

Cloud Native Application



Cloud Foundry and Microservices

Derrick Wong



Microservices Overview

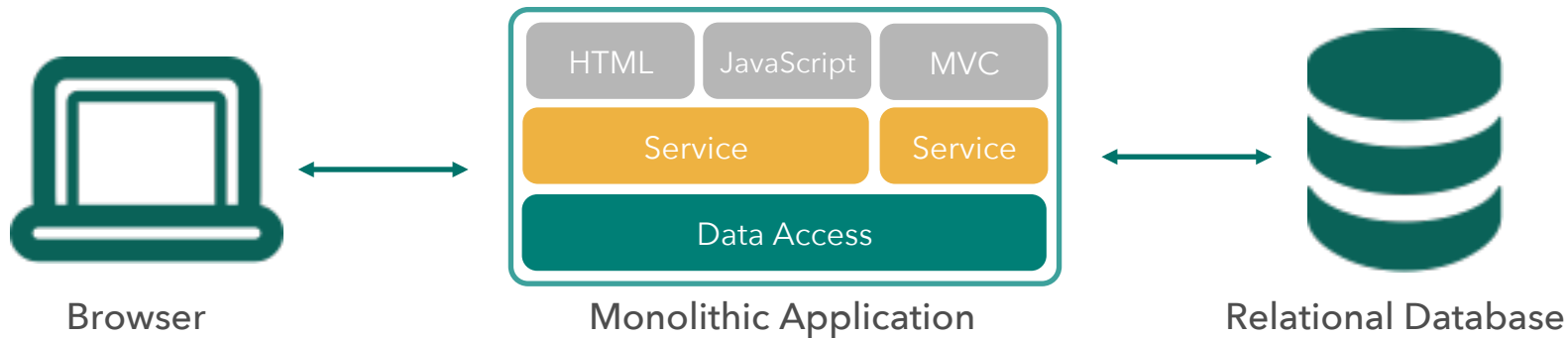
DEFINE: Microservice

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.

