Cloud Native Application

Cloud Foundry and Microservices

Derrick Wong

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Microservices Overview

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DEFINE: Microservice

If every service has to be updated in concert, it's not loosely coupled!

Loosely coupled service oriented architecture with bounded contexts

If you have to know about surrounding services you don't have a bounded context.

Adrian Cockcroft, Former Netflix Chief Cloud Architect

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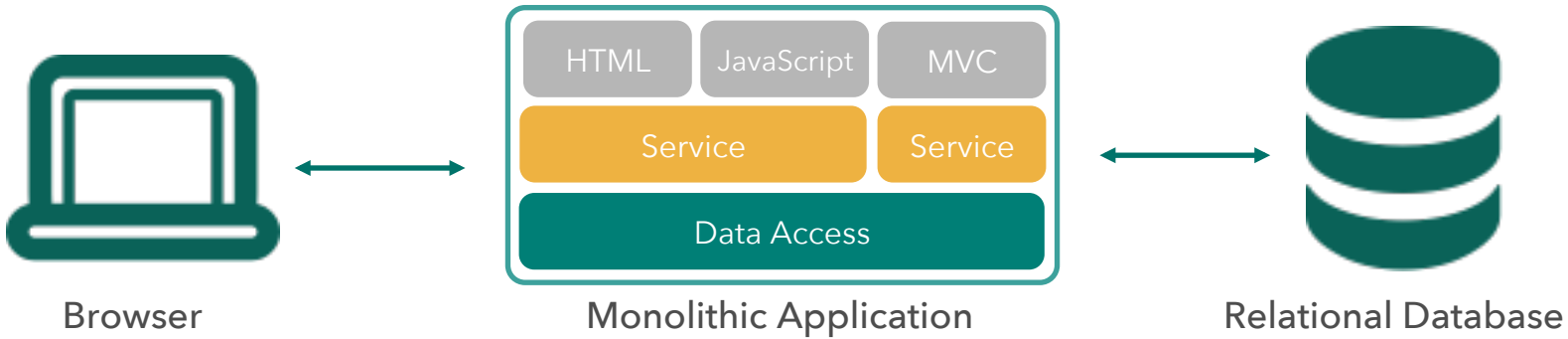
Monolithic Architecture



Monolithic Architectures

- Complex
- Modularity Dependent Upon Language / Frameworks
- Change Cycles Tightly Coupled / Obstacle to Frequent Deploys
- Inefficient Scaling
- Can Be Intimidating to New Developers
- Obstacle to Scaling Development
- Requires Long-Term Commitment to Technical Stack

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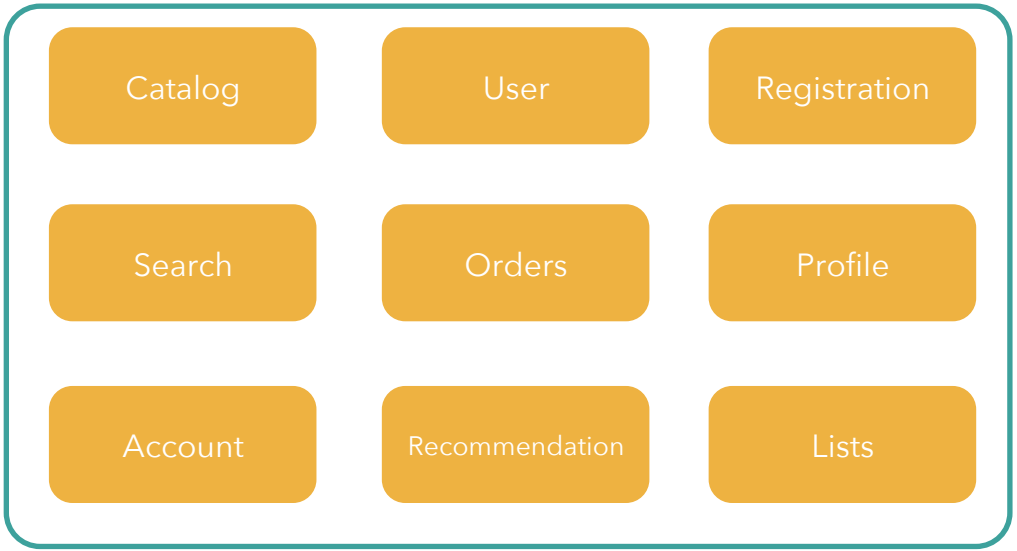
Monolithic Architectures



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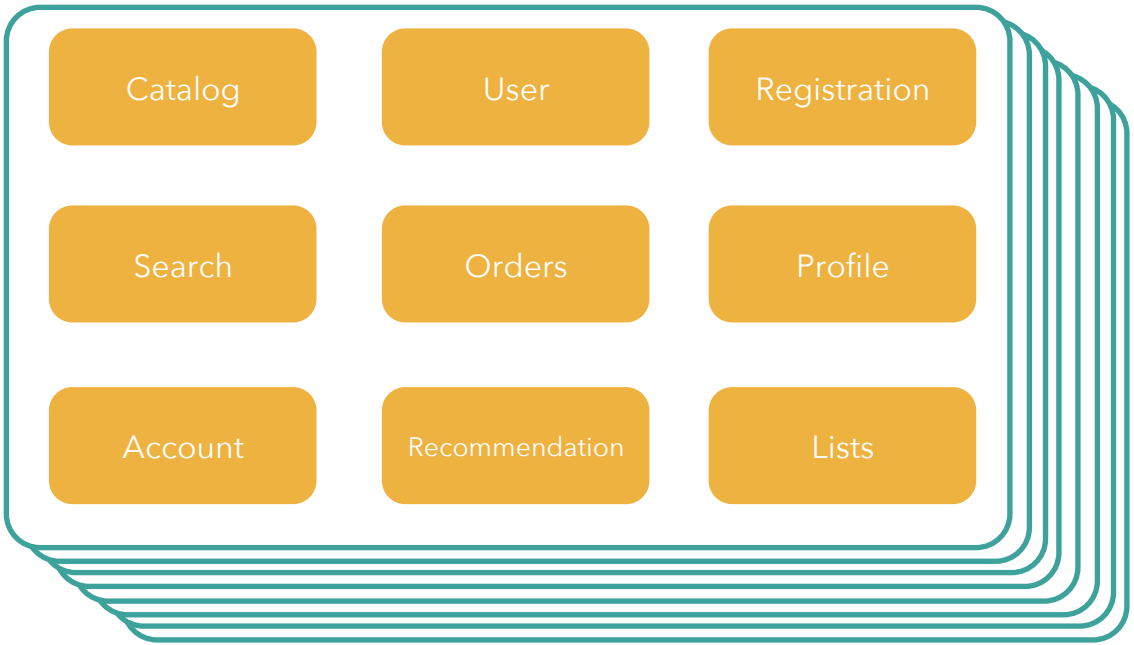
Scaling Monolithic Architectures



