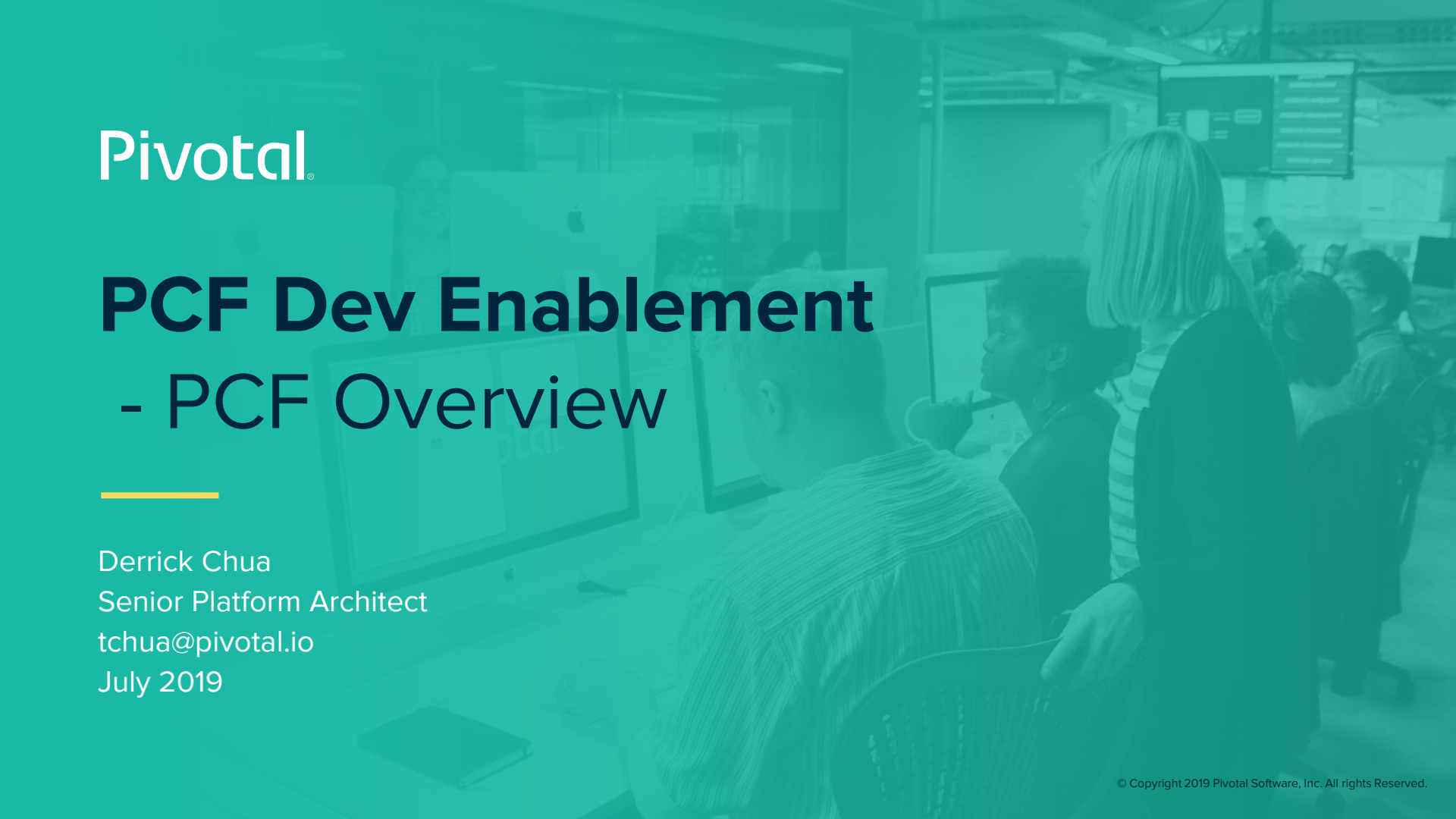


Pivotal

PCF Dev Enablement

- PCF Overview

Derrick Chua
Senior Platform Architect
tchua@pivotal.io
July 2019

Pivotal Facts

Formed in 2013 as spinout from EMC/VMware. Now a publicly-traded company (NYSE:PVTL).

Chief Executive Officer is Rob Mee.

Mission is to **transform how the world build and run software**.

Key customers include DBS, Yahoo Japan, Comcast, Allstate, Ford, Citi, Boeing, Southwest, Verizon.

Over 2,800 employees in 25+ locations globally.

IPO in April 2018. Current Market Cap approx. 4.6B

Pivotal

The Pivotal value proposition

Developer Productivity

- Accelerate feedback loops by improving delivery velocity
- Focus on applications, not infrastructure
- Give developers the tools and frameworks to build resilient apps

Operational Efficiency

- Employ 500:1 developer to operator ratio
- Perform zero-downtime upgrades
- Runs the same way on every public/private cloud