Monolithic Architecture

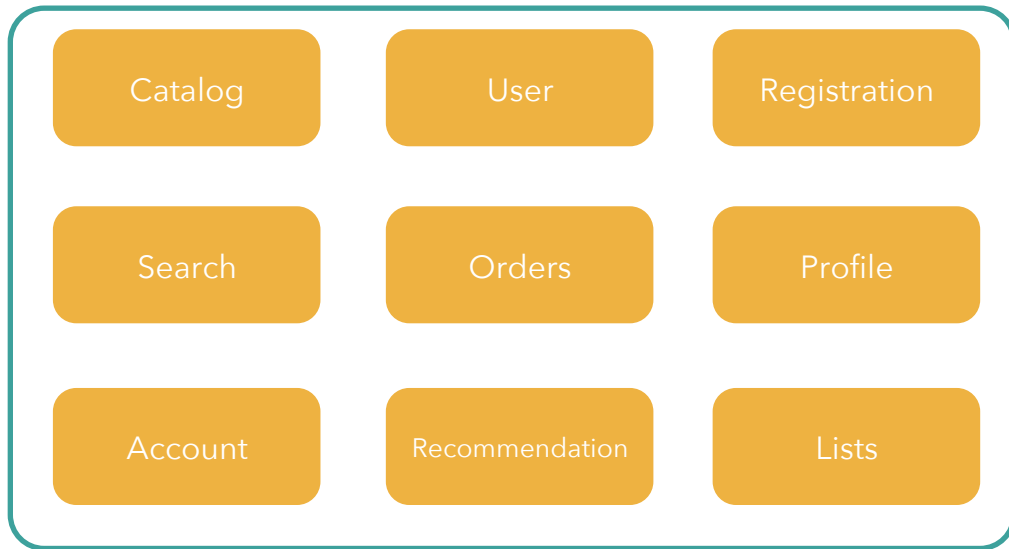


Monolithic Architectures



- 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

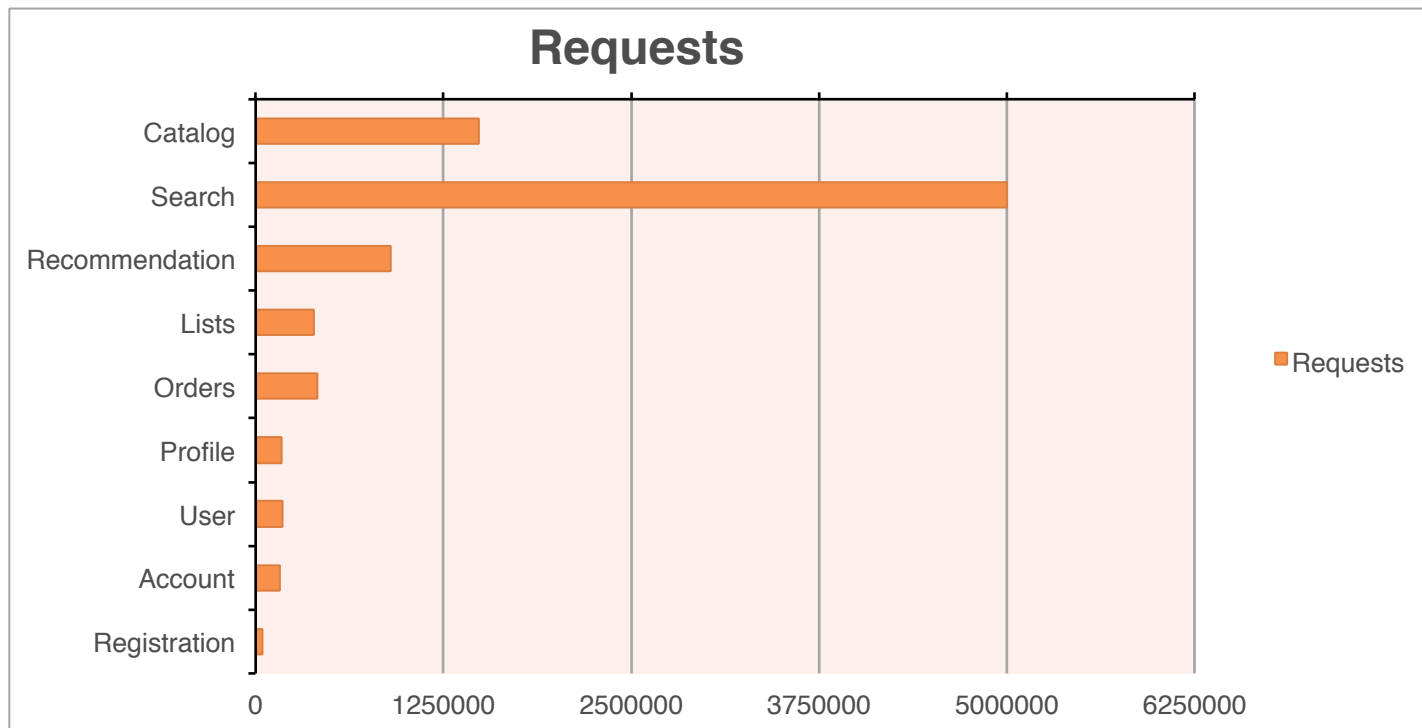
Monolithic Architectures



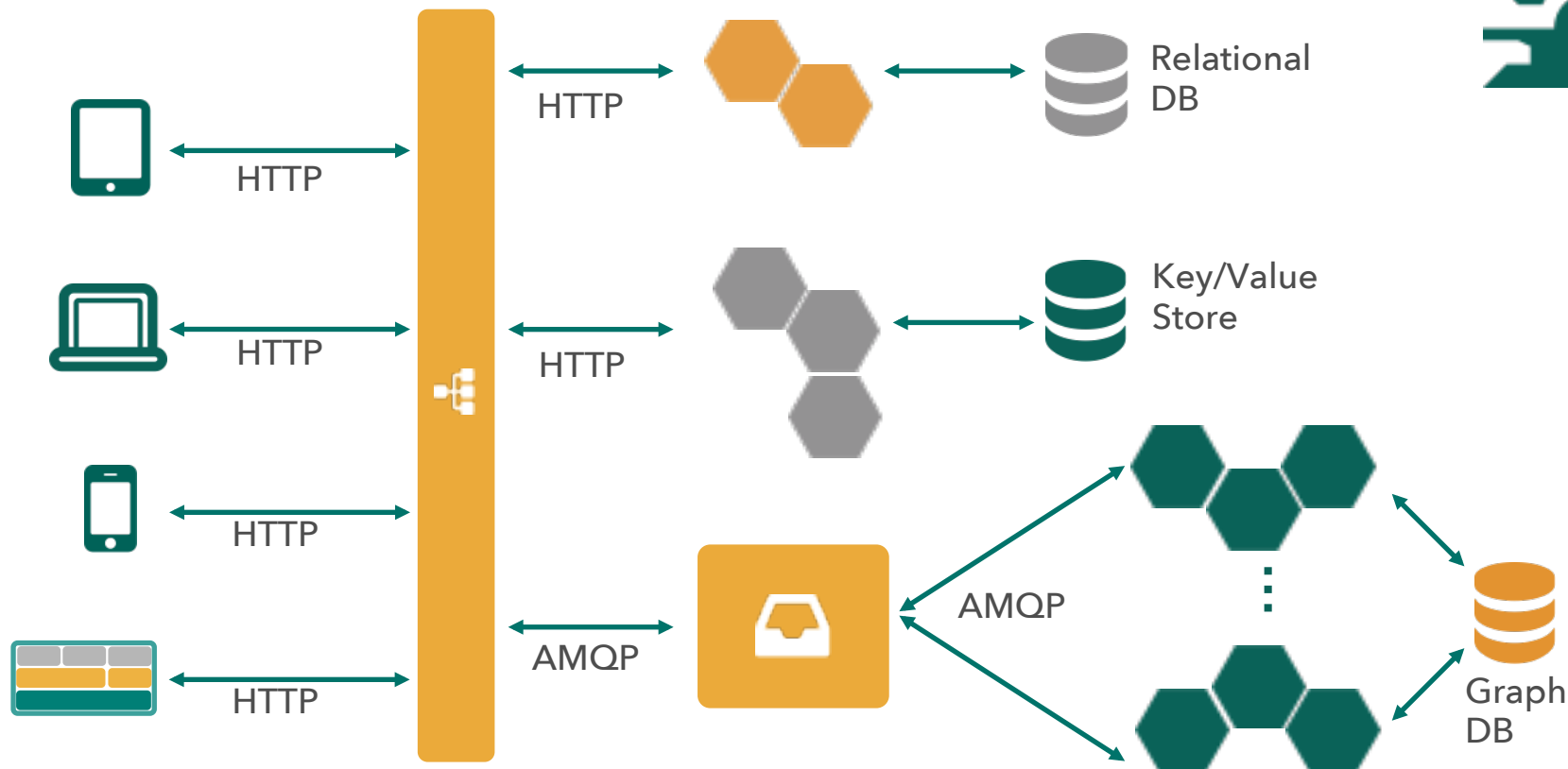
Scaling Monolithic Architectures



Linear scalability?



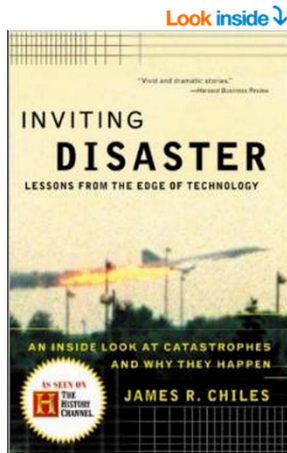
Microservice Architecture



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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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.