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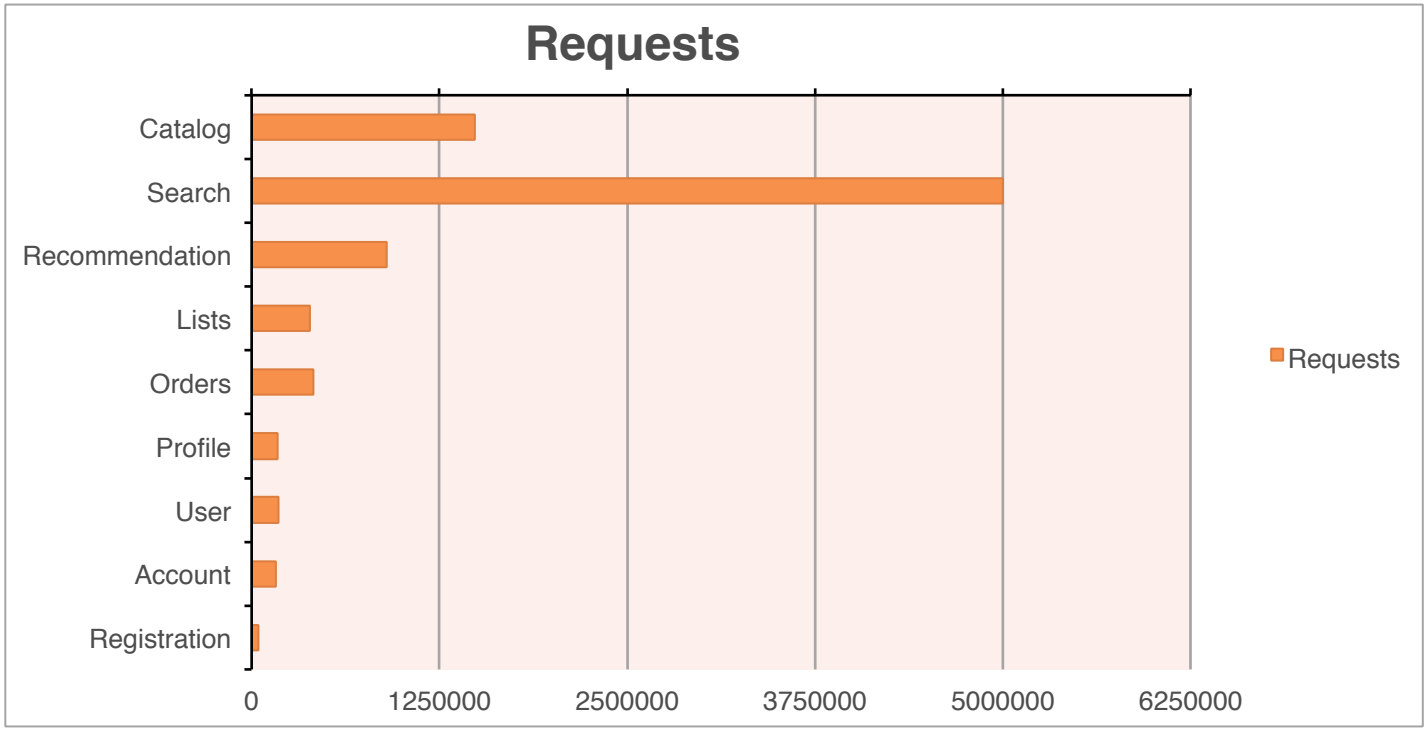
Linear scalability?