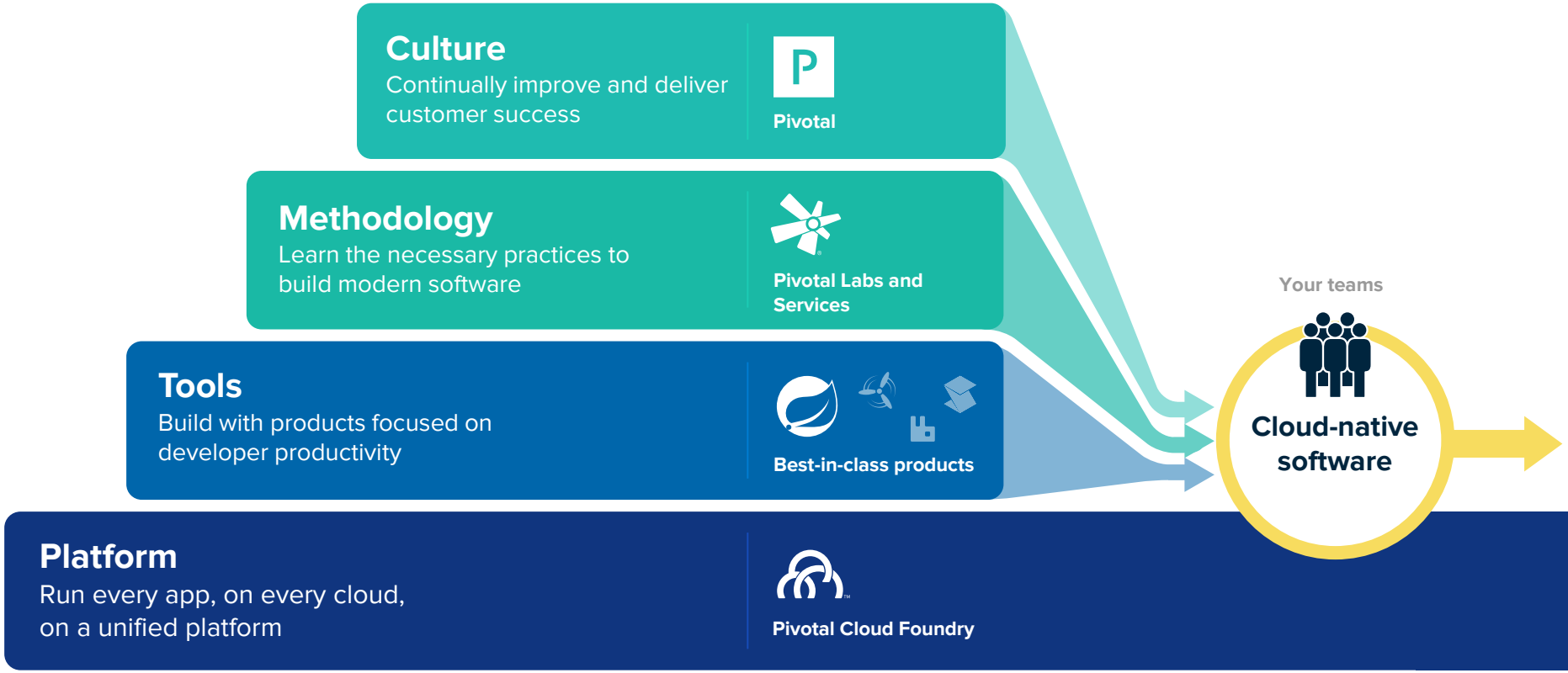
Comprehensive Security

- Adopt a defense-in-depth approach
- Continuously update platforms to limit threat impact
- Apply the 3 R's → repair, repave, rotate

High Availability

- Run platforms that stays online under all circumstances
- Scale up and down, in and out, through automation
- Deploy multi-cloud resilience patterns

Pivotal adopts a holistic partnership approach to software



DBS

Faster time to market

6 months

to

< 4 weeks

for

major releases

Increased release cadence

10X

improvement in lead time

(32 hours -> 3 hours)

6X

improvement in effort needed

(12 hours -> 2 hours)

Self provisioning infrastructure

1 week

To

Intraday

Stability and maintainability

Zero minutes downtime in Production

(since 2016)

Pivotal

YAHOO! JAPAN

Speed	Scale	Stability	Security	Savings
75% ↓ Time to Deploy	Weeks → 5secs Time to Scale	ZERO Downtime	5x ↑ Patch Frequency	2:3 → 6:2500 Ops:Dev Ratio
Weeks → 4hrs Workspace Provisioning	600k TPS	2hr → 2mins VM Recovery	1d → 1hr Time to Patch	3845 Apps in Production