Partitioning Strategies



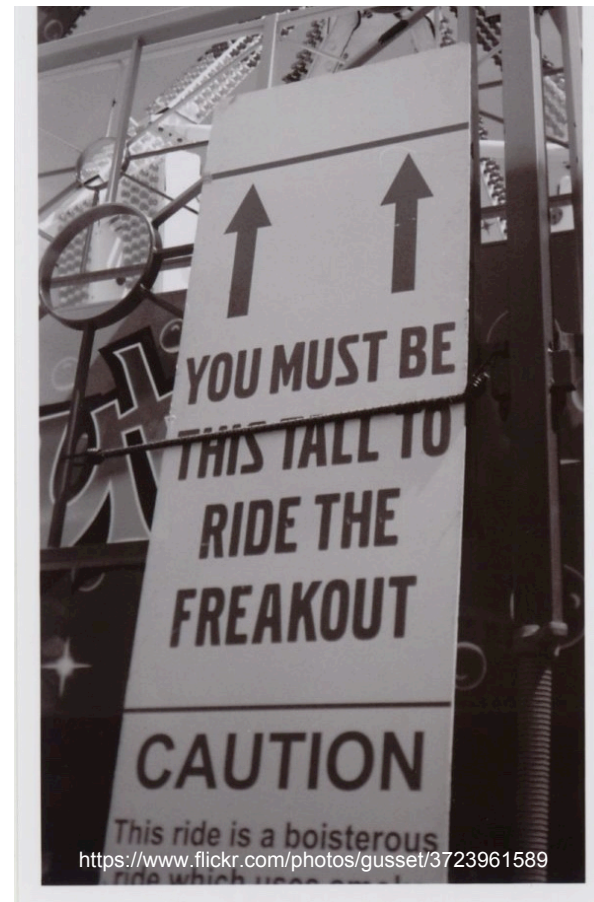
Challenges of Microservices



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

You must be this tall to use Microservices...

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



Source: "[Microservice Prerequisites](#)," Martin Fowler, August 2014.

Platform Features



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

Pattern:

Configuration/Service Consumption



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)

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)