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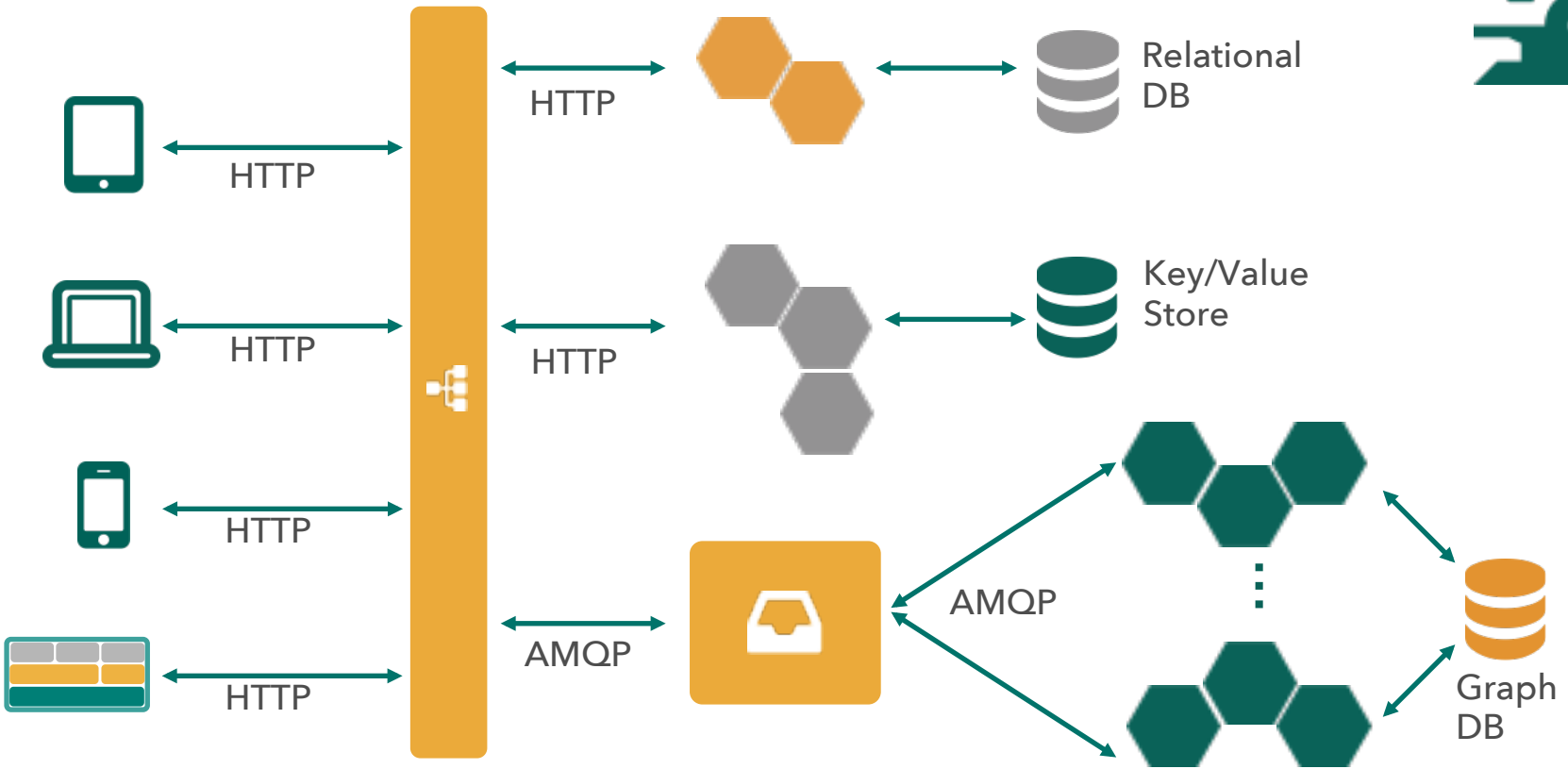
Microservice Architecture



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Microservice Architectures

- Simple
- Modularity Based on Component Services
- Change Cycles Decoupled / Enable Frequent Deploys
- Efficient Scaling
- Individual Components Less Intimidating to New Developers
- Enables Scaling of Development
- Eliminates Long-Term Commitment to Technical Stack

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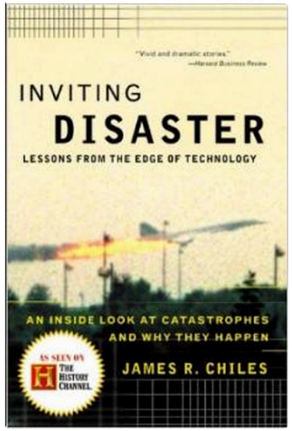

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Inviting Disaster: Lessons From the Edge of Technology Paperback

by James R. Chiles (Author)

★★★★½ 58 customer reviews

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Combining captivating storytelling with eye-opening findings, *Inviting Disaster* delves inside some of history's worst catastrophes in order to show how increasingly "smart" systems leave us wide open to human tragedy.

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How many microservices?

ELEVEN

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All teams will henceforth expose their data and functionality through service interfaces.

Teams must communicate with each other through these interfaces.

There will be no other form of inter-process communication allowed: no direct linking, no direct reads of another team's data store, no shared-memory model, no back-doors whatsoever. The only communication allowed is via service interface calls over the network.

It doesn't matter what technology they use.

All service interfaces, without exception, must be designed from the ground up to be externalizable. That is to say, the team must plan and design to be able to expose the interface to developers in the outside world. No exceptions.

http://apievangelist.com/2012/01/12/the-secret-to-amazons-success-internal-apis/

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Partitioning Strategies

Challenges of Microservices

- Distributed System
- Remote Calls More Expensive Than In-process Calls
- Eventual Consistency
- Features Spanning Multiple Services
- Dependency Management / API Versioning
- Refactoring Module Boundaries

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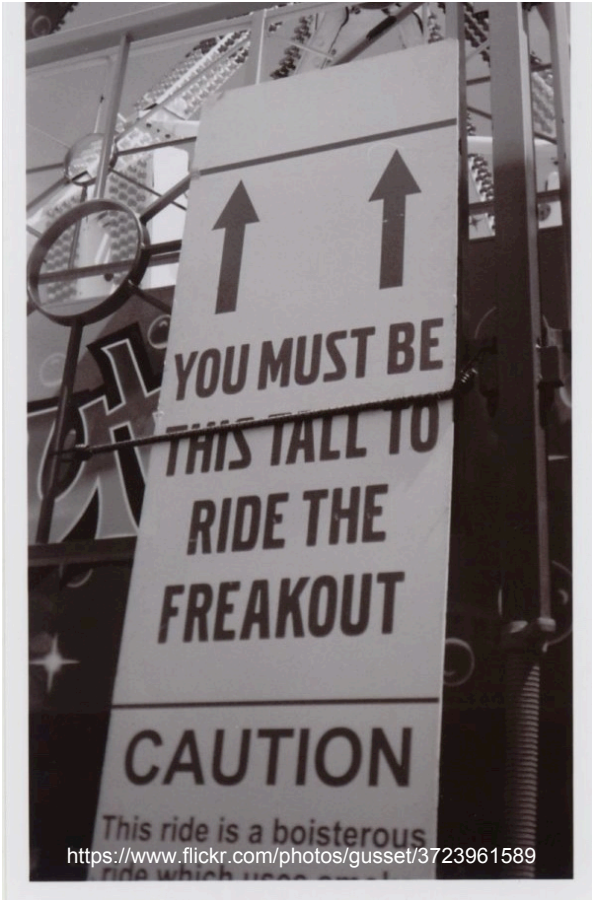
You must be this tall to use Microservices…

- Rapid provisioning
- Basic monitoring
- Rapid application deployment
- DevOps culture



https://www.flickr.com/photos/gusset/3723961589

Source: "Microservice Prerequisites," Martin Fowler, August 2014.