Pivotal

What PCF Financial Customers Have To Say on Youtube

https://www.youtube.com/watch?v=McV0Q5GY-fM

https://www.youtube.com/watch?v=WDvCIhfb6y4

https://www.youtube.com/watch?v=5wokS2VySoQ

https://www.youtube.com/watch?v=wk5IFkIQYL8

https://www.youtube.com/watch?v=v6cE0jXjdtE

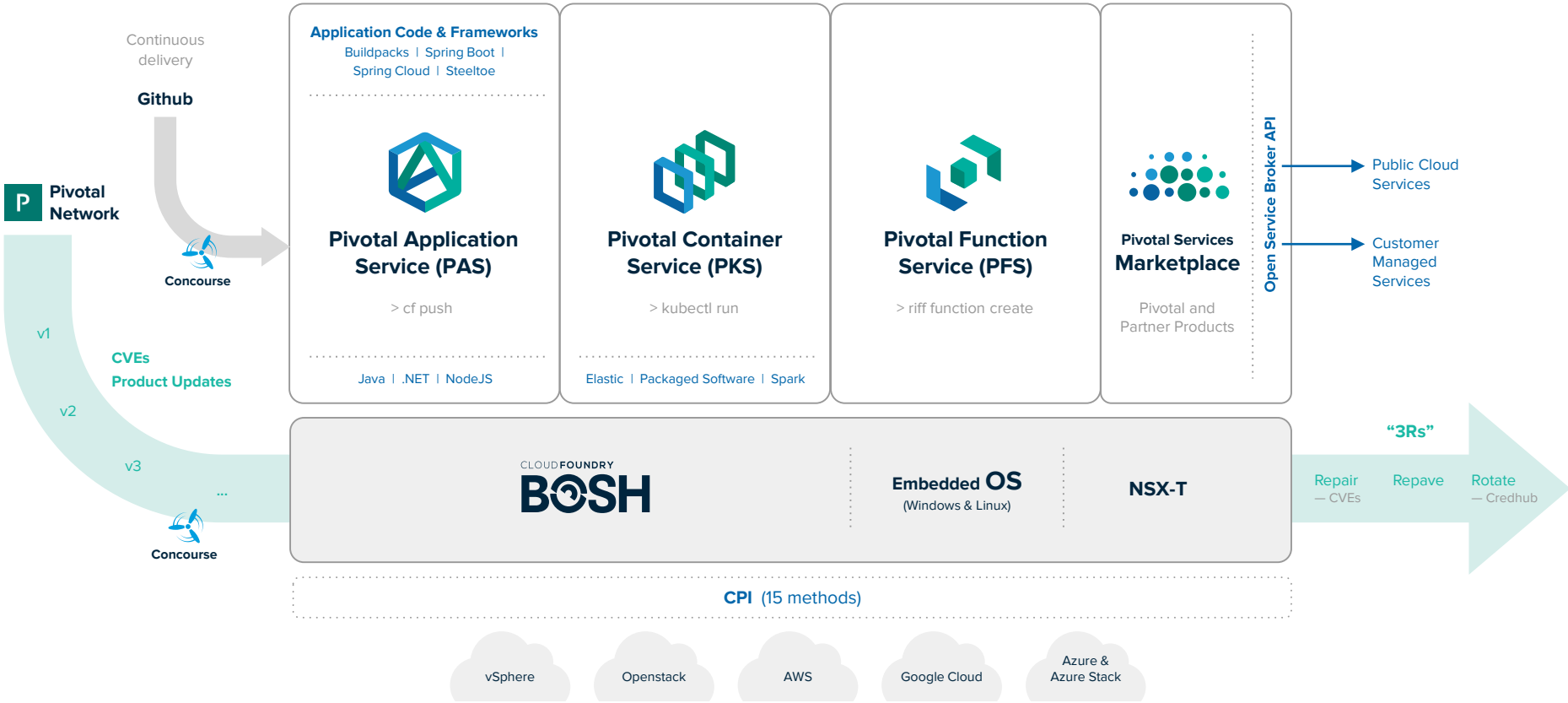
https://www.youtube.com/watch?v=vabrFqYKNeI

https://www.youtube.com/watch?v=dWJexxudXQE

https://www.youtube.com/watch?v=gP4Utp5M918

Pivotal

PCF - One platform for all your workloads



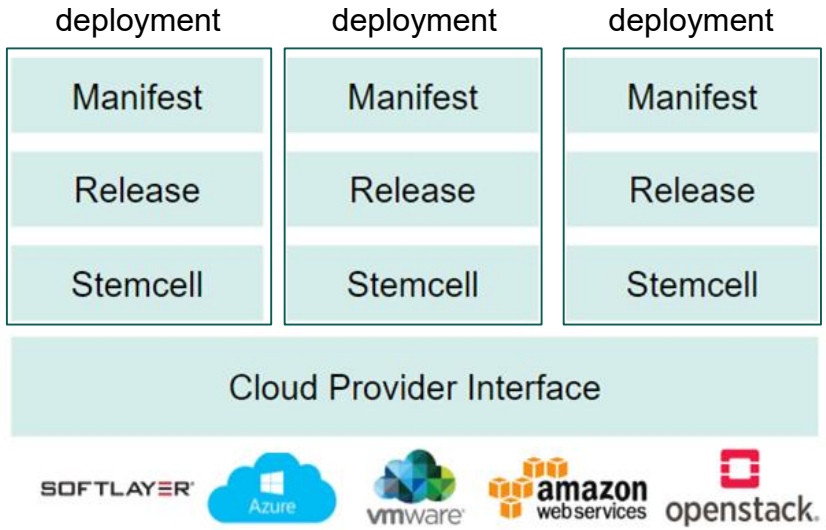
Pivotal

BORG++ = BOSH → the heart of PCF

An open source tool chain for release engineering, deployment, lifecycle management and monitoring of large scale distributed services.

- Declarative immutable infrastructure
- Packaging w/ embedded OS
- Server provisioning on any IaaS
- Software deployment across clusters
- Health monitoring (server AND processes)
- Service state monitoring
- Infrastructure resizing
- Self-healing w/ Resurrector
- Storage management
- Rolling upgrades via canaries