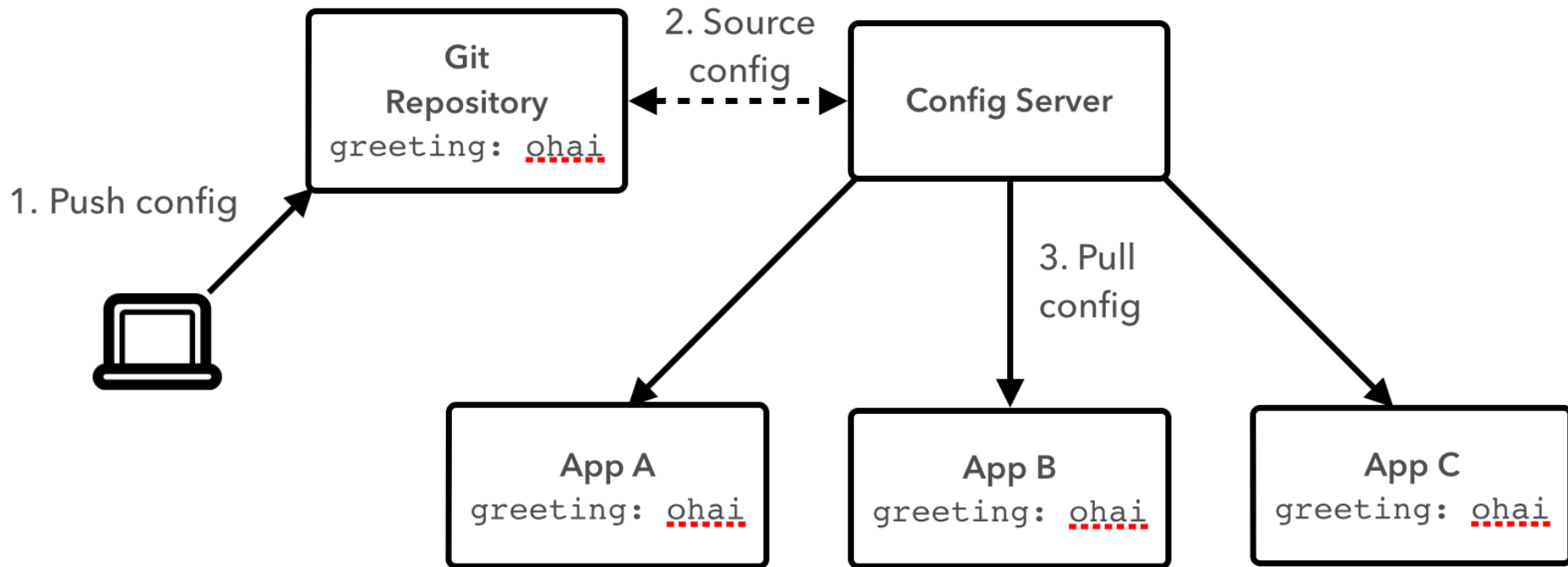
Why environment variables?



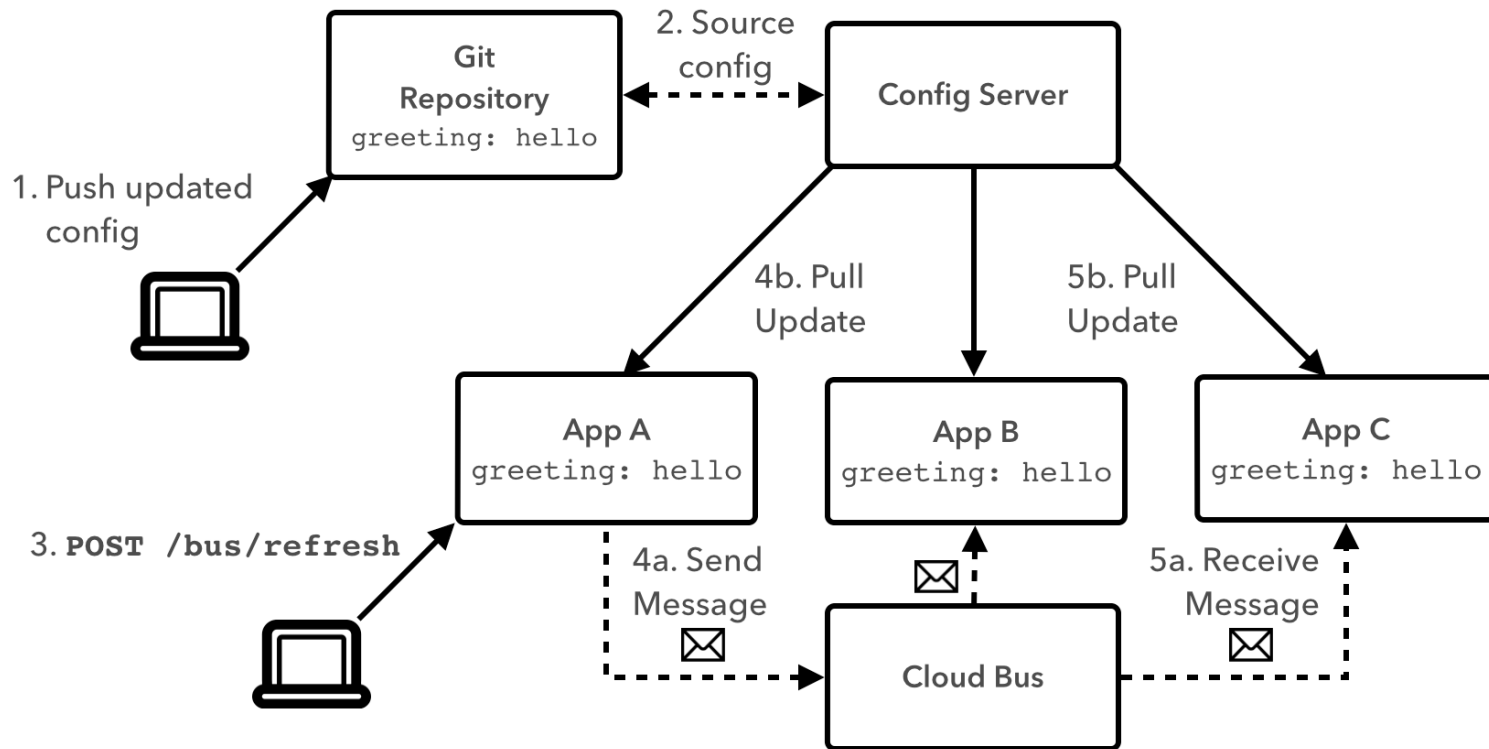
When "...the codebase could be made open source at any moment, without compromising any credentials."