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Platform Features

- Environment Provisioning
- On-Demand/Automatic Scaling
- Failover/Resilience
- Routing/Load Balancing
- Data Service Operations
- Monitoring

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Pattern:

Configuration/Service Consumption

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What is configuration?

- Resource handles to databases and other backing services
- Credentials to external sources (e.g. S3, Twitter, ...)
- Per-deploy values (e.g. canonical hostname for deploy)
- ANYTHING that's likely to vary between deploys (dev, test, stage, prod)

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Where NOT to store it:

- In the **CODE** (Obvious)
- In **PROPERTIES FILES** (That's code...)
- In the **BUILD** (ONE build, MANY deploys)
- In the **APP SERVER** (e.g. JNDI datasources)

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Why environment variables?

When "...the codebase could be made open source at any moment, without compromising any credentials."

http://12factor.net/config

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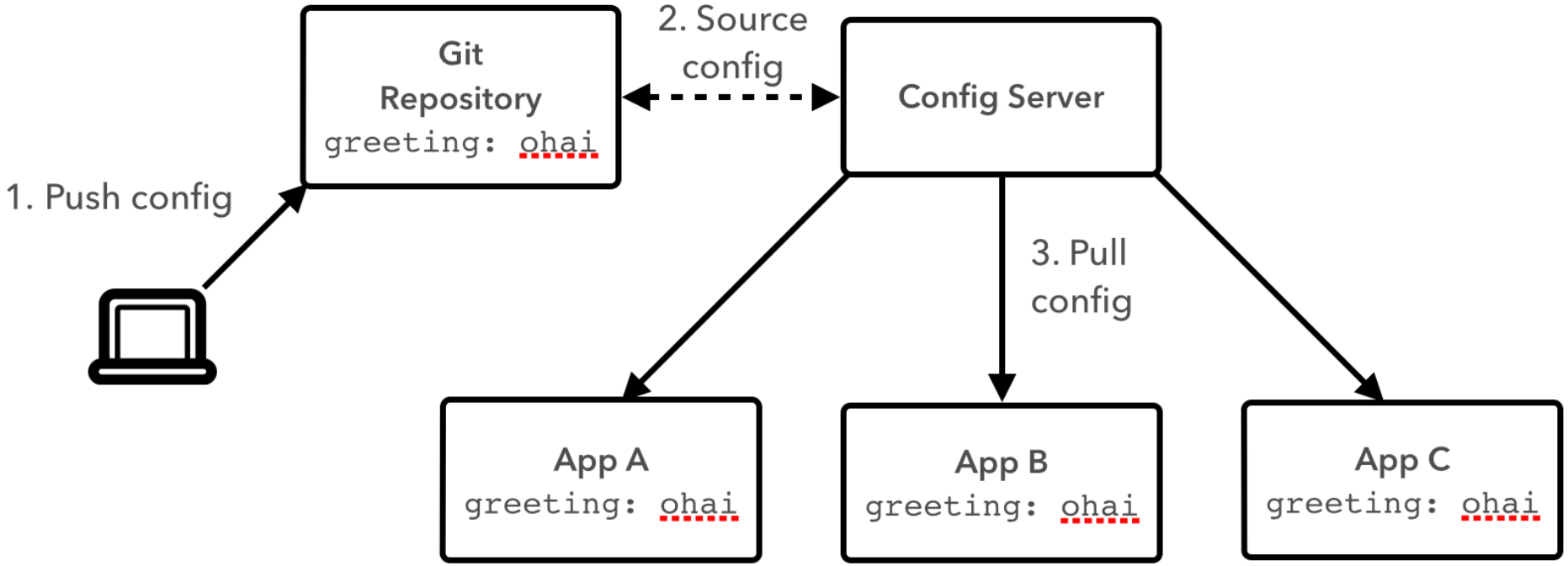
Config Server



