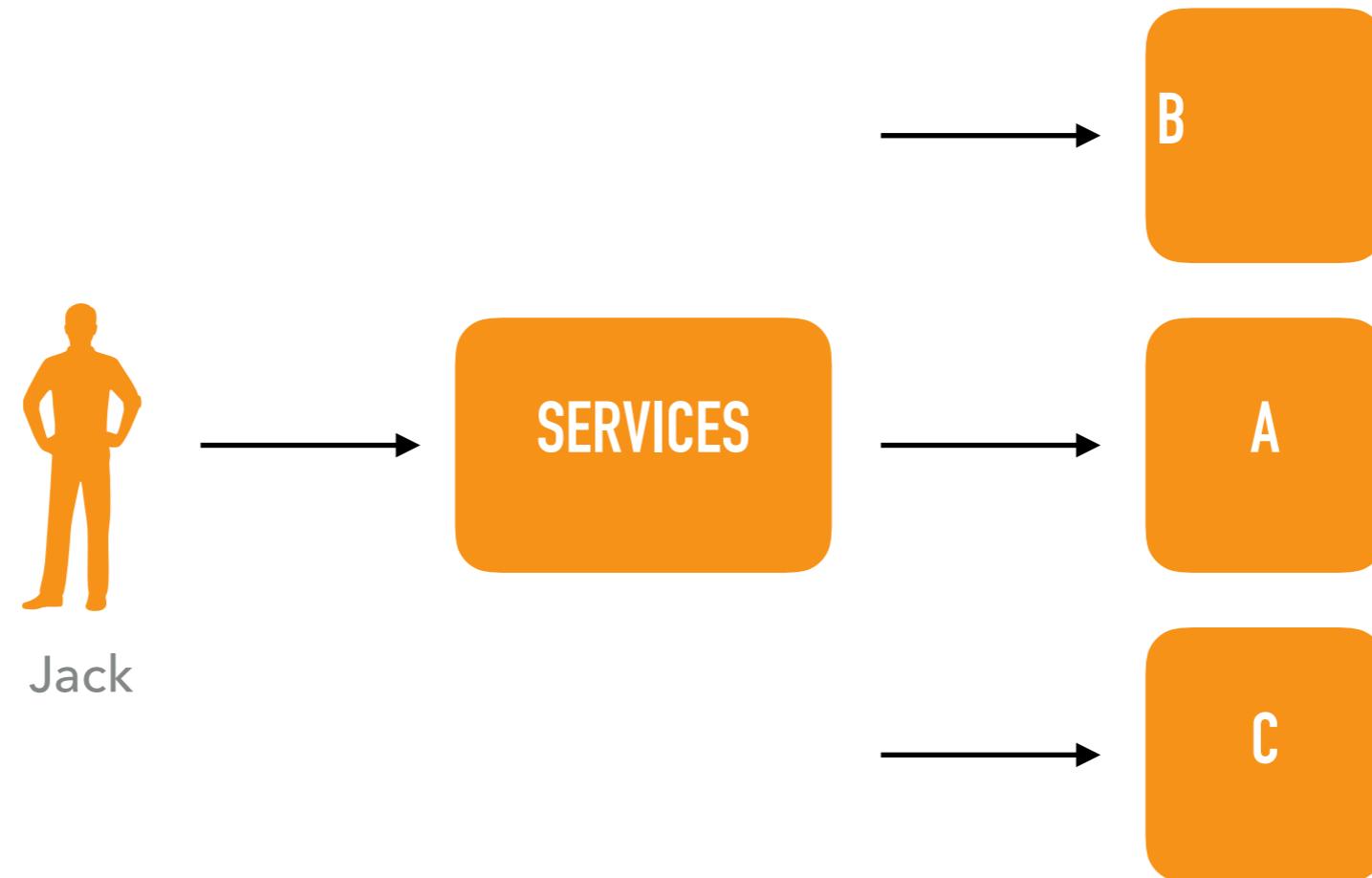
PROBLEMS



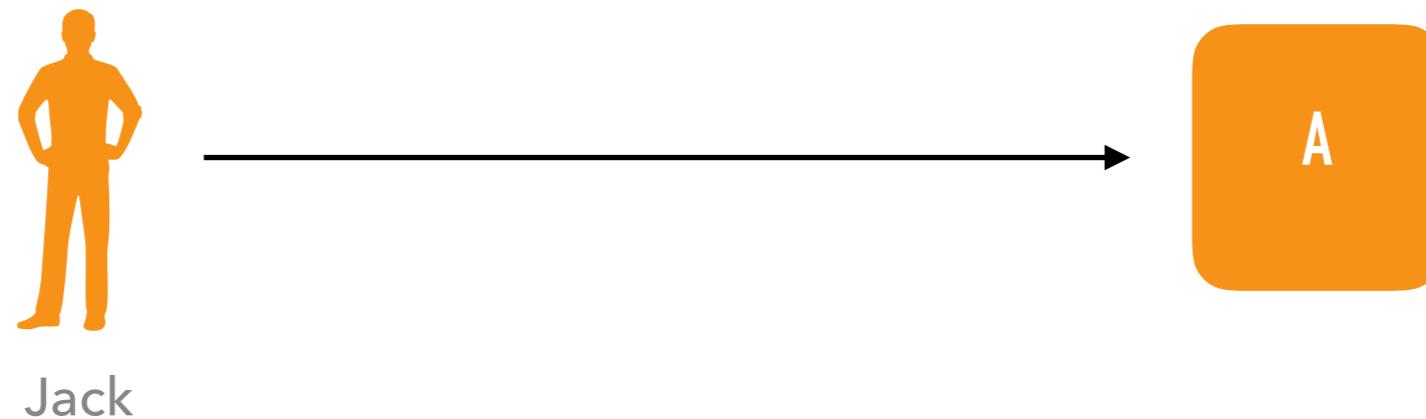
PROBLEMS: BUGS



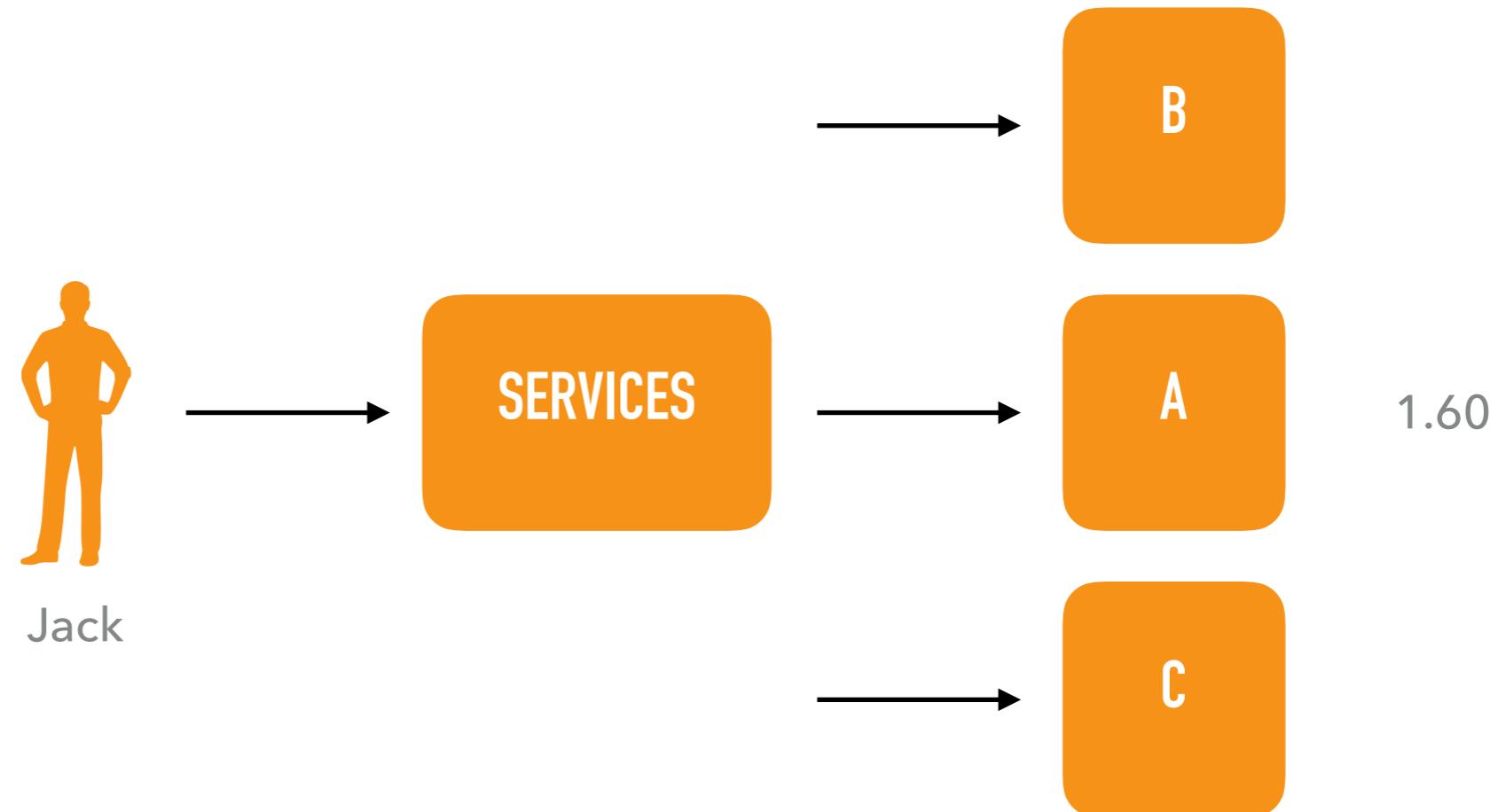
PROBLEMS: DRIFT



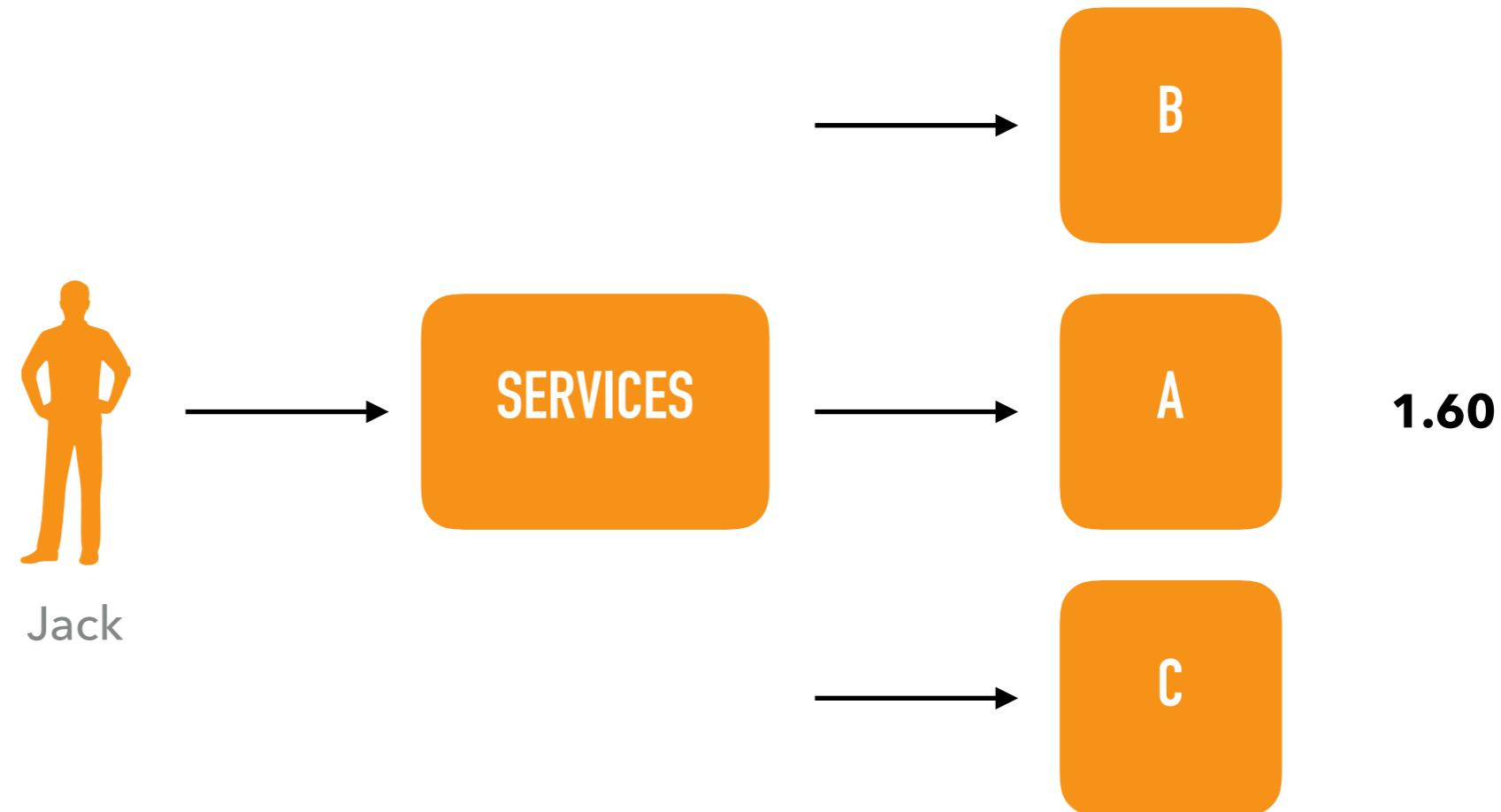
PROBLEMS



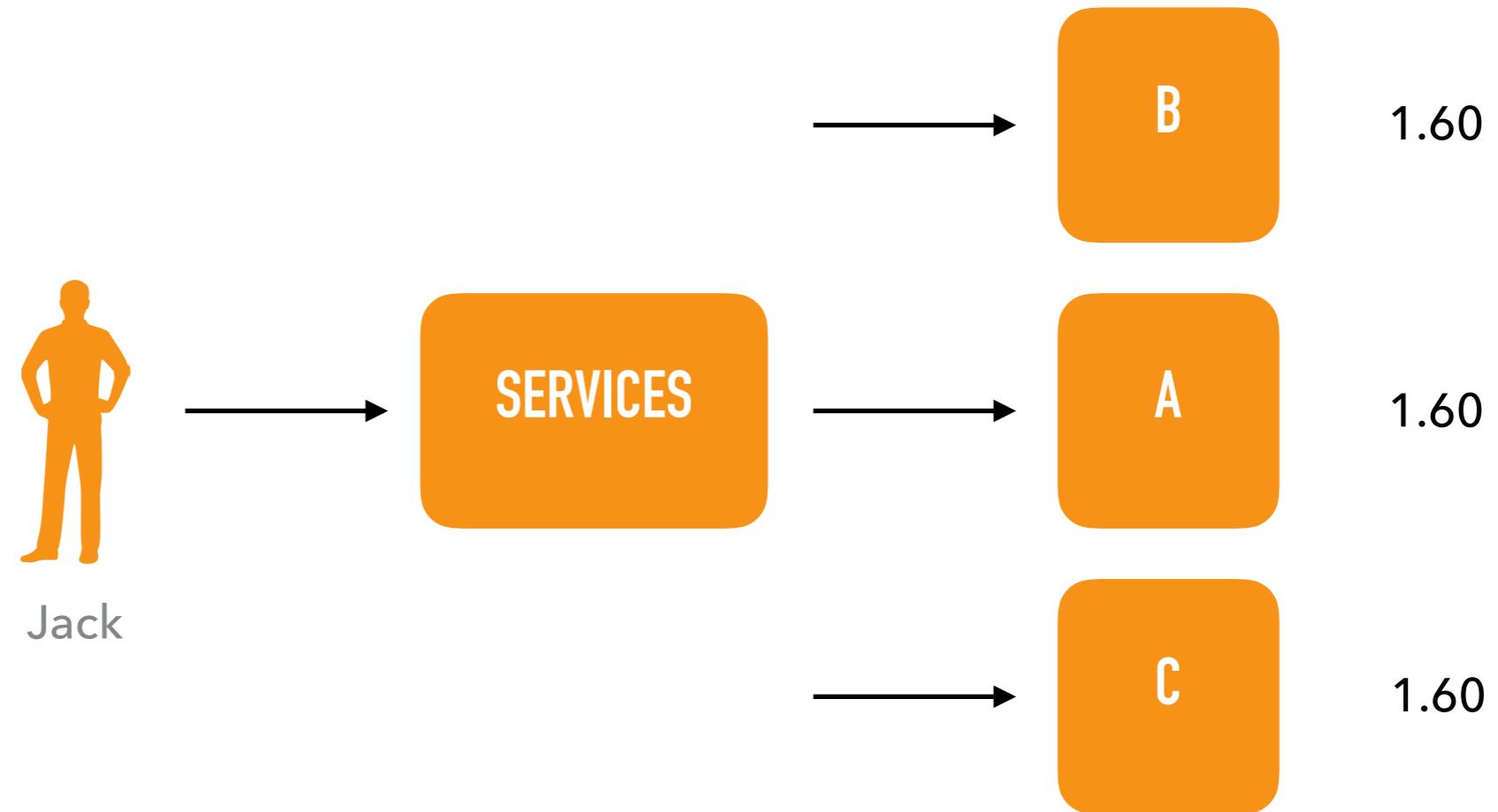
TAGGING/BRANCH DEADLOCKS



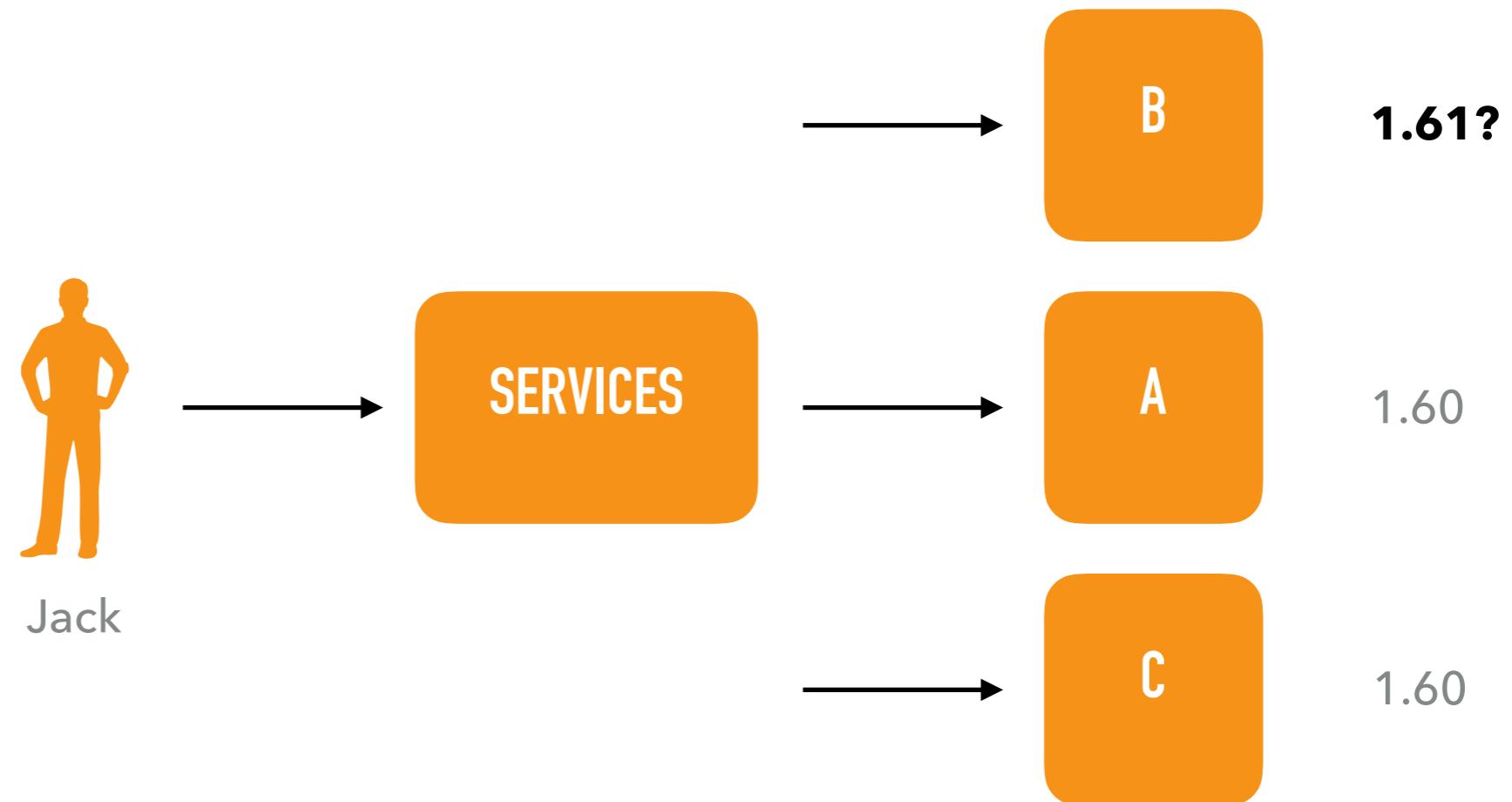
TAGGING DEADLOCKS



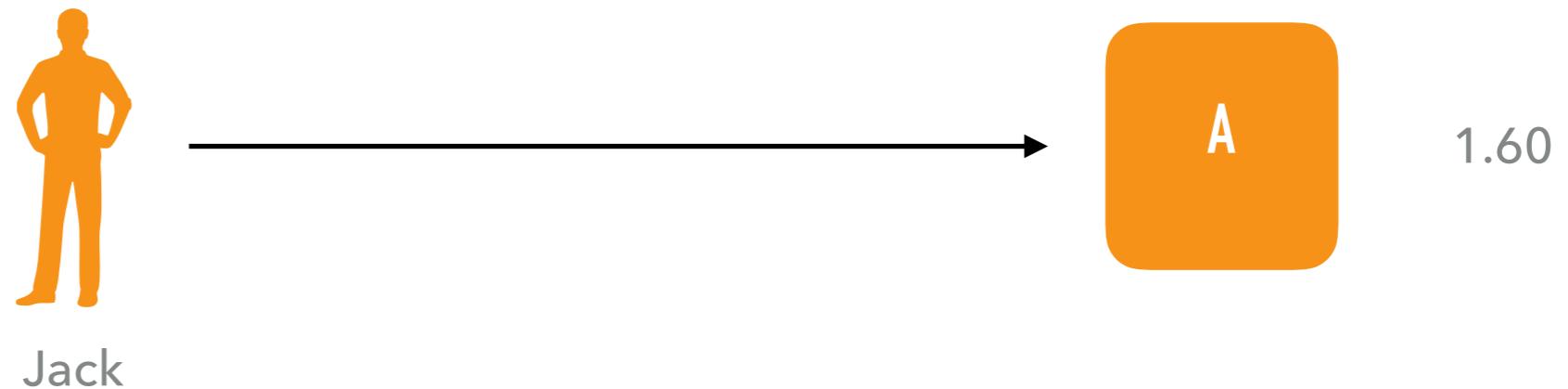
TAGGING DEADLOCKS



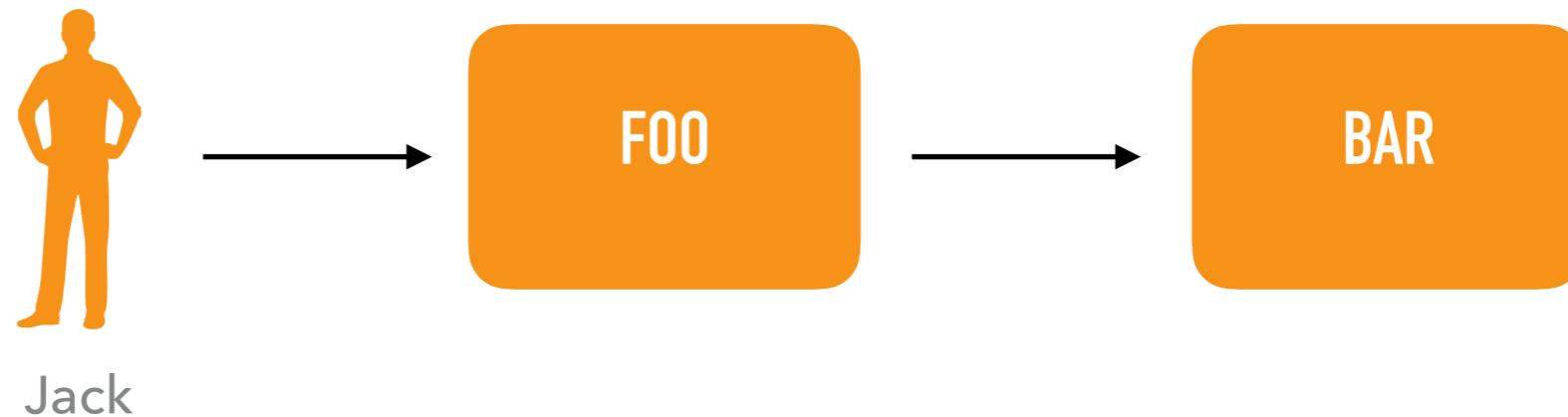
TAGGING DEADLOCKS



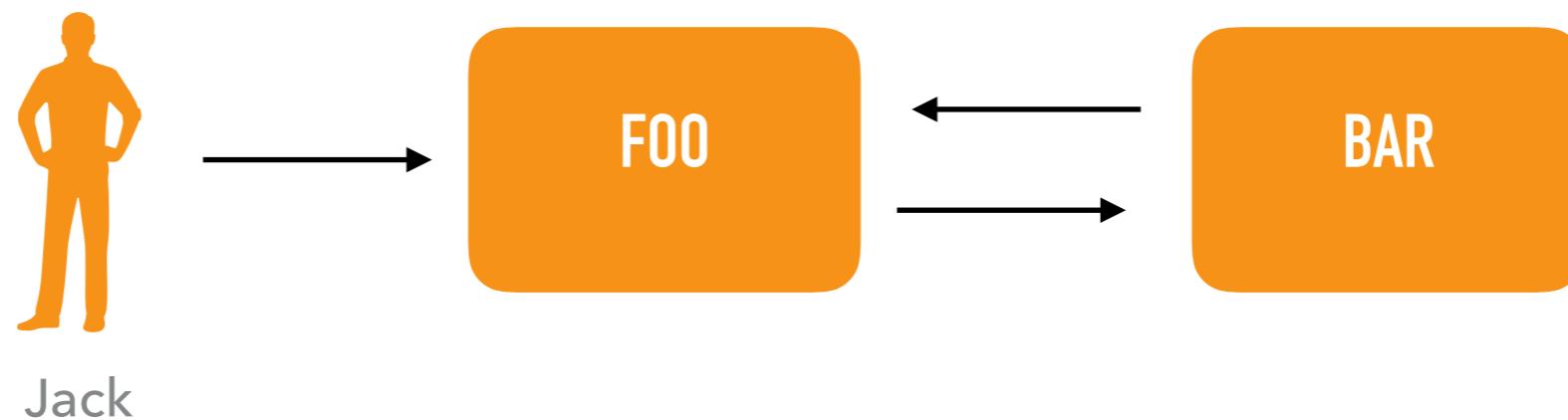
TAGGING DEADLOCKS



CYCLOMATIC DEPENDENCY



CYCLOMATIC DEPENDENCY



CHALLENGES

- ▶ Feedback speed
- ▶ Parallel development
- ▶ Complexity
- ▶ Different lifecycles
- ▶ Different teams

GUIDELINES

- ▶ Less frequent changes, higher risk, in lower layers
- ▶ Small blocks
- ▶ No cyclomatic dependencies