BOSH –
declarative immutable deployments



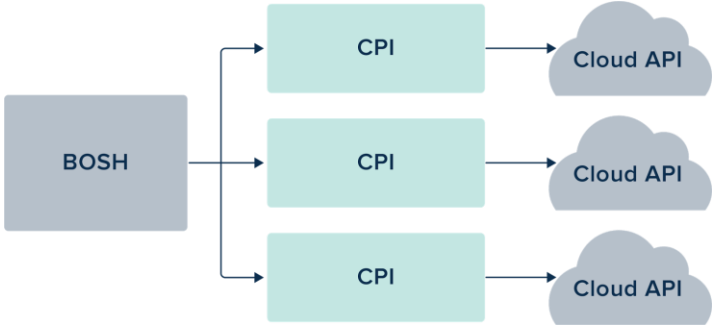
zookeeper.yml

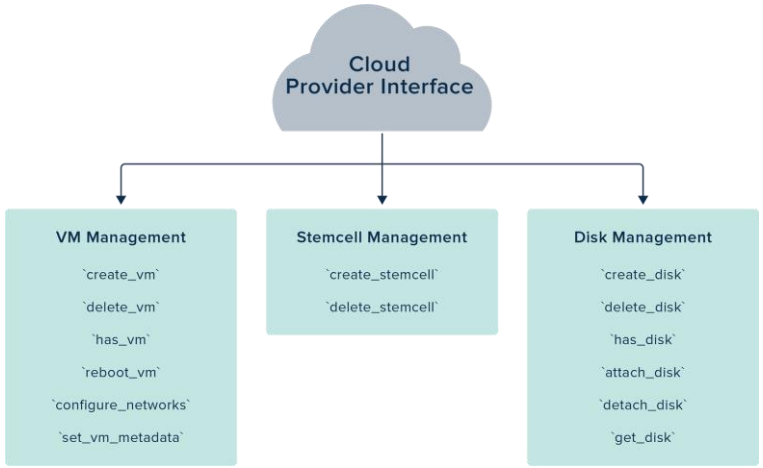
```yaml
---
name: zookeeper

releases:
- name: zookeeper
  version: 0.0.7
  url: git+https://github.com/cppforlife/zookeeper-release

stemcells:
- alias: default
  os: ubuntu-trusty
  version: latest

update:
  canaries: 2
  max_in_flight: 1
  canary_watch_time: 5000-60000
  update_watch_time: 5000-60000
```

```yaml
instance_groups:
- name: zookeeper
  azs: [z1, z2, z3]
  instances: 5
  jobs:
  - name: zookeeper
    release: zookeeper
    properties: {}
  - name: status
    release: zookeeper
    properties: {}
  vm_type: default
  stemcell: default
  persistent_disk: 10240
  networks:
  - name: default
```

```yaml
- name: smoke-tests
  azs: [z1]
  lifecycle: errand
  instances: 1
  jobs:
  - name: smoke-tests
    release: zookeeper
    properties: {}
  vm_type: default
  stemcell: default
  networks:
  - name: default
```