<http://12factor.net/config>

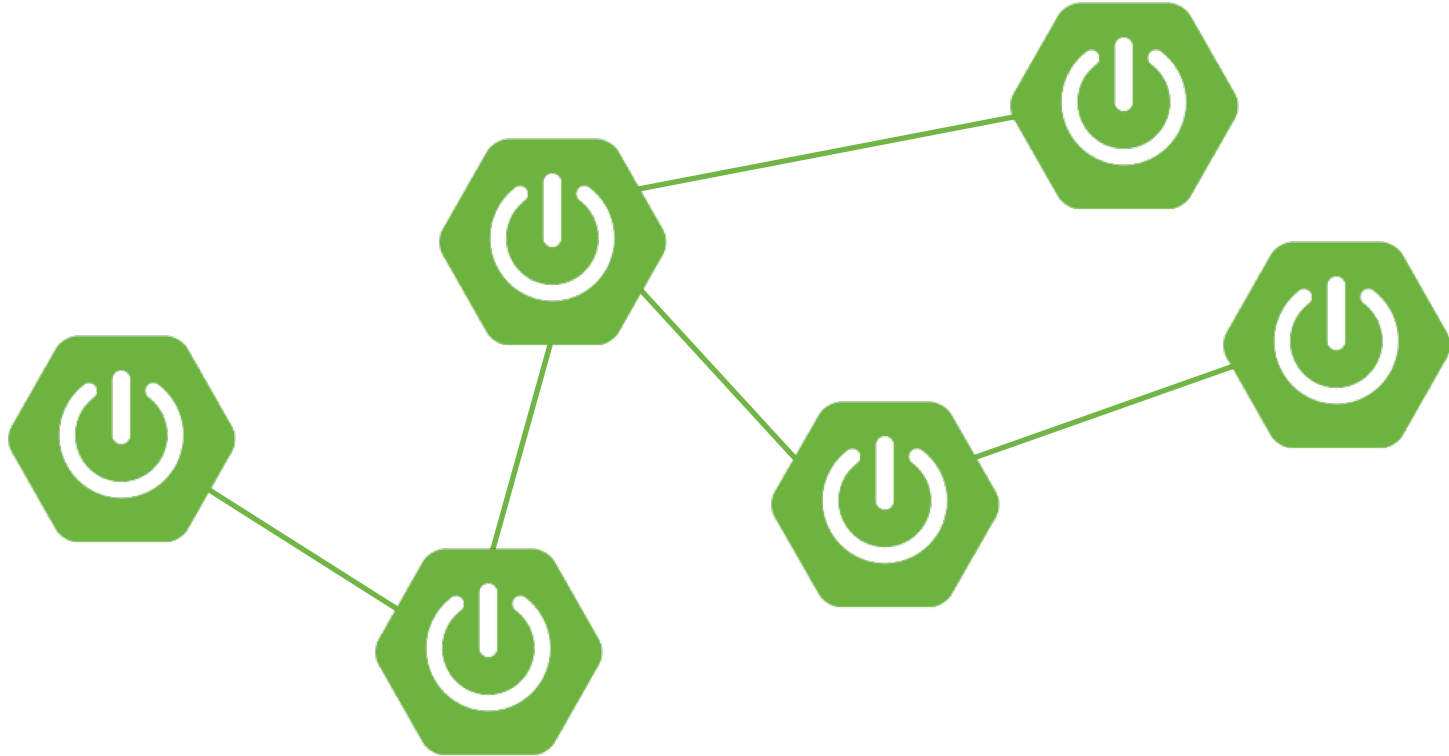
Config Server



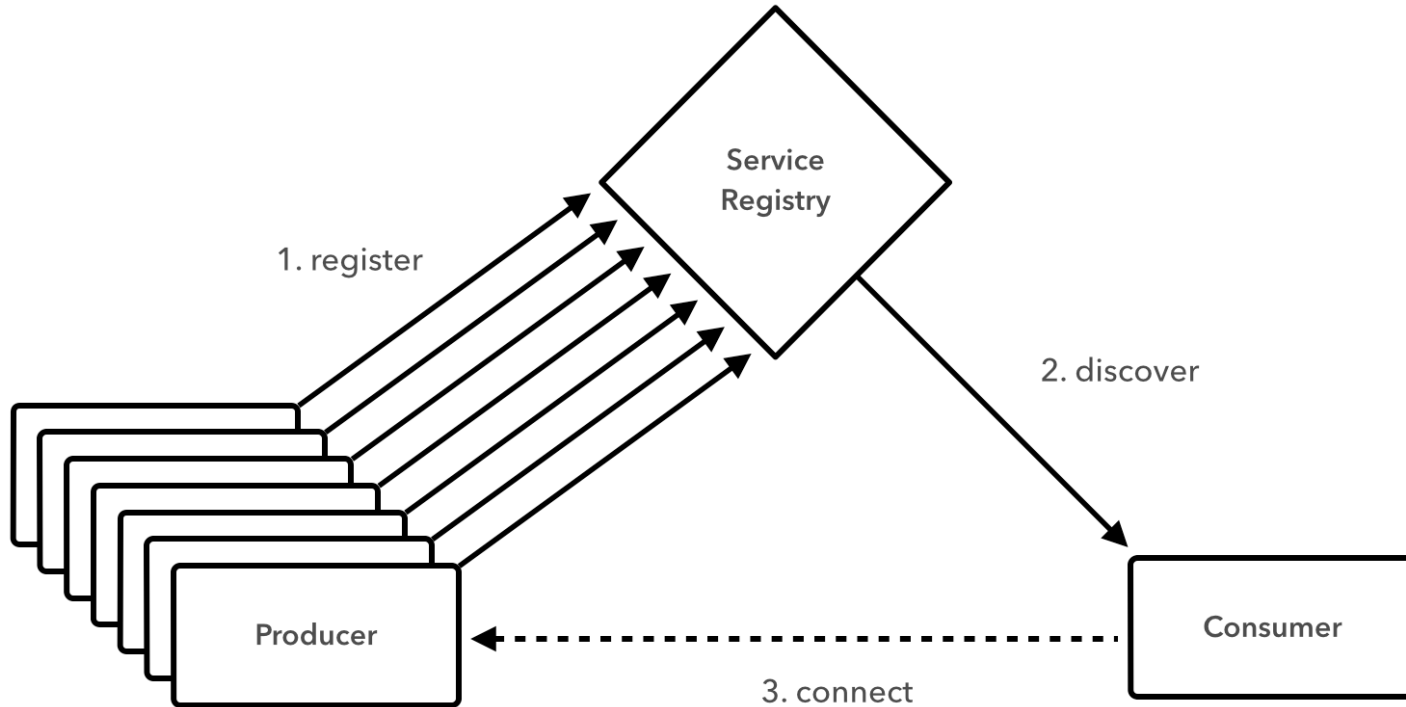
Config Server + Cloud Bus



But no Microservice is an Island...