- ▶ Decouple independent services
- ▶ Only deploy pipelines manually

NEW APPROACH

ARCHITECTURE

DOMAIN

CONFIG

DATA

APPLICATION

SECRETS

INFRA

VPC

NETWORK

GLOBAL

ALERTING

CONFIG

BOOTSTRAP

ACCOUNTS

ROLES

SECURITY

NEW APPROACH

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SECURITY

NAMING STANDARDISATION

- ▶ Environment
- ▶ Application
- ▶ Component
- ▶ Examples:
 - ▶ /prod/billing/foo
 - ▶ /dev-susan/billing/foo
 - ▶ staging-billing-foo

CODE TRACEABILITY

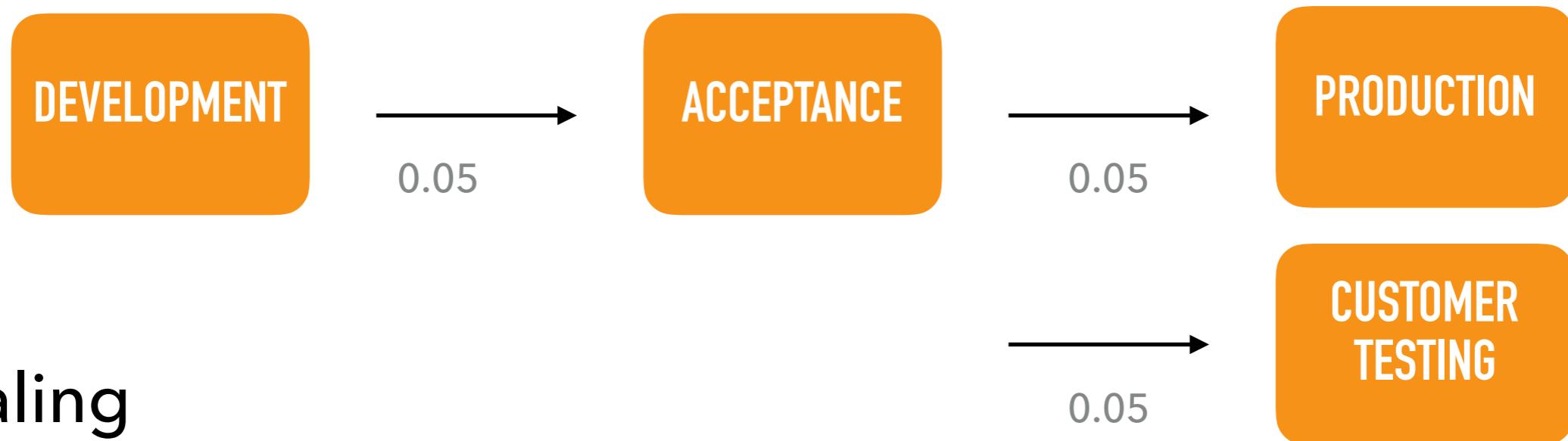
- ▶ Tag:
 - ▶ github.com/org/teamA/billing-infrastructure/stackA
- ▶ Naming:
 - ▶ Billing-application-foo -> GitHub.com/org/billing/infrastructure/src/application/foo

IDENTICAL ENVIRONMENTS



- ▶ Scaling

IDENTICAL ENVIRONMENTS



- ▶ Scaling
- ▶ Multiple environments

IDENTICAL ENVIRONMENTS



- ▶ Scaling
- ▶ Multiple environments
- ▶ Acceptance tests everything

OPEN SOURCE

- ▶ Terraform: <https://github.com/terraform-community-modules>
- ▶ AWS CDK: <https://cdkpatterns.com/>
- ▶ AWS CloudFormation: [https://aws.amazon.com/quicksstart/?](https://aws.amazon.com/quicksstart/)
- ▶ Gruntwork*: <https://www.gruntwork.io/>



PATH OF ENLIGHTENMENT

DEVOPS METRICS

LEAD TIME

DEPLOYS

CHANGE
FAILURE RATE

MEAN TIME TO
RECOVERY

DEVOPS METRICS

LEAD TIME

DEPLOYS

CHANGE
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DEVOPS METRICS

LEAD TIME

DEPLOYS

CHANGE
FAILURE RATE

MEAN TIME TO
RECOVERY

A blurry, warm-toned photograph of a car's interior. The steering wheel is prominent in the foreground on the left, and the dashboard and center console are visible in the background. The overall atmosphere is soft and out of focus.