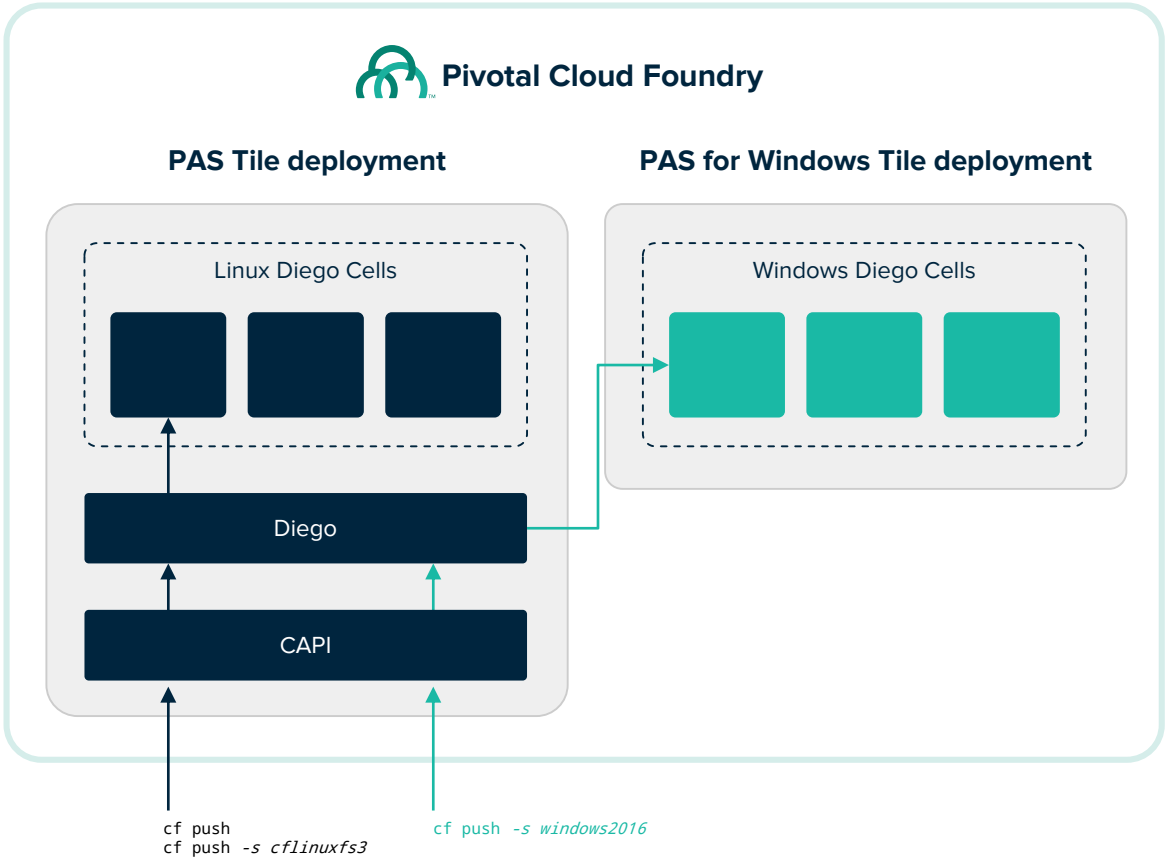
Multi-Cloud with BOSH + CPI



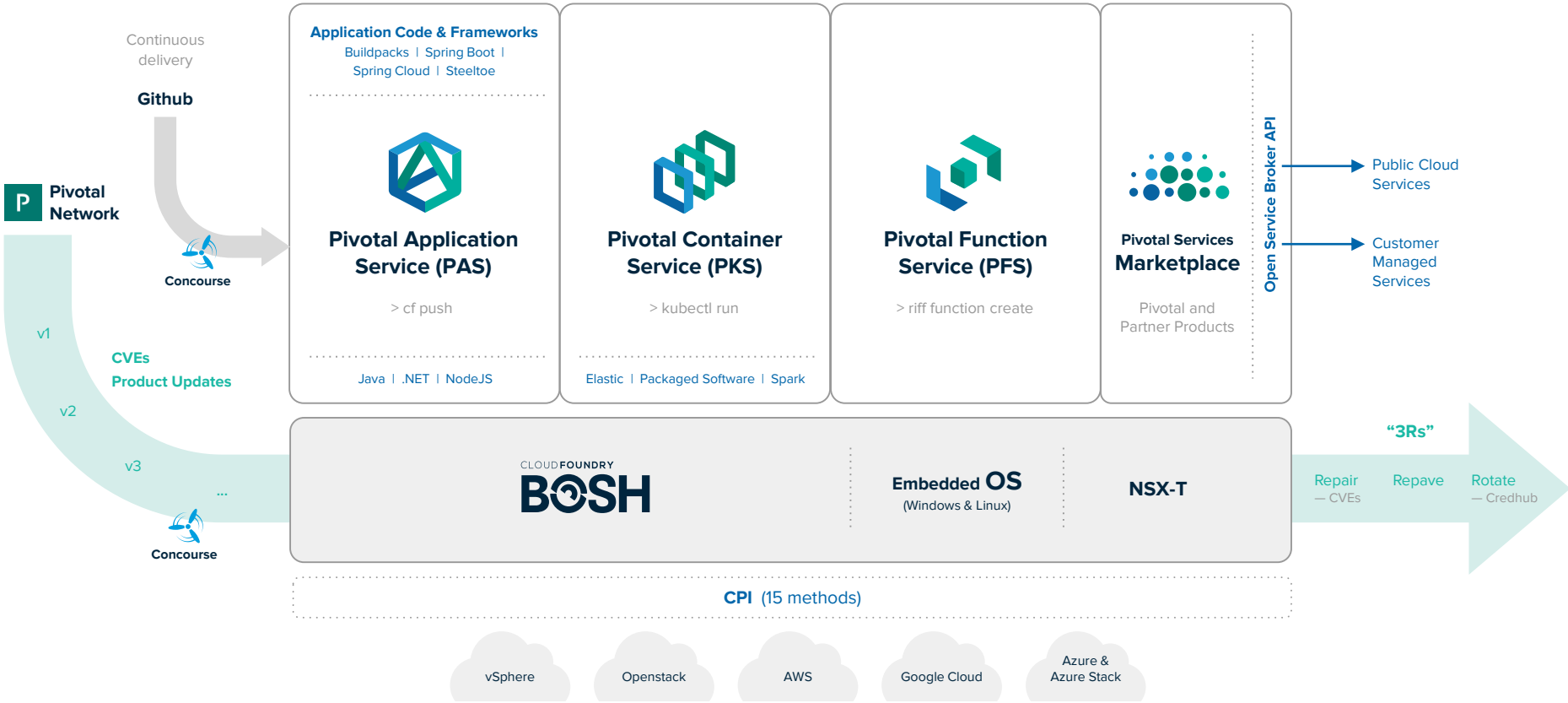


vmware® openstack® Azure aws Google Cloud Platform

Operating system of choice



PCF - One platform for all your workloads



Pivotal

Pivotal Application Service (PAS): A Runtime for Apps

Increase speed and deploy code to production thousands of times per month. Use PAS to run Java, .NET, and Node apps.

Best runtime for Spring and Spring Boot — Spring's microservice patterns—and Spring Boot's executable jars—are ready-made for PAS.

Turnkey microservices operations and security — Spring Cloud Services brings microservices best practices to PAS. It includes Config Server, Service Registry, and Circuit Breaker Dashboard.

A native Windows and .NET experience — Use PAS to run new apps built with .NET Core. Run your legacy .NET Framework apps on PAS too, using the .NET Hosted Web Core buildpack. Push applications to containers running on Windows Server 2016.

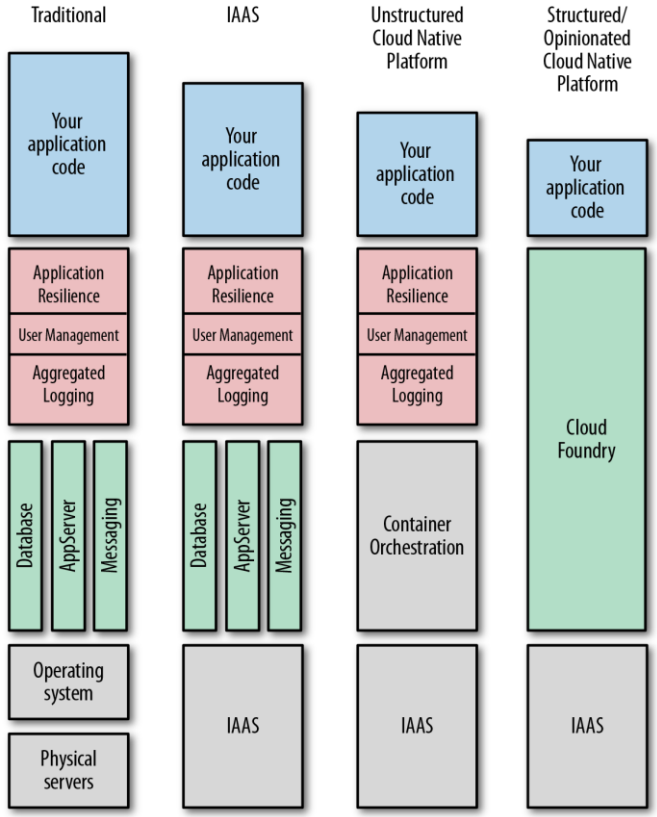
Built for apps — PAS has everything to need to run apps. Buildpacks manage runtime dependencies; metrics, logging, and scaling are done for you. Multitenancy, and blue/green deployment patterns are built-in. Extend apps with a rich service catalog.

Container-ready — PAS supports the OCI format for Docker images. Run platform-built and developer-built containers.