Service Registration/Discovery



Service Registration/Discovery

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

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

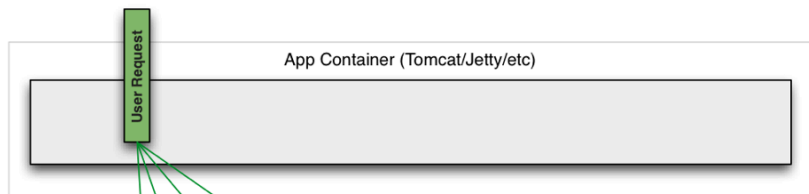
    public static void main(String[] args) {
        SpringApplication.run(CustomerApp.class, args);
    }
}
```

Pattern:

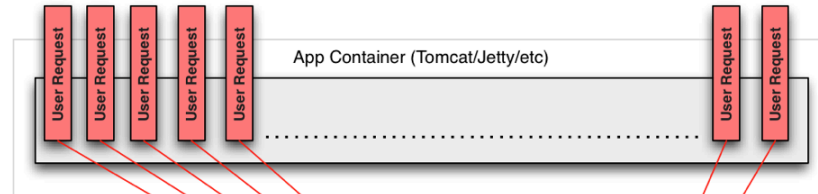
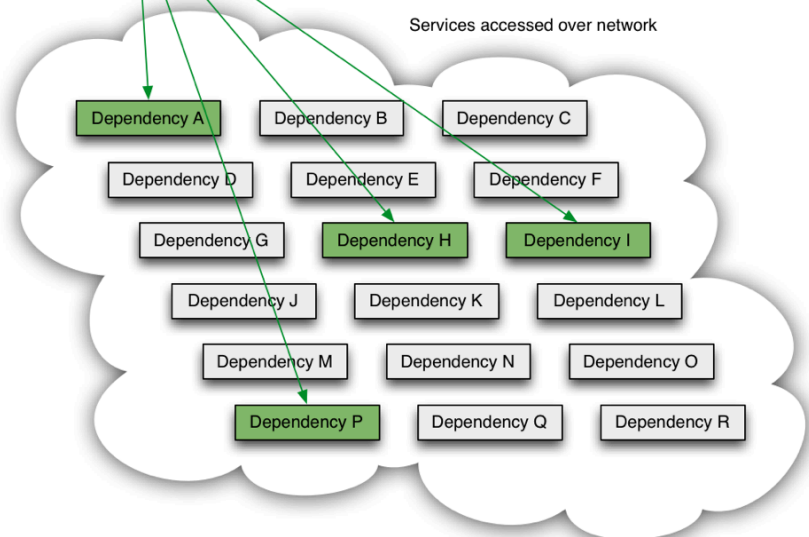
Fault Tolerance



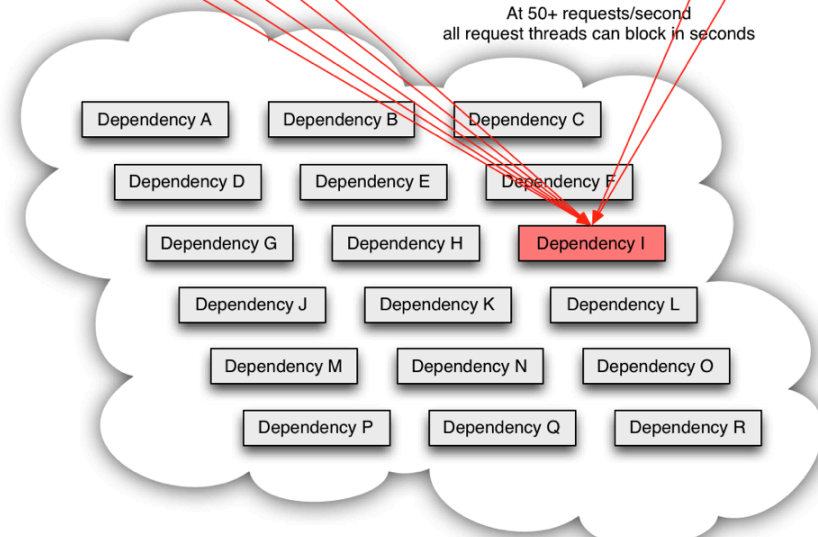
Fault Tolerance at Netflix



Services accessed over network



User request blocked by latency in single network call