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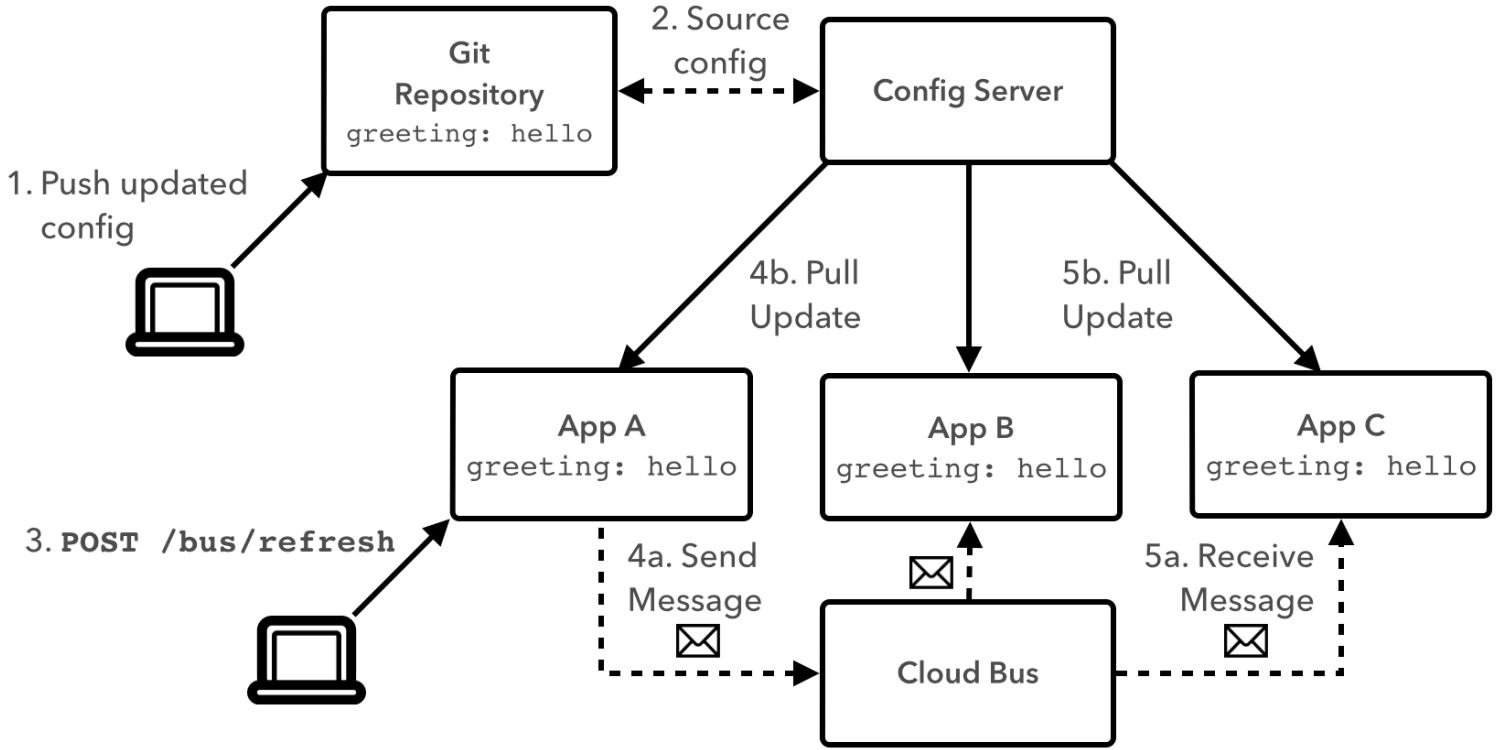
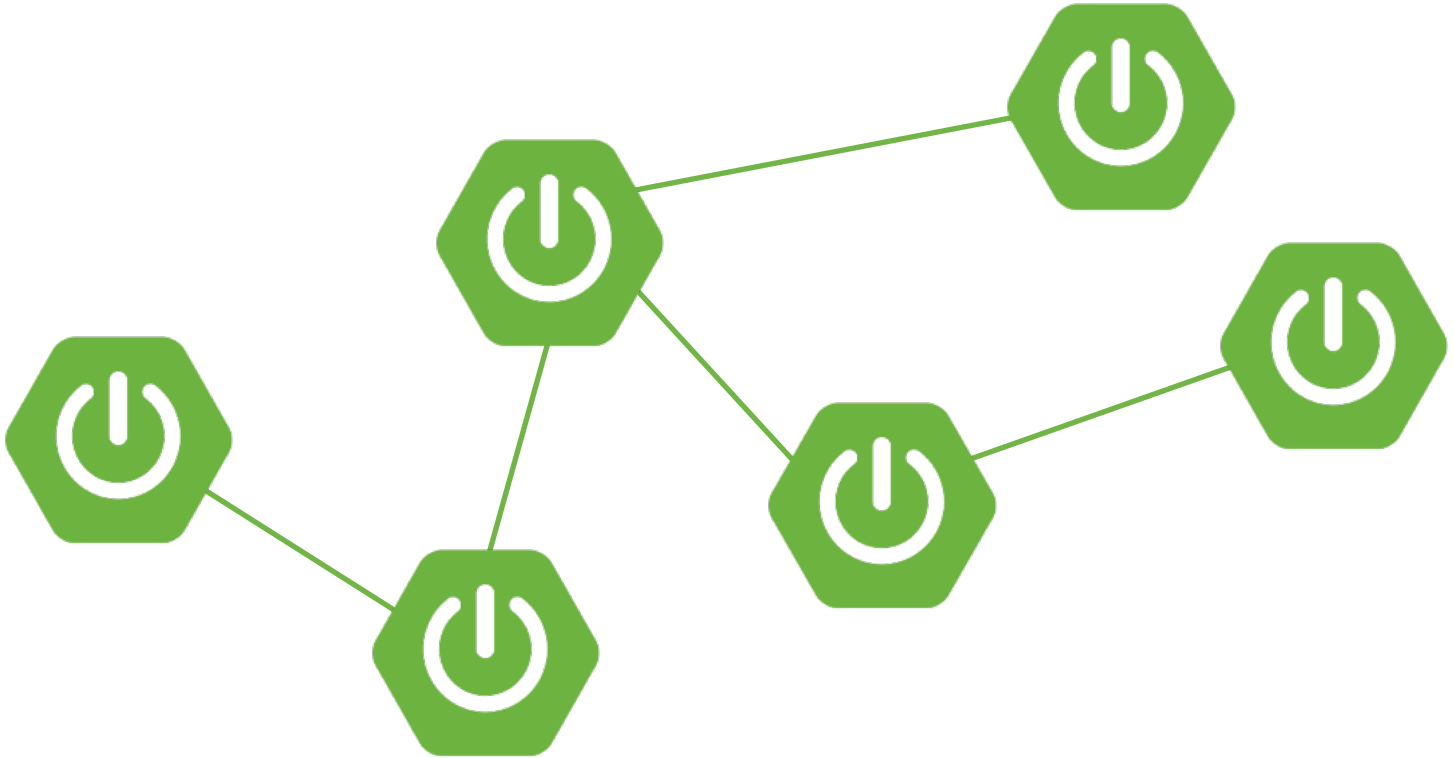
Config Server + Cloud Bus