TEST DRIVEN DEVELOPMENT



**ARCHITECTING FOR
OPERATIONS**

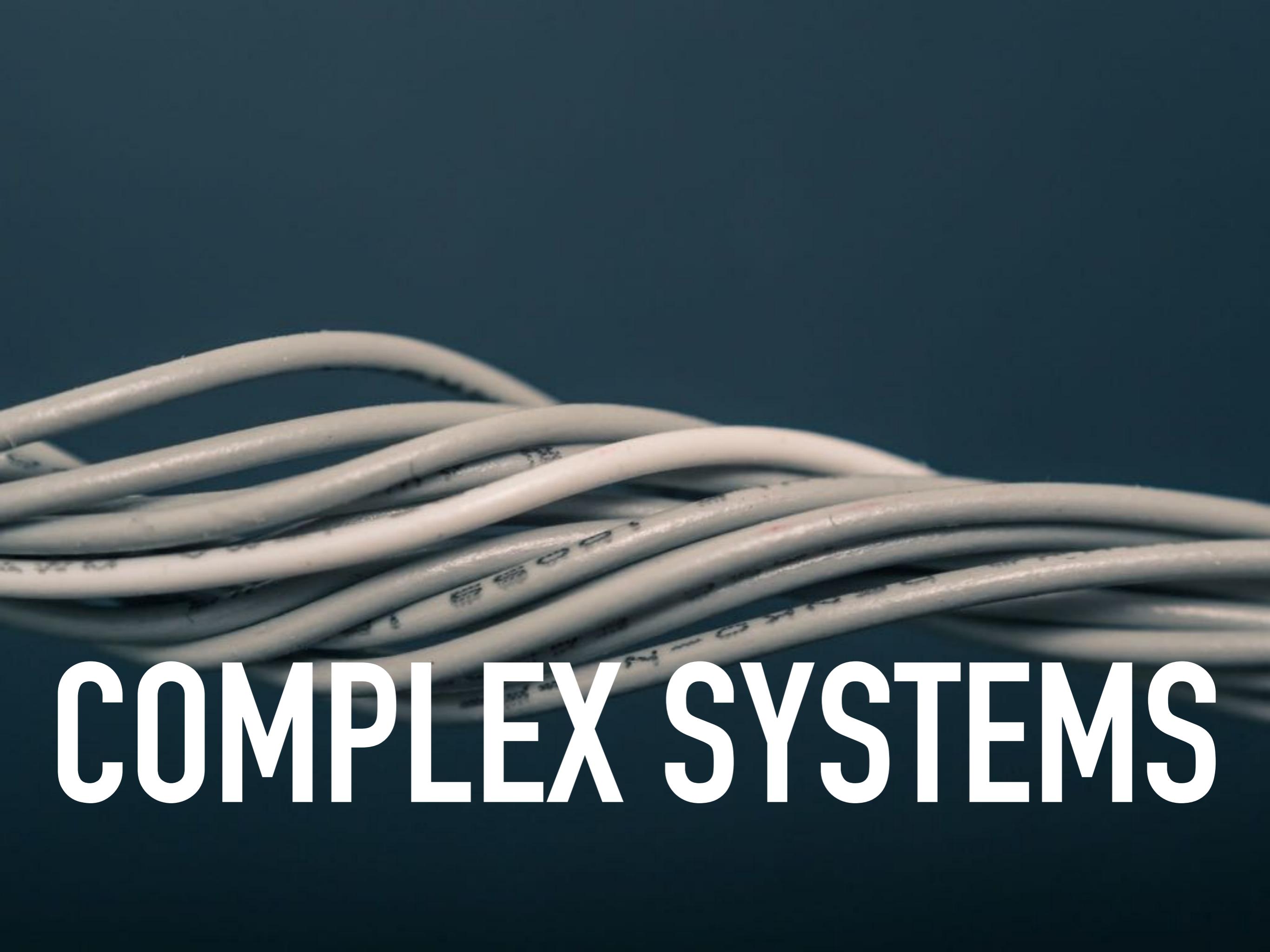
**FAILURE IS
INEVITABLE**



RUNTIME

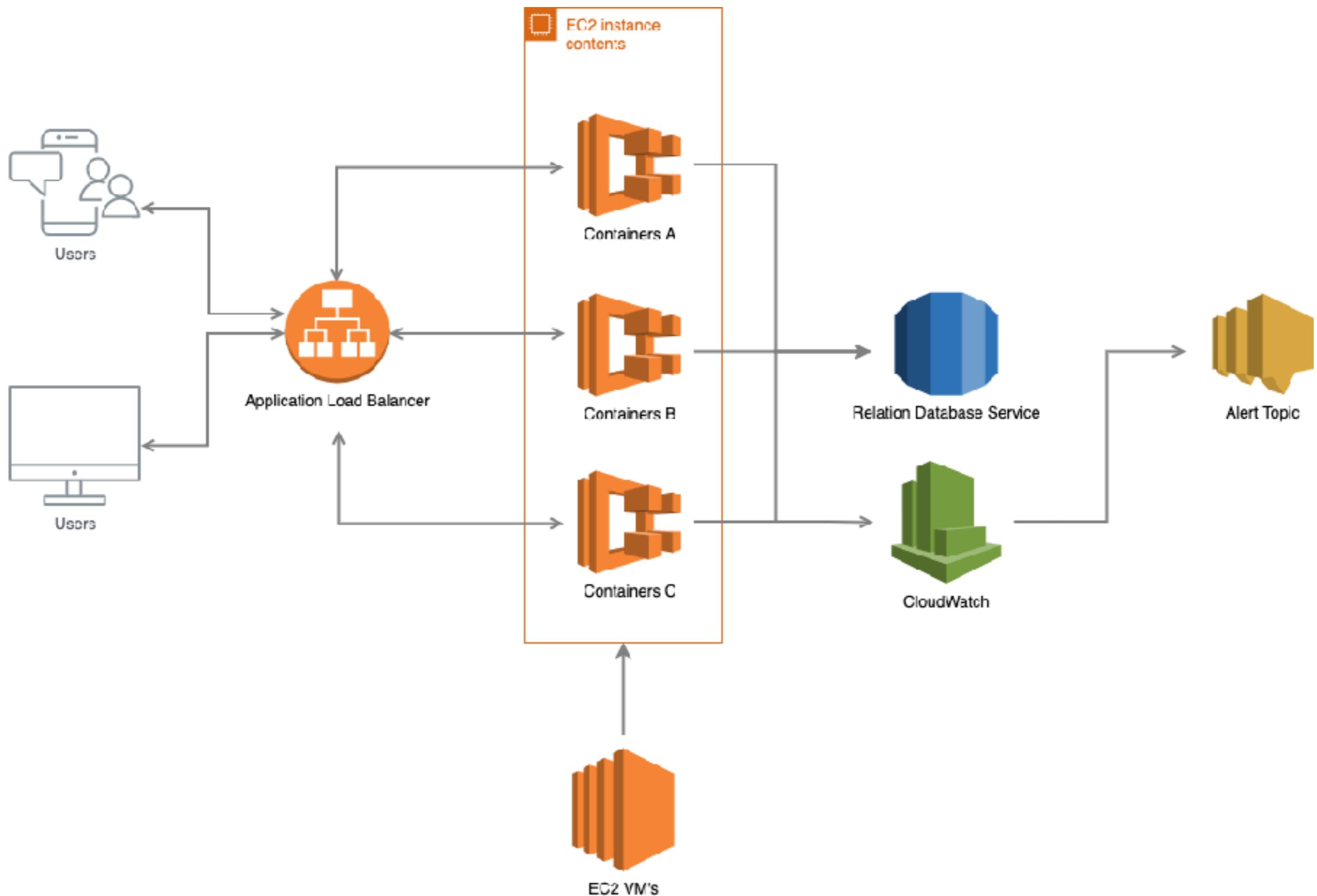
DATA

DATA



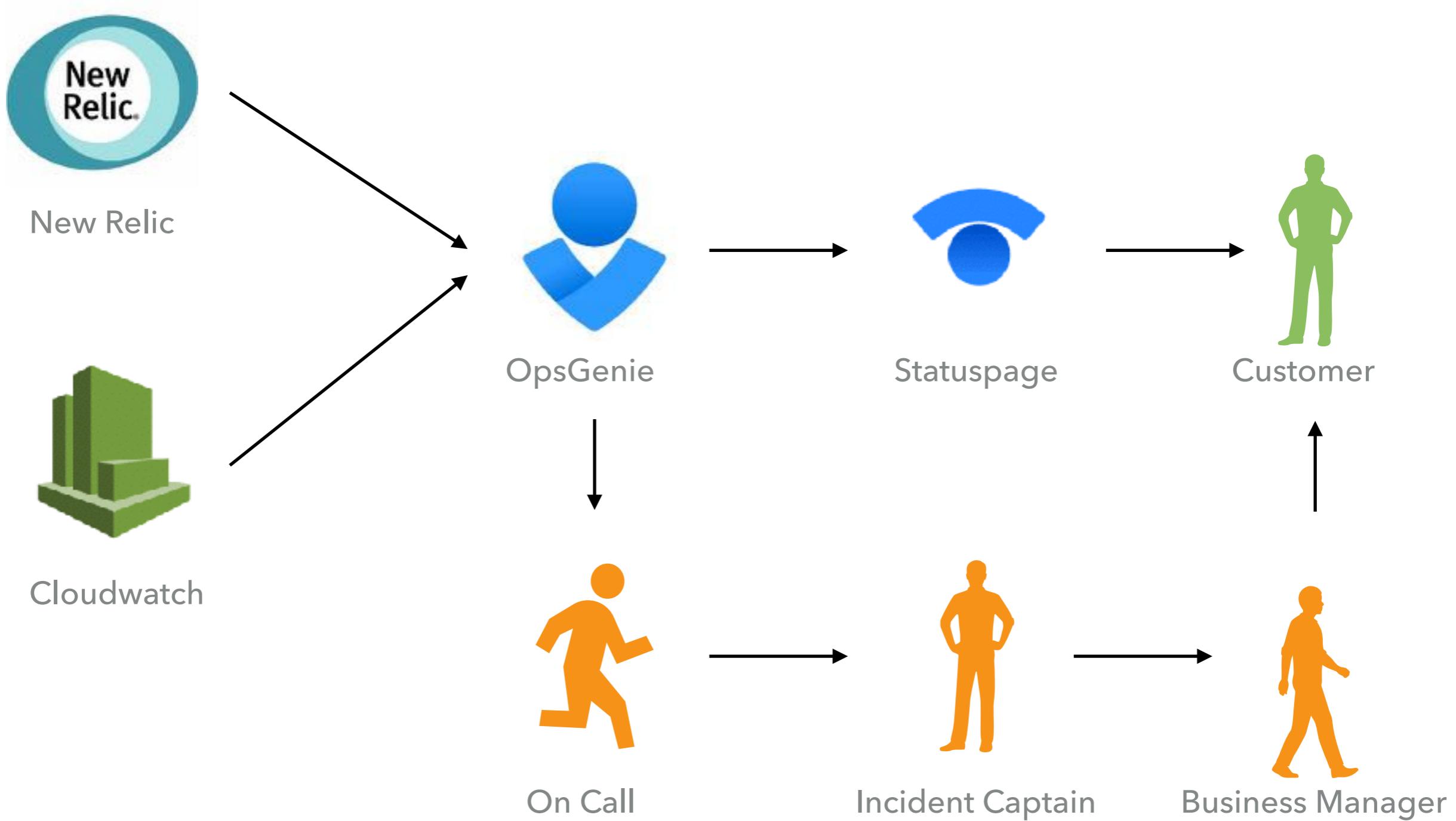
COMPLEX SYSTEMS

FAILURE IS INEVITABLE



FAILURE IS INEVITABLE

COMMUNICATION



A black and white photograph showing a close-up view of laboratory glassware. In the foreground, there is a large Erlenmeyer flask containing a clear liquid. A smaller test tube is partially inserted into the liquid. Behind it, another Erlenmeyer flask is visible, also containing liquid. To the right, a test tube rack holds several test tubes, some of which appear to have liquid in them. The lighting is dramatic, creating strong highlights and shadows on the glass surfaces.