At 50+ requests/second
all request threads can block in seconds

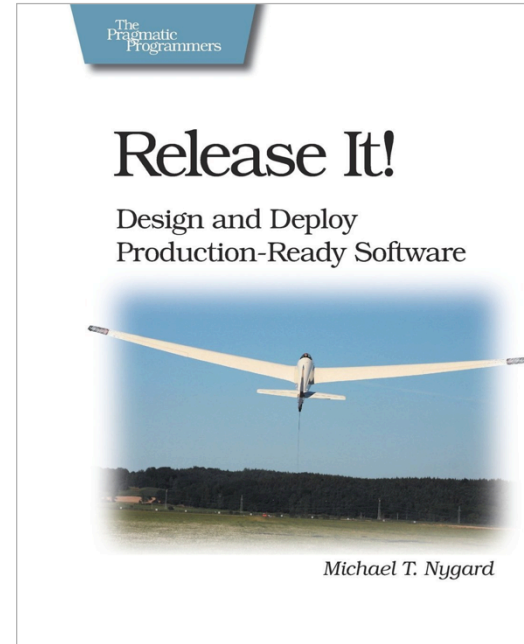




Without taking steps to ensure fault tolerance, 30 dependencies each with 99.99% uptime would result in 2+ hours downtime/month ($99.99\%^{30} = 99.7\%$ uptime = 2+ hours downtime in a month).

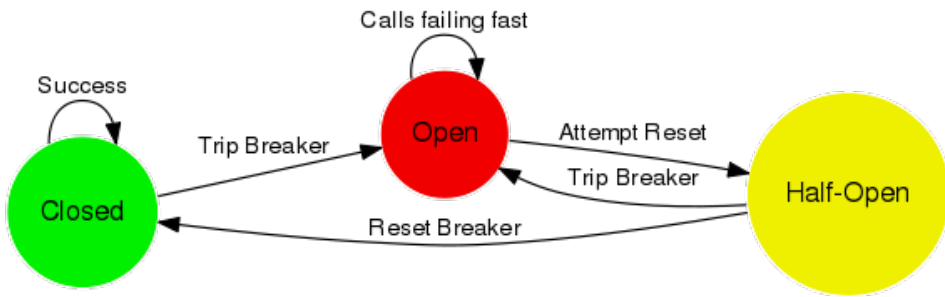
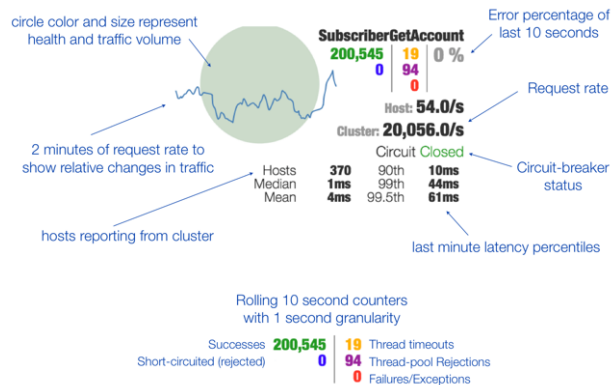
<http://techblog.netflix.com/2012/02/fault-tolerance-in-high-volume.html>

Circuit Breaker

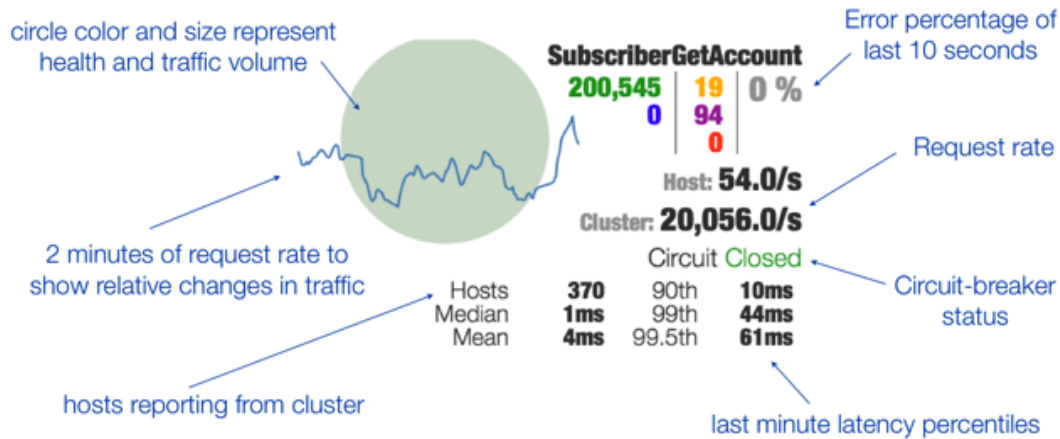


Resilience

- 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