But no Microservice is an Island…



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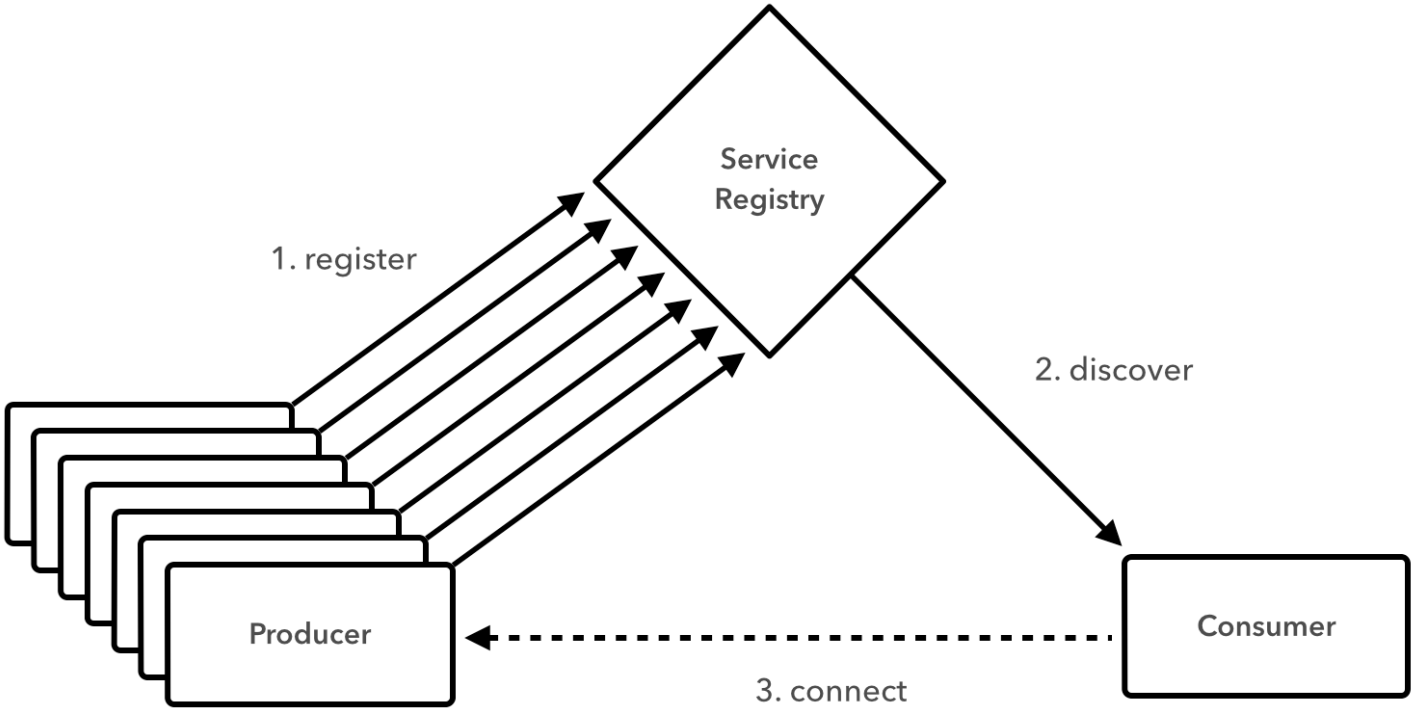
Service Registration/Discovery



Service Registration/Discovery

```
@SpringBootApplication
@EnableCircuitBreaker
@EnableDiscoveryClient
public class CustomerApp extends RepositoryRestMvcConfiguration {

    @Override
    protected void configureRepositoryRestConfiguration(RepositoryRestConfiguration
config) {
        config.exposeIdsFor(Customer.class);
    }

    public static void main(String[] args) {
        SpringApplication.run(CustomerApp.class, args);
    }

}
```

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Pattern:

Fault Tolerance

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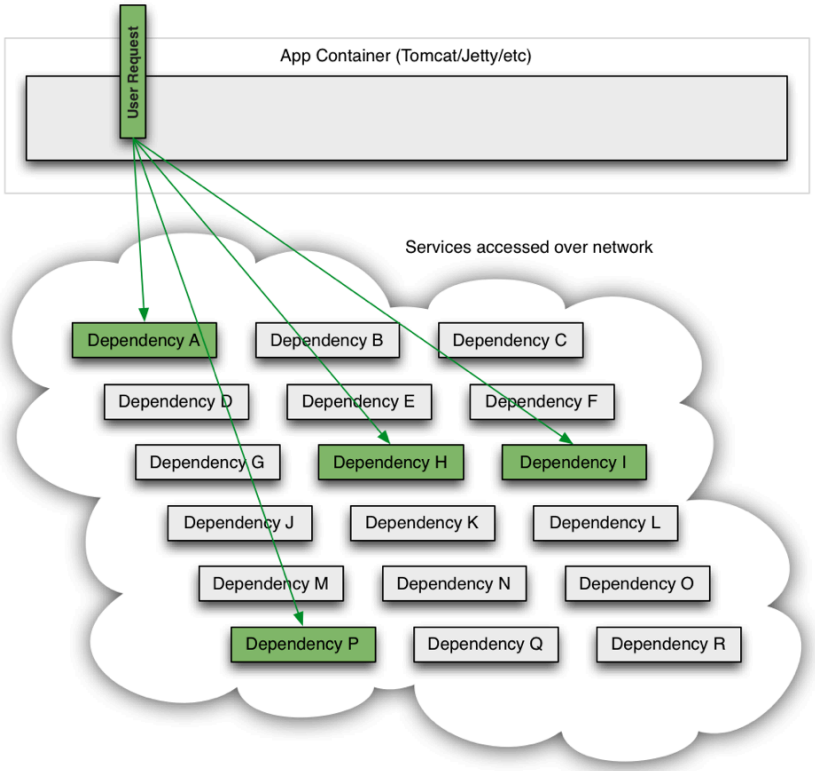
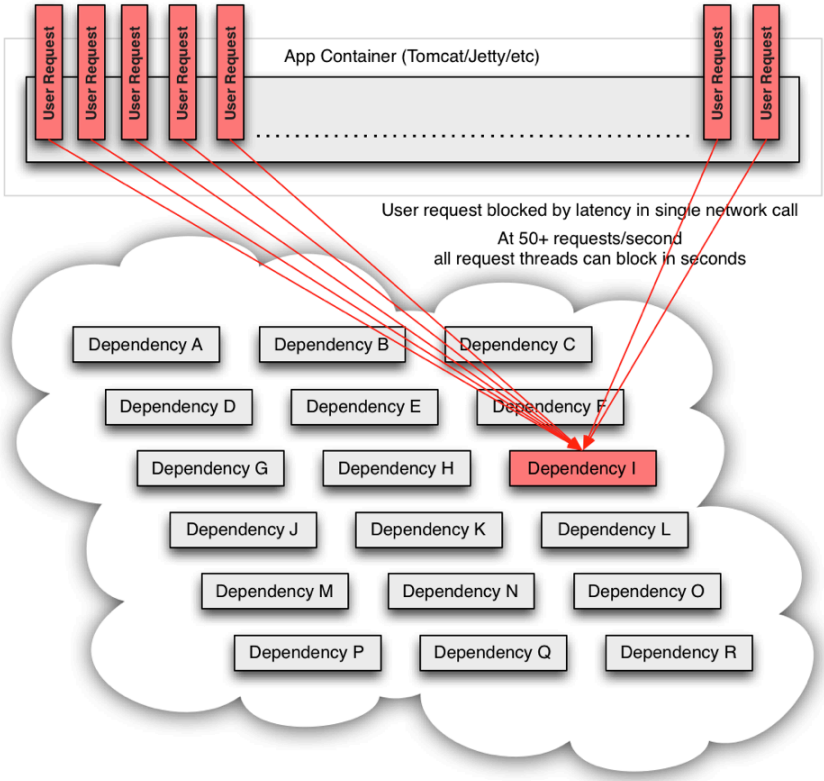
Fault Tolerance at Netflix