SCIENTIFIC APPROACH

SCIENTIFIC APPROACH

- ▶ Describe objectively
- ▶ Formulate a hypothesis
- ▶ Derive an experiment
- ▶ Observe outcomes



LOOK FOR CHANGE

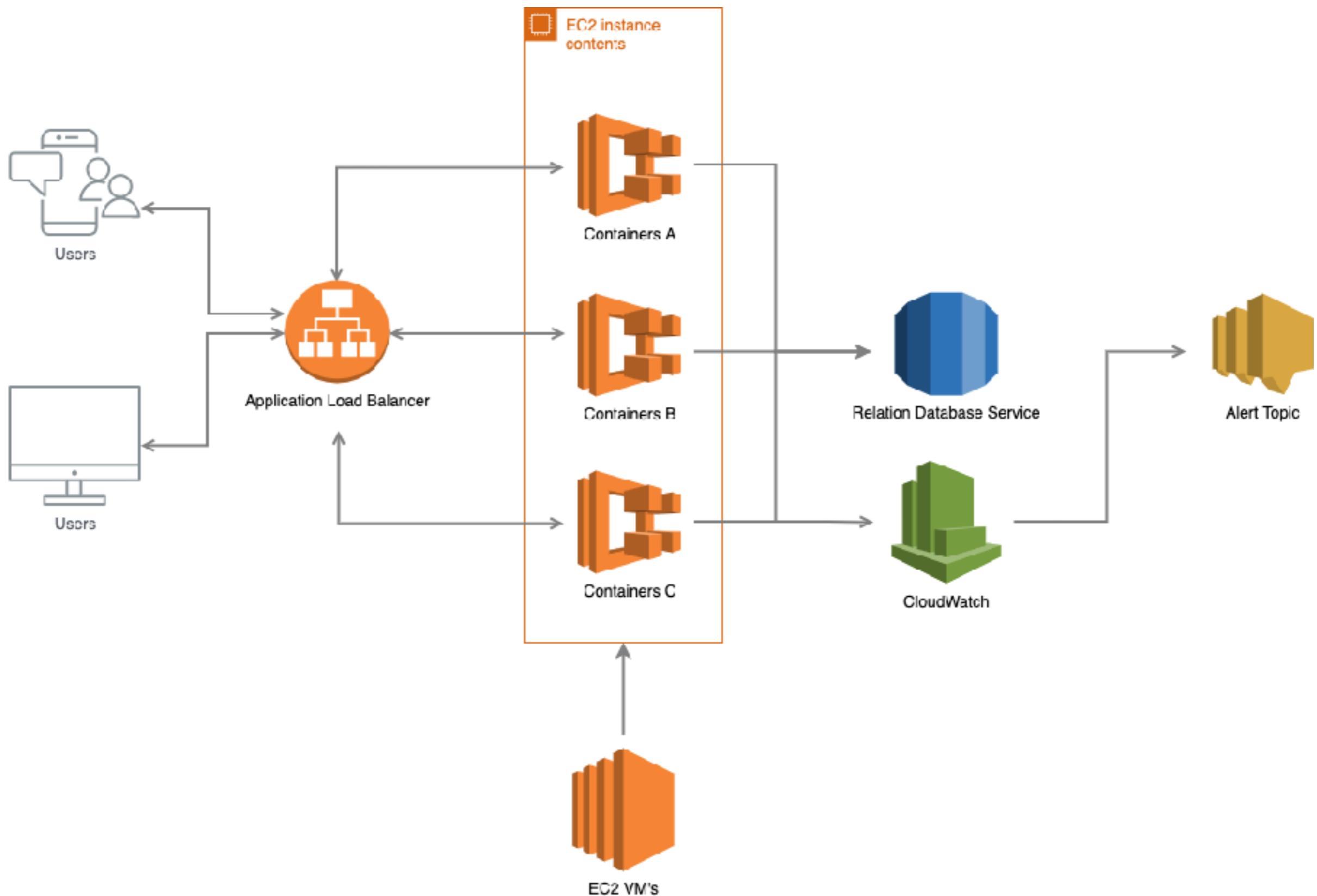


POST MORTEM

A close-up photograph of a person's hand holding a pair of sunglasses. The sunglasses have dark, reflective lenses that show a clear reflection of a dense green forest with many trees. The frames of the sunglasses are dark brown or black. The background is a solid, muted green.

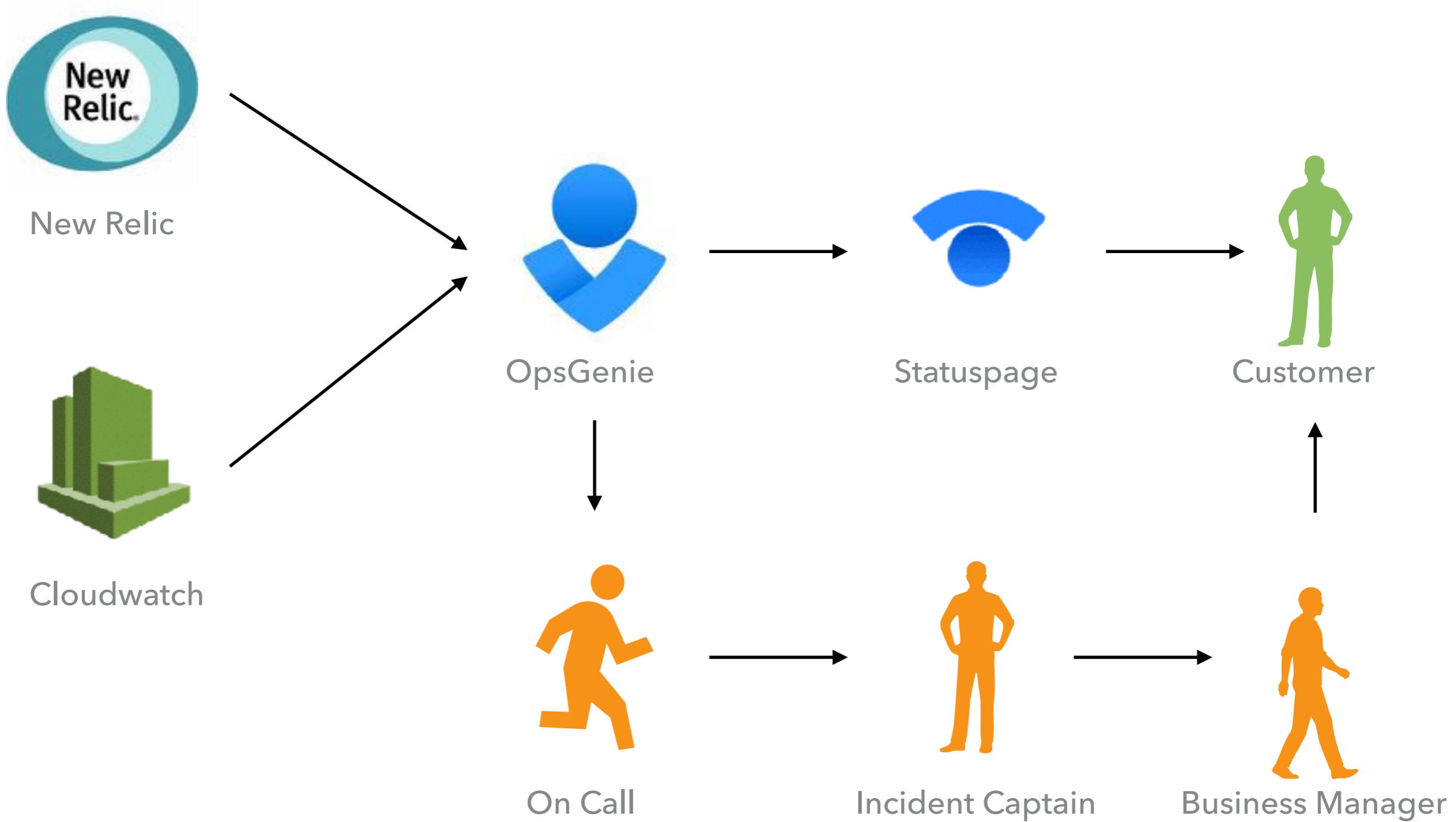
TRANSPARENCY

FAILURE IS INEVITABLE



FAILURE IS INEVITABLE

COMMUNICATION



POST MORTEM TEMPLATE

- ▶ Timeline: What happened?