Pivotal Application Service (PAS): A Runtime for Apps

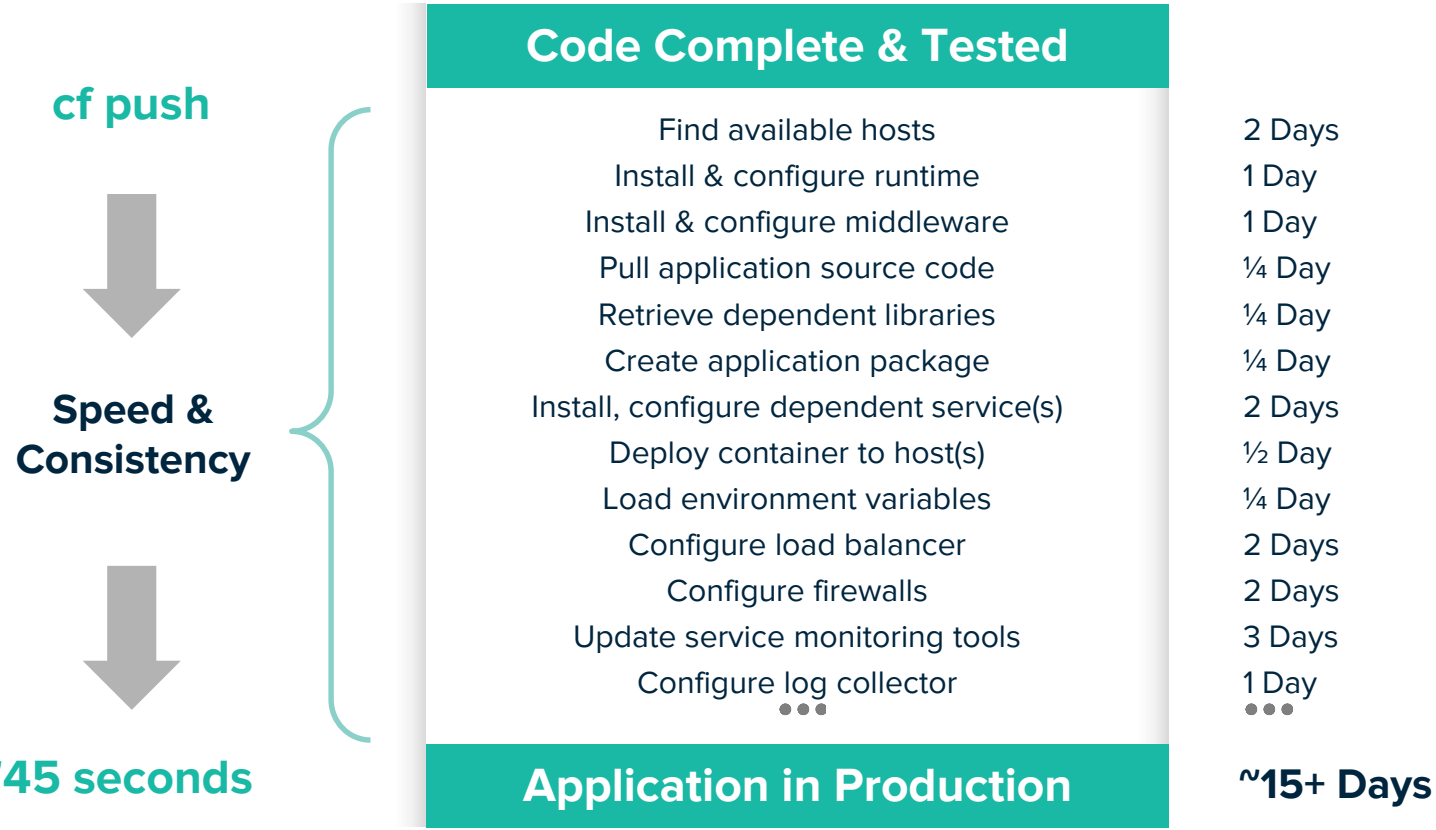
Pivotal Application Service™

- Developers focus on actual application code
- Operators gain productivity with automation



source: Cloud Foundry: The definitive guide, 1st Edition

No More Tickets, Just Self-Service



Spring Boot + App Runtime

The combination proven to boost velocity with enterprise development teams.

Spring Boot

Effortless dependency management

Embedded App Server

Creates self-contained apps that “just run”

Pivotal Application Service

Generates a container from a jar

Instantly starts the app in a container upon cf push

Adds environment properties

Microservices Ready | NetflixOSS | Actuator Integration | Metrics & Logging

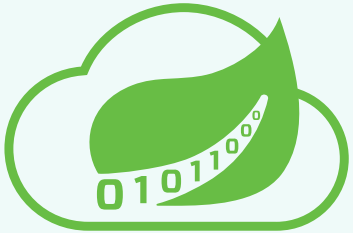
Spring by Pivotal: The Standard for Cloud Native Java

Spring Boot

Build Anything

Spring Cloud

Coordinate Anything



Spring Cloud Data Flow

Connect Anything

Code Clarity | Lower Complexity | Less Tech Debt | Focus on Business Logic | Better Test Coverage | Faster Code Completion

Build & Operate Microservices with Spring Cloud Services

Config Server for PCF

Delivers a dynamic, central configuration service to manage an application's external properties across all environments.