http://techblog.netflix.com/2012/02/fault-tolerance-in-high-volume.html

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Without taking steps to ensure fault tolerance, 30 dependencies each with 99.99% uptime would result in 2+ hours downtime/month (99.99%^{30} = 99.7% uptime = 2+ hours downtime in a month).

http://techblog.netflix.com/2012/02/fault-tolerance-in-high-volume.html

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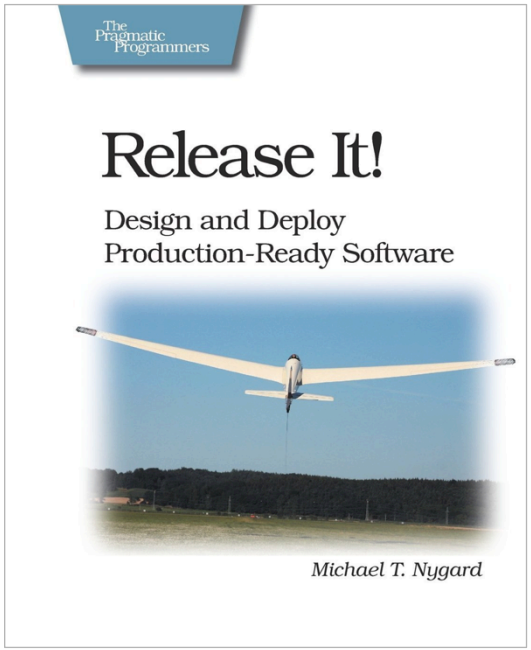
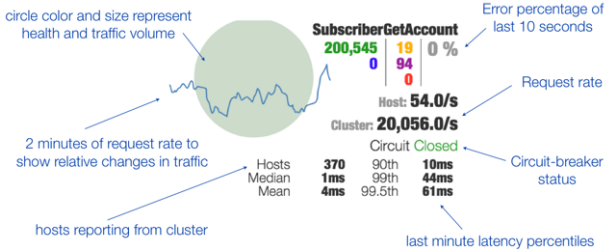
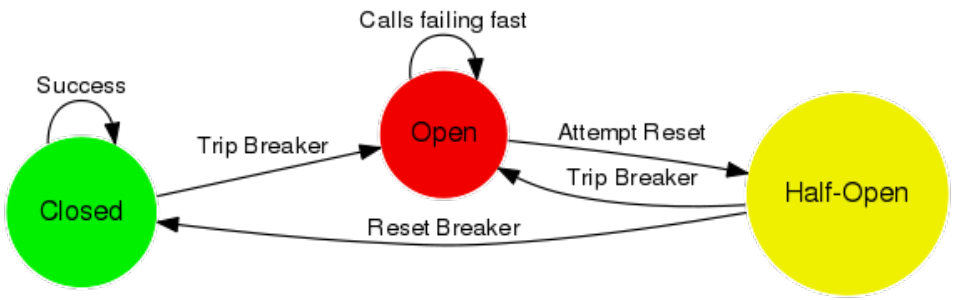
Circuit Breaker



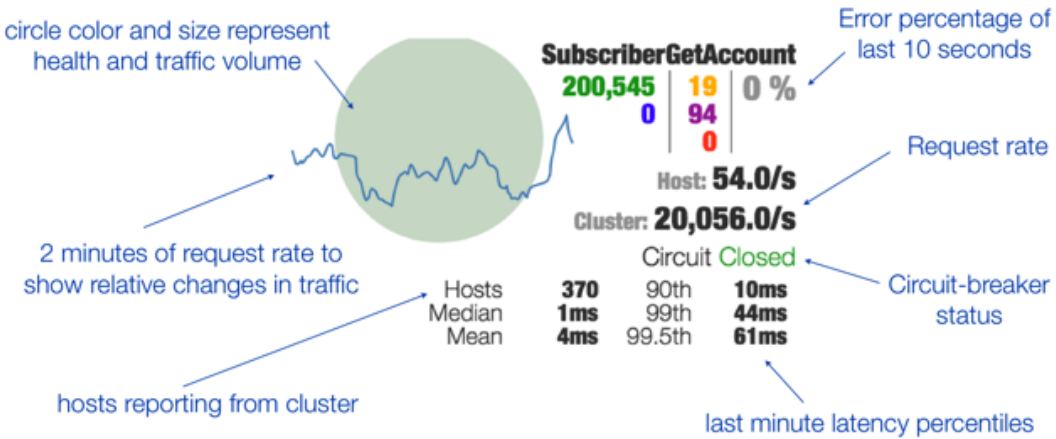
Resilience

- On large distributed systems, failures are a norm and not an exception, be ready for that.