- ▶ Impact

- ▶ Resolutions

- ▶ Root Cause

- ▶ Follow up

- ▶ Public Communication

- ▶ Improvements

- ▶ Organisational

- ▶ Technical



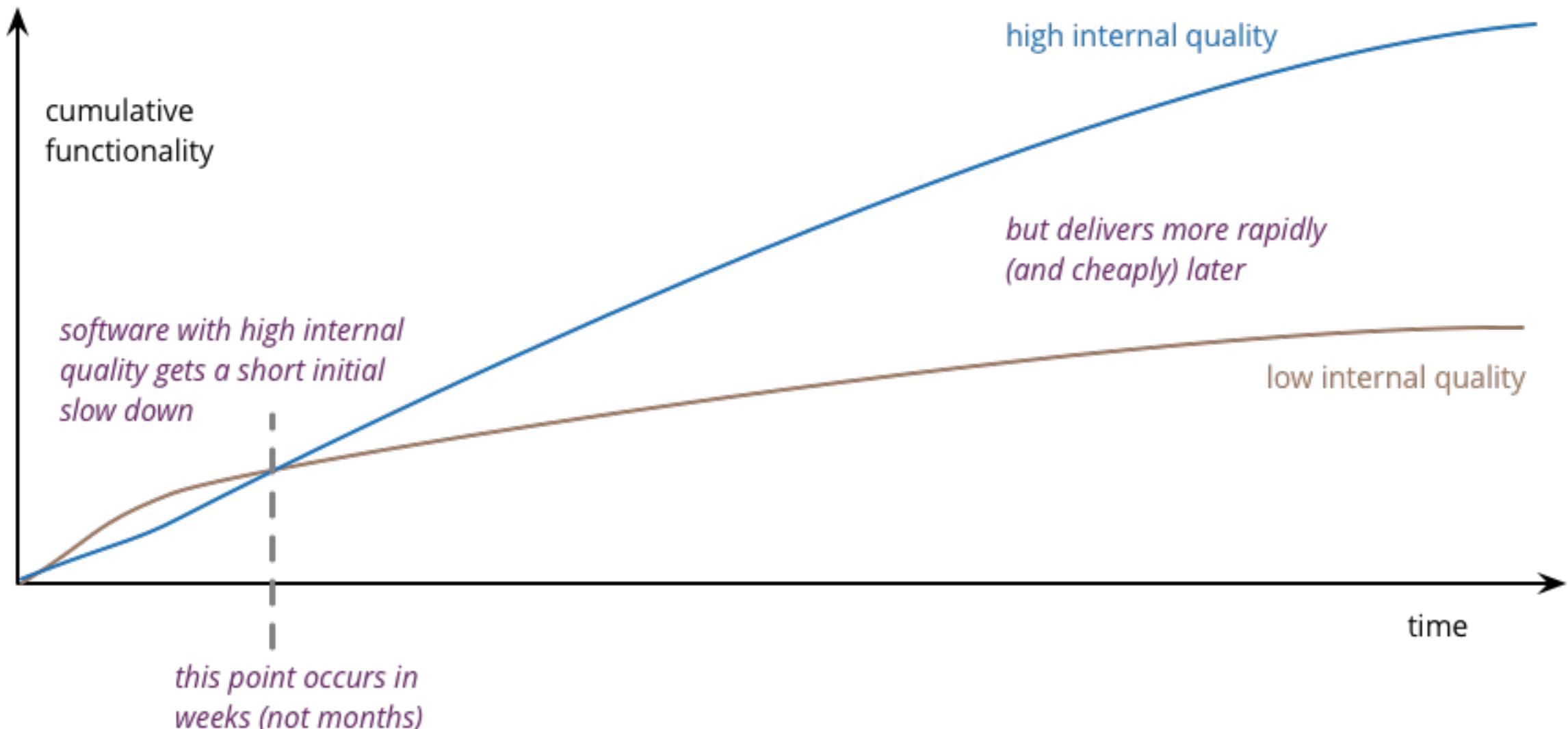
UNIQUE FAILURES



NO WORKAROUND

BUILDING FOR FAILURE

QUALITY



Source: Is High Quality Software Worth the Cost? By Martin Fowler <https://www.martinfowler.com/articles/is-quality-worth-cost.html>



BROKEN WINDOW THEORY

A wide-angle photograph of a grand concert hall. The ceiling is high and decorated with intricate gold-colored moldings and a large, multi-tiered crystal chandelier. The walls are also gold-colored and feature arched niches. In the center of the stage, an orchestra is performing, with musicians visible in their seats. The audience seating is arranged in rows, facing the stage. The overall atmosphere is formal and elegant.

STAGING



**ARCHITECTING FOR
OPERATIONS**

**BUILDING FOR
FAILURE**

PESSIMIST



An aerial photograph of a large, modern cargo ship, likely a bulk carrier or chemical tanker, painted in a vibrant red color. The ship is shown from a high angle, moving from the bottom right towards the top left across a vast expanse of blue ocean. The horizon is visible in the distance under a clear sky. The ship's hull reflects the warm light of the setting sun, creating a bright path on the water.

DEPLOYMENT STRATEGY

A dramatic photograph of a volcanic eruption. A massive, dark, billowing plume of smoke and ash rises from a volcano, dominating the center of the frame. The smoke is thick and turbulent, with various shades of grey and black. In the foreground, the dark, rocky slopes of the volcano are visible, covered in sparse vegetation. The background is filled with more clouds and smoke, creating a sense of scale and intensity.

BIG BANG RELEASES

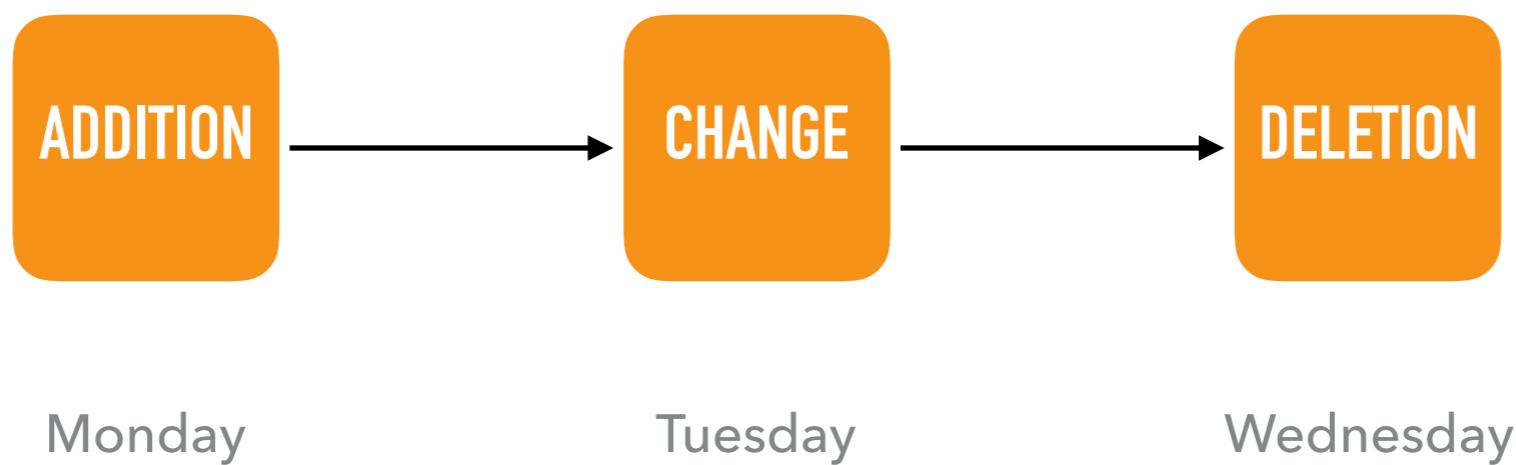
A dramatic photograph of a man in dark swim trunks leaping from a large, layered rock cliff into the ocean. He is captured mid-air, arms slightly outstretched. The cliff face is rugged and textured, with warm sunlight illuminating its upper portion. The ocean below is a deep blue with white-capped waves crashing against the base of the cliff. The sky is a pale, overcast grey.

UNSTOPPABLE RELEASES

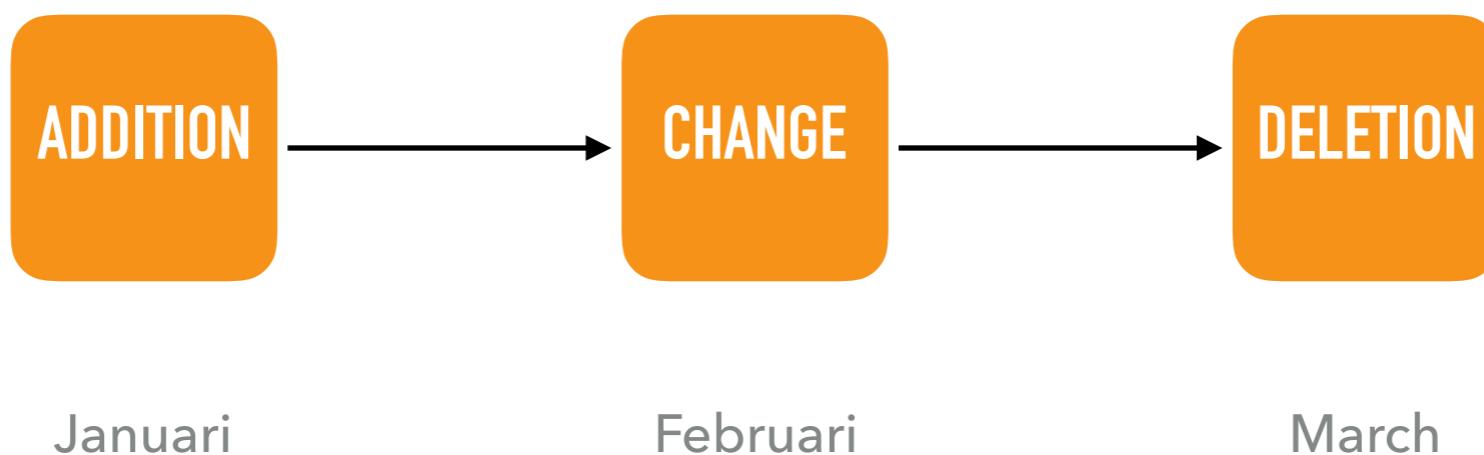
A young girl with brown hair tied back with a pink bow is sitting in a chair, looking down at her arm where a medical professional is applying a small, colorful bandage. She is wearing a white short-sleeved shirt with small holes and a rainbow-colored strap across her shoulder. A hand with a blue and red beaded bracelet is holding the bandage in place. The background shows a wooden door and a white wall.