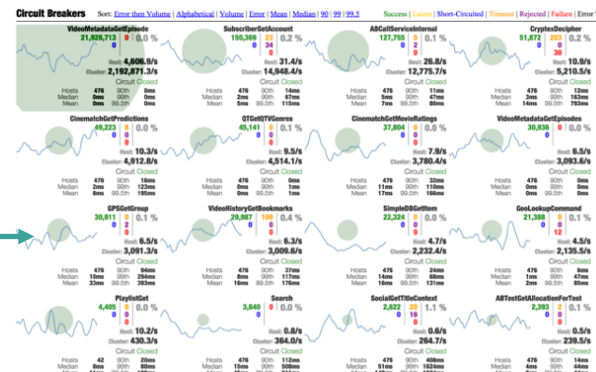

A Failing Circuit



Turbine



Dashboard



Spring Cloud Services Suite



Spring Cloud Services



Config Server

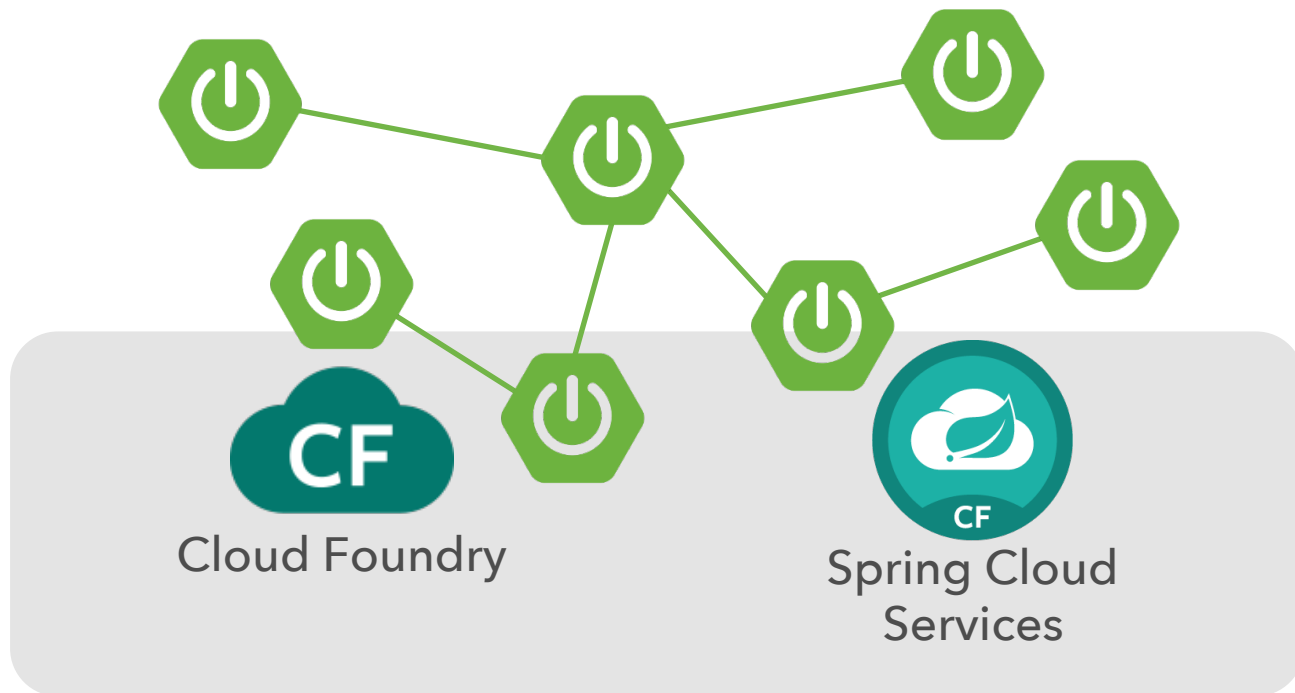


Service Registry



**Circuit Breaker
Dashboard**

It takes a platform...



Spring Cloud Services Suite



**Spring Cloud
Services**

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

Spring Cloud Config Server



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 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

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