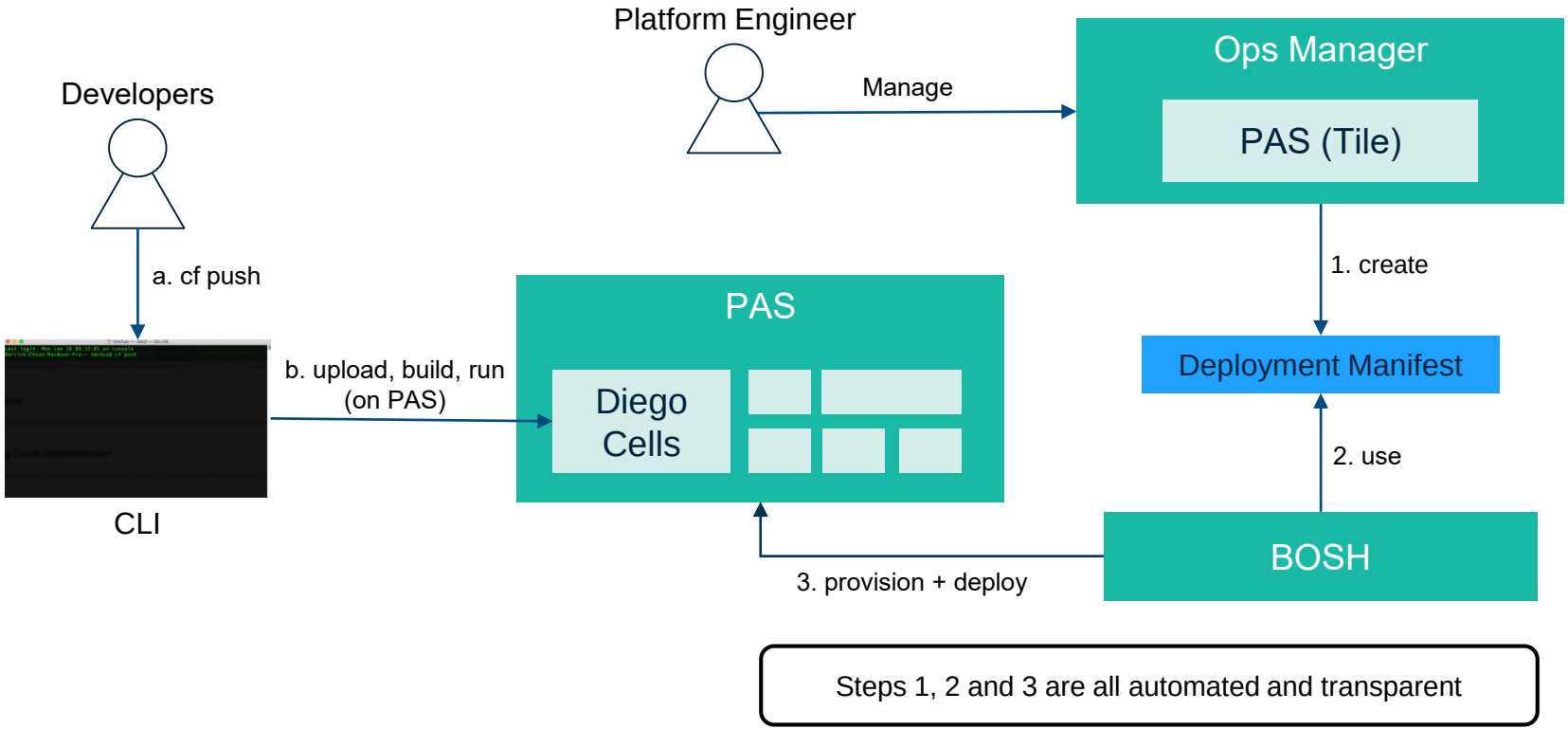
Service Registry for PCF

Provides an implementation of the NetflixOSS Eureka Service Discovery pattern, as a service.