Hystrix Dashboard



Rolling 10 second counters
with 1 second granularity

Successes	200,545	19	Thread timeouts
Short-circuited (rejected)	0	94	Thread-pool Rejections
		0	Failures/Exceptions

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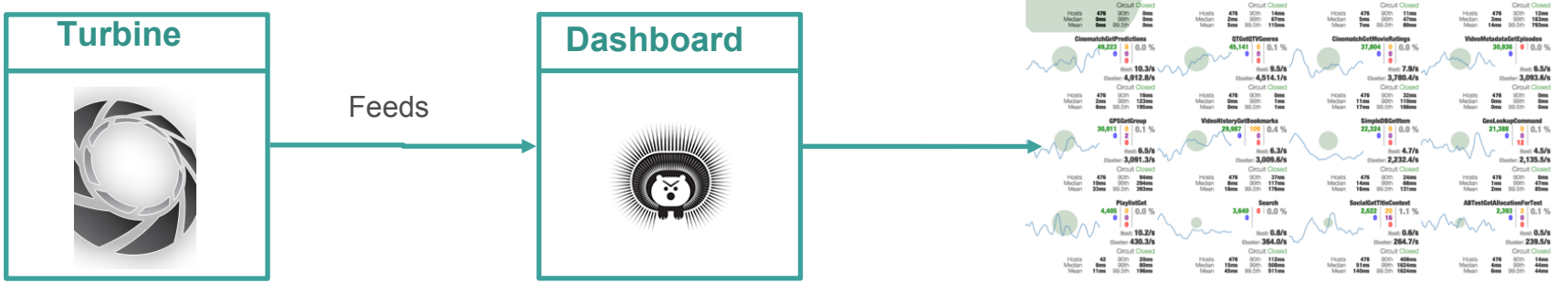
A Failing Circuit

Putting it all together



Spring Cloud Services Suite

Spring Cloud Services

Config Server

Service Registry

Circuit Breaker Dashboard

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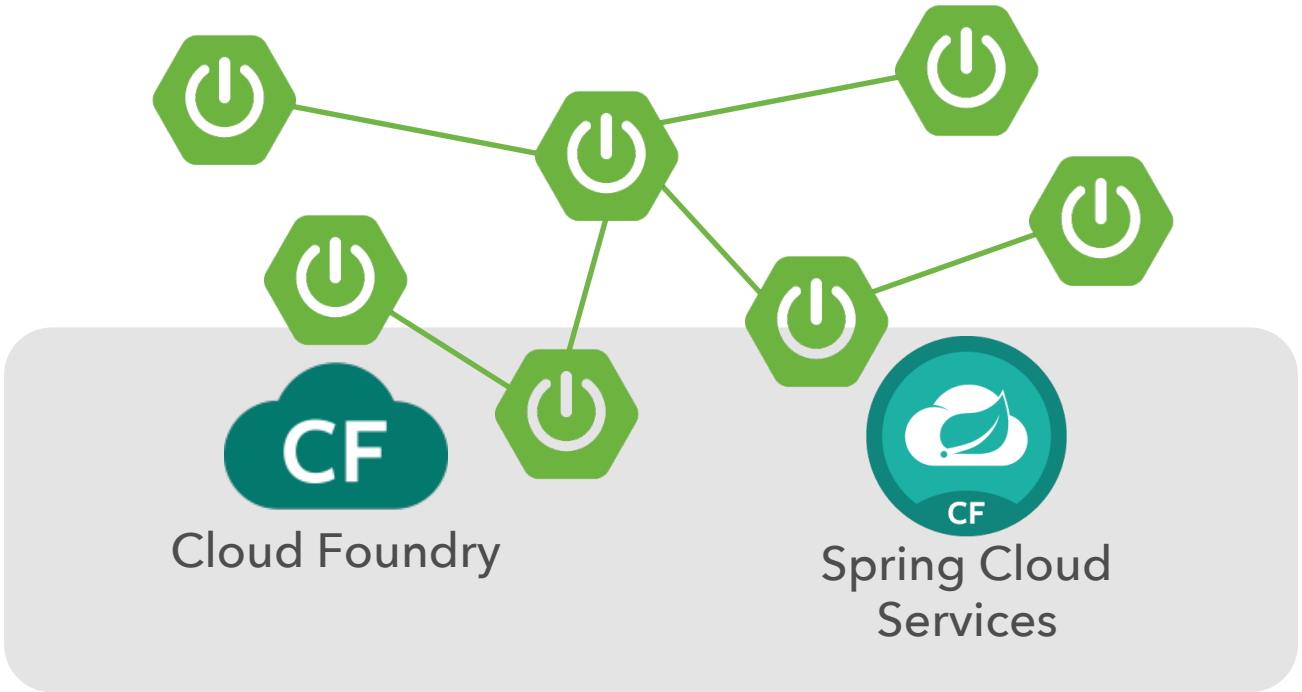
It takes a platform…



Spring Cloud Services Suite

- Installed via Pivotal Ops Manager
- Adds all services to Pivotal Cloud Foundry Marketplace
- **Dependencies:**
  - MySQL for PCF
  - RabbitMQ for PCF
- Public Beta: May 2015

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Spring Cloud Config Server

- Spring Cloud Config Server
- Service Binding via Spring Cloud Connector
- Git/SVN URL for Config Repo provided via Service Dashboard (post-provisioning)
- Single tenant, scoped to CF space
  (nothing prevents shared Git repo)

Spring Cloud Service Registry

- Service Registration and Discovery via Netflix OSS Eureka
- Service Binding via Spring Cloud Connector
- Single-tenant, scoped to CF space
- Registration via CF Route
- PCF 1.5: Support Direct Address (“promiscuous”) Mode

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Spring Cloud Services Suite

Circuit Breaker Dashboard

- Netflix OSS Turbine + Hystrix Dashboard
- Aggregation via AMQP (RabbitMQ)
- Binding via Spring Cloud Connector
- Single-tenant, scoped to CF space

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A NEW PLATFORM FOR A NEW ERA