IF IT HURTS,
DO IT MORE OFTEN

BACKWARDS COMPATIBLE



BACKWARDS COMPATIBLE





ALWAYS PUSH TO PRODUCTION

FEATURE TOGGLERS



SIMPLE FEATURE TOGGLES

```
function calculate(){  
  
    if( featureToggle("use-new-algorithm") ){  
  
        return newCalculation();  
  
    }else{  
  
        return oldCalculation();  
  
    }  
  
}
```



HOPE IS NOT A STRATEGY

GRACEFUL DEGRADATION



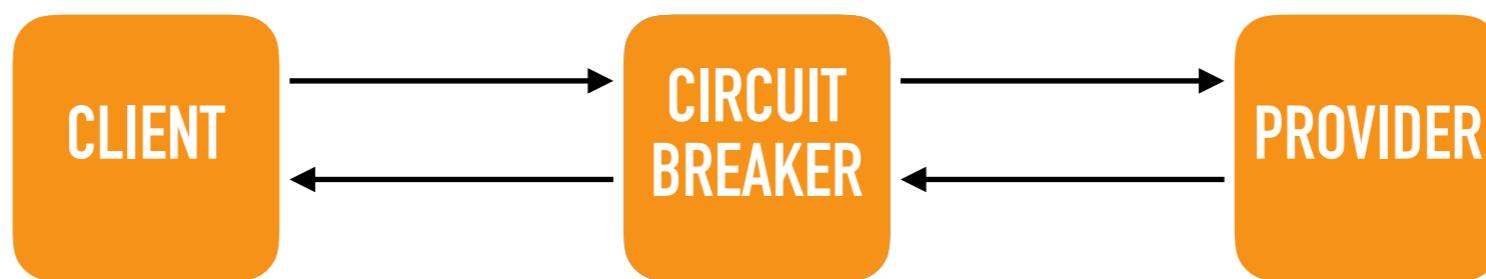
GRACEFUL DEGRADATION

- ▶ Return less precise data
 - ▶ Incomplete data
 - ▶ Cached data
 - ▶ Preset data
 - ▶ No data

CIRCUIT BREAKER

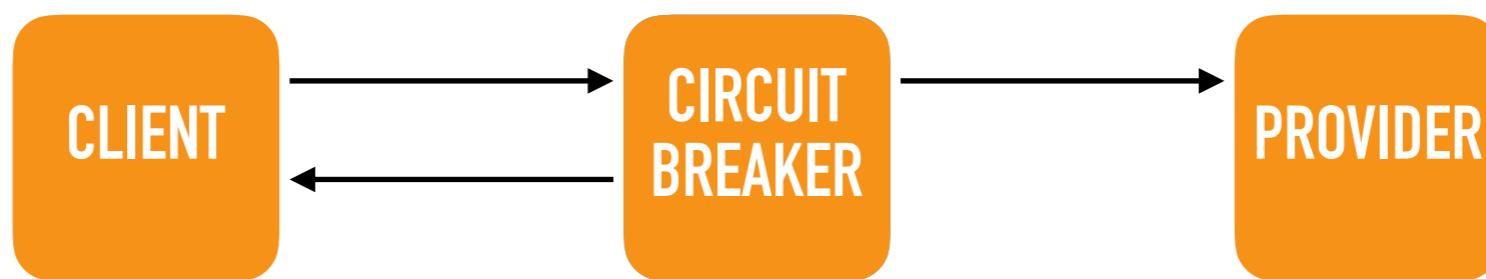


CIRCUIT BREAKER



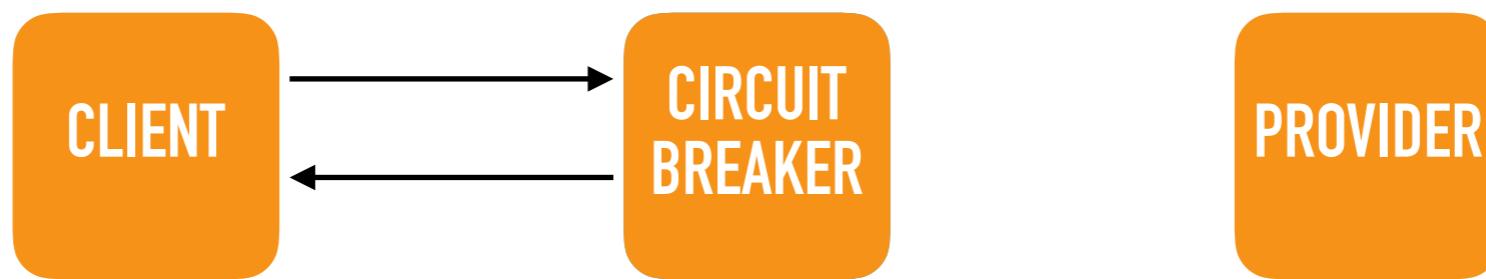
NORMAL

CIRCUIT BREAKER



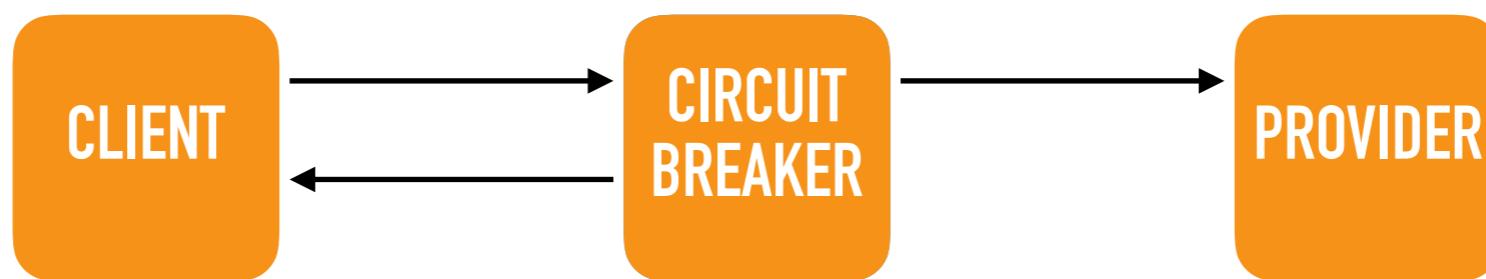
TIMEOUT

CIRCUIT BREAKER



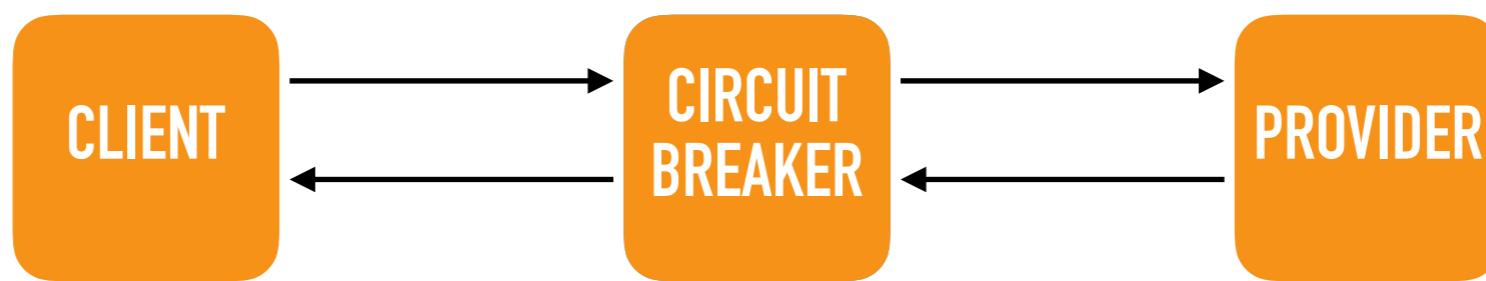
CIRCUIT OPEN

CIRCUIT BREAKER



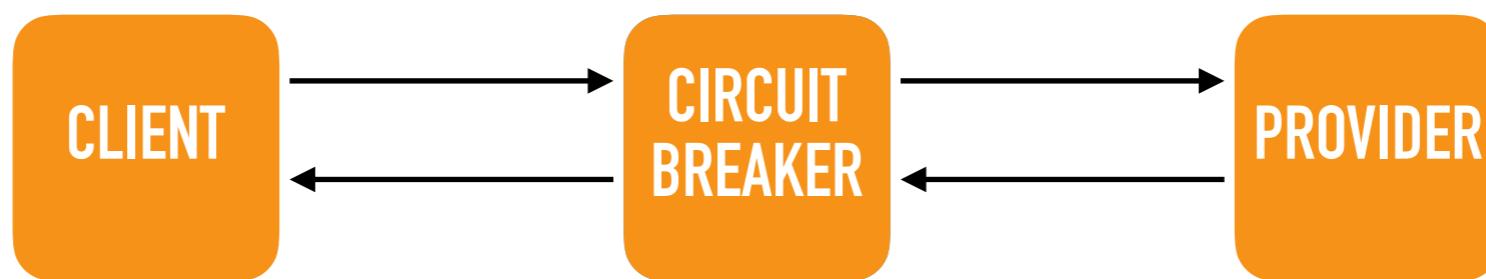
TRIAL

CIRCUIT BREAKER



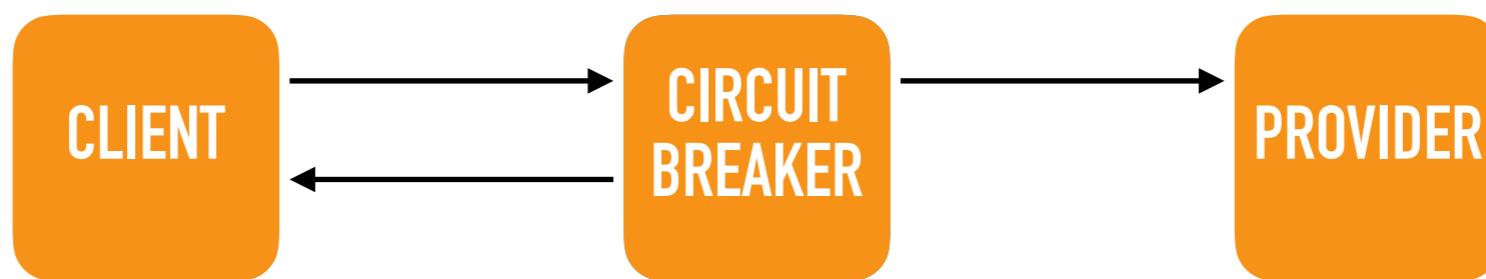
RECOVERY

CIRCUIT BREAKER



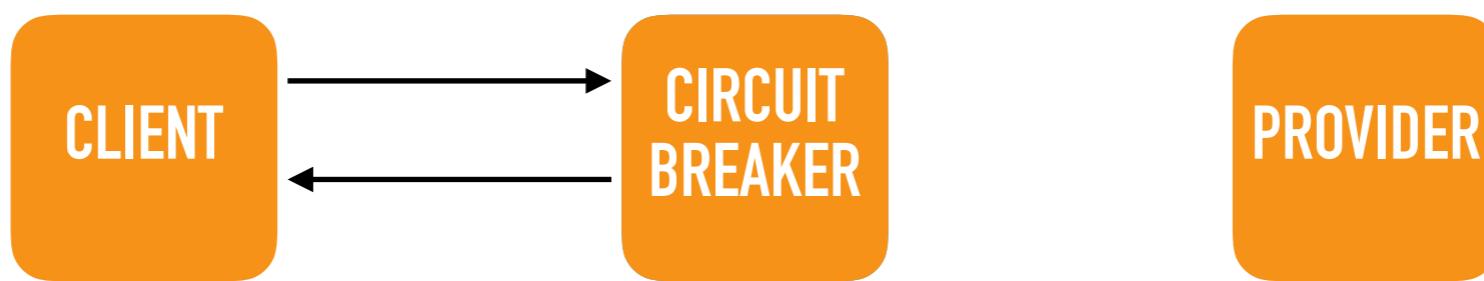
NORMAL

CIRCUIT BREAKER



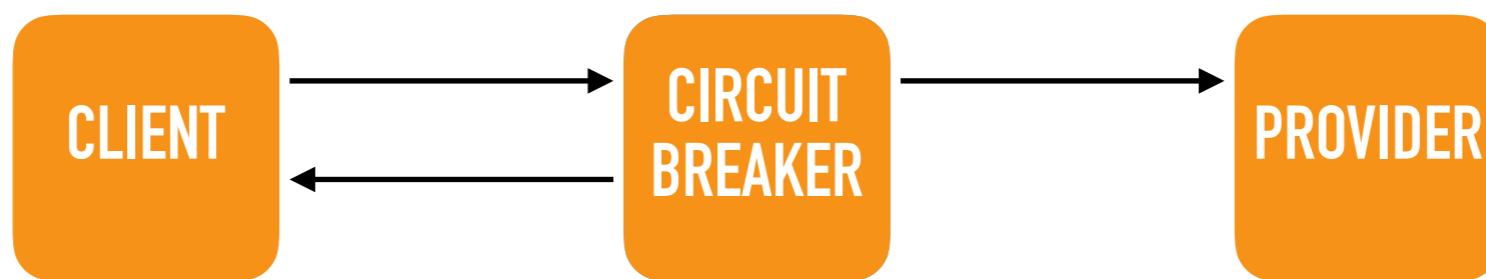
TIMEOUT

CIRCUIT BREAKER



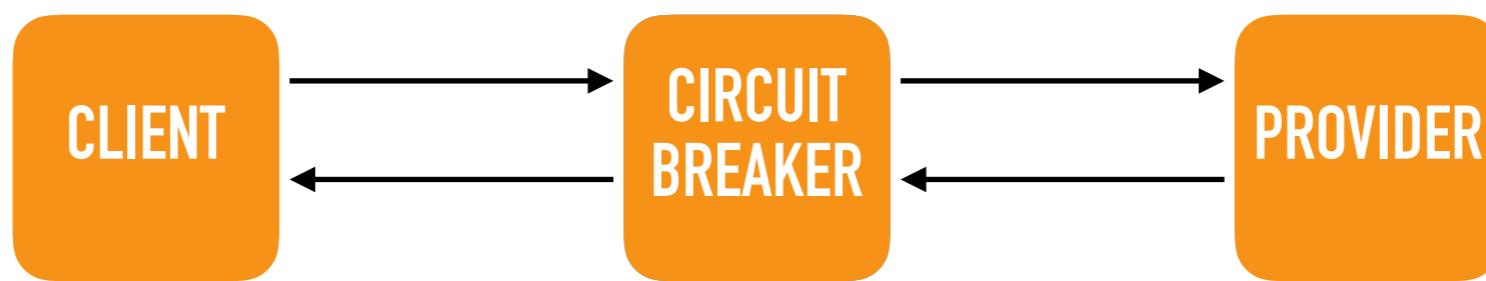
CIRCUIT OPEN

CIRCUIT BREAKER



TRIAL

CIRCUIT BREAKER

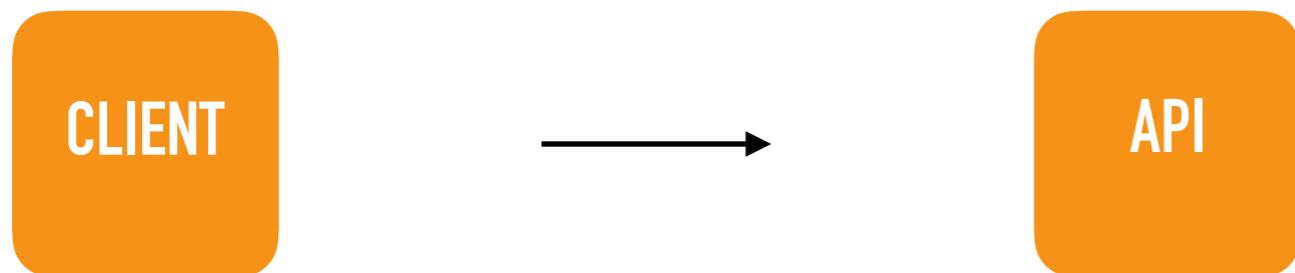


RECOVERY



ASYNCHRONOUS

ASYNCHRONOUS



Source: Asynchronous patterns for Cloud Functions by Preston Holmes <https://cloud.google.com/community/tutorials/cloud-functions-async>

ASYNCHRONOUS



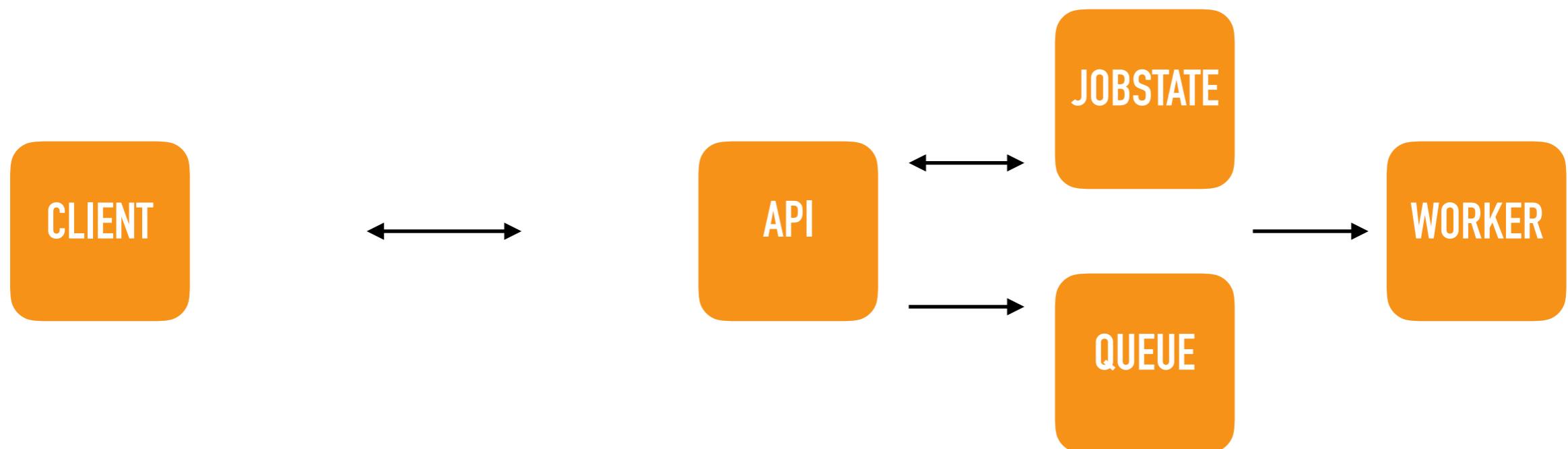
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ASYNCHRONOUS



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ASYNCHRONOUS



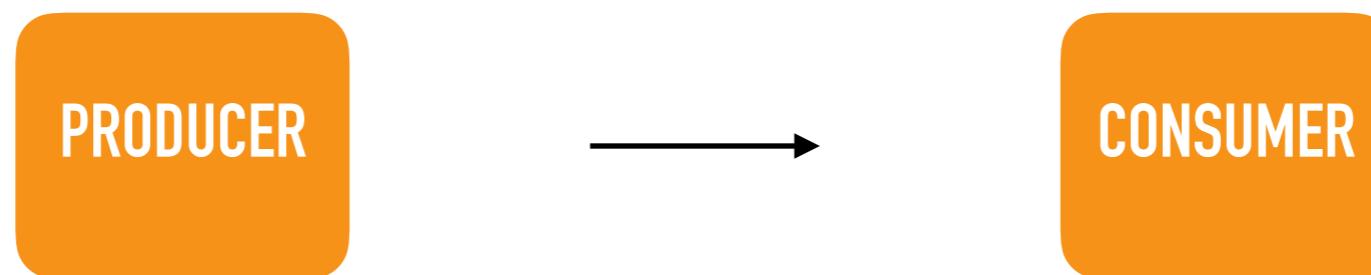
Source: Asynchronous patterns for Cloud Functions by Preston Holmes <https://cloud.google.com/community/tutorials/cloud-functions-async>

EVENT DRIVEN



BUILDING FOR FAILURE

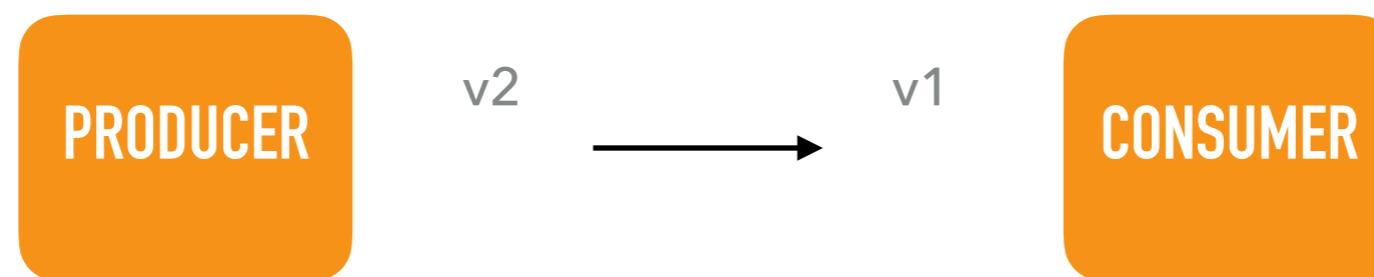
EVENT DRIVEN



Source: Event Driven by Martin Fowler <https://martinfowler.com/articles/201701-event-driven.html>

BUILDING FOR FAILURE

EVENT DRIVEN



EVENT DRIVEN



QUALITY VS INNOVATION



SITE RELIABILITY ENGINEERING

- ▶ How much quality have we agreed upon?
- ▶ How much quality do we provide?
- ▶ How much quality do we want?



QUANTIFY QUALITY

ERROR BUDGET





TOIL

TOIL

- ▶ Designate Engineer
- ▶ Focus on incidents
- ▶ Shields the team
- ▶ Engineers solutions
- ▶ Close collaboration with Product Owner



OBSERVABILITY

FAKE POSITIVES



USER NOTIFICATIONS



CONCLUSION

ATTRIBUTION

- ▶ Sources are on bottom of the slides
- ▶ All pictures are from unsplash.com and their creators

CONCLUSION

FURTHER READING

AWS Well-Architected Framework

November 2018



Source: AWS Well-Architected Framework Whitepaper <https://aws.amazon.com/architecture/well-architected/>

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ANY QUESTIONS?