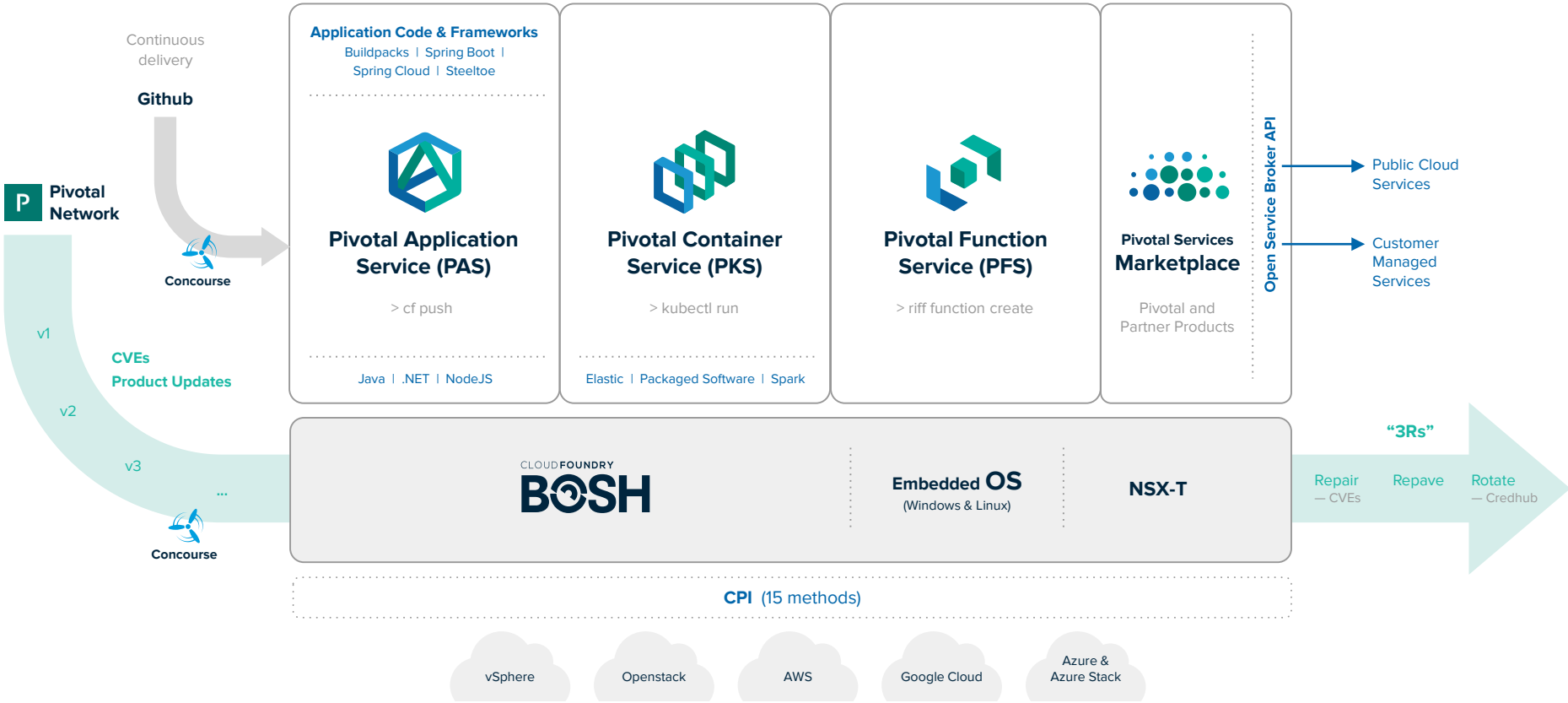
Circuit Breaker Dashboard for PCF

Visualizes a stream of Turbine health and metric data from the circuit breakers inside your microservices or applications.

BOSH + PAS = The full picture

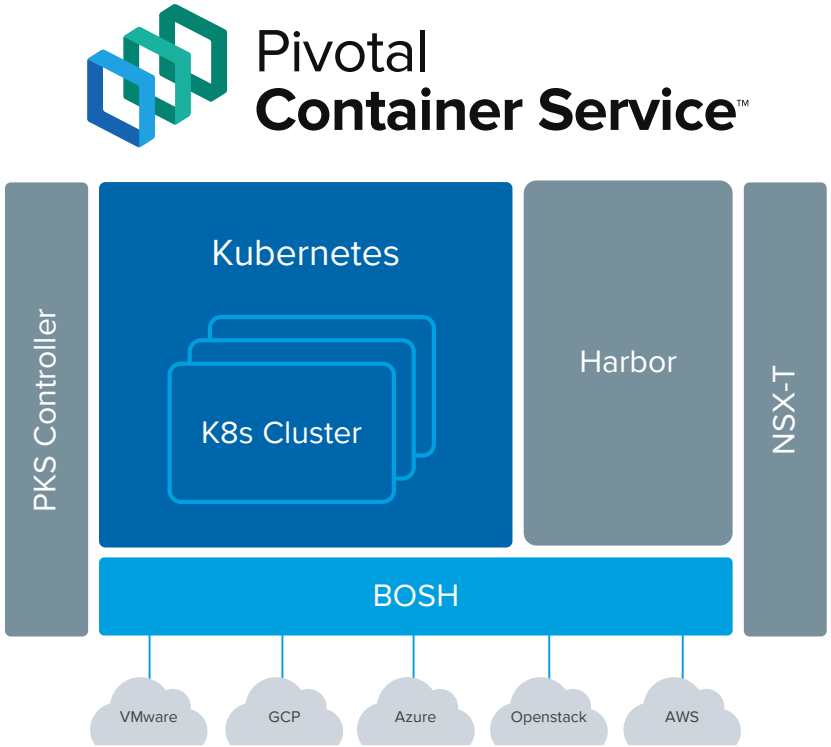


PCF - One platform for all your workloads



Pivotal

Pivotal Container Service (PKS): A Runtime for Containers



Built with open-source Kubernetes — Constant compatibility with the current stable release of Kubernetes, operated by BOSH. No proprietary extensions.

Production-ready — Highly available from apps to infrastructure, no single points of failure with master, etcd and worker nodes spanning multiple availability zones. Built-in health checks, scaling, auto-healing and rolling upgrades.

Multicloud — BOSH provides a reliable and consistent operational experience. For any cloud.

Network management and security out-of-the-box with VMware NSX-T. Automated microsegmentation and multi-tenant isolation.

Fully automated Ops — Fully automated deploy, scale, patch, upgrade. No downtime. Use CD pipelines to deploy your platform, too.

Zero downtime upgrades — Upgrade to the latest version of Kubernetes, apply maintenance without impacting availability using BOSH's Day 2 capabilities.

Pivotal Container Service (PKS): A Runtime for Containers

A turnkey solution to provision, operate and manage enterprise grade Kubernetes clusters

Pivotal
+
vmware
+
Google

Pure CNCF-Certified Kubernetes Dial Tone:

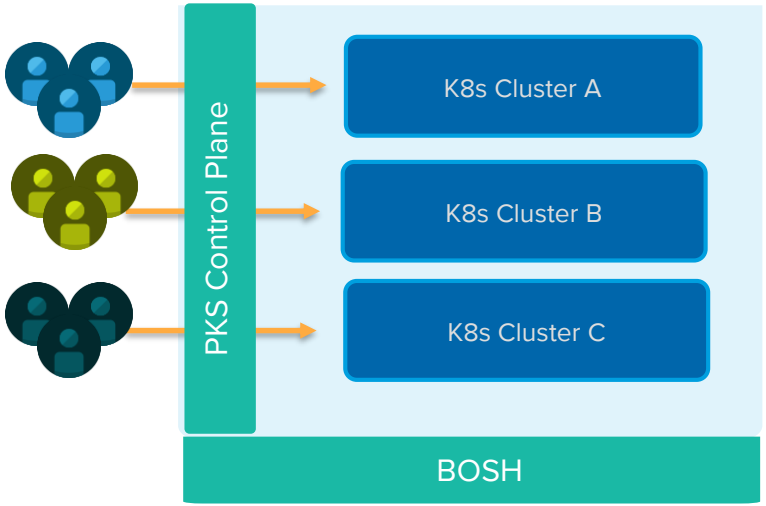
- Health management
- Aggregated metrics and logging
- Autoscaling
- Persistence interface

BOSH Control Plane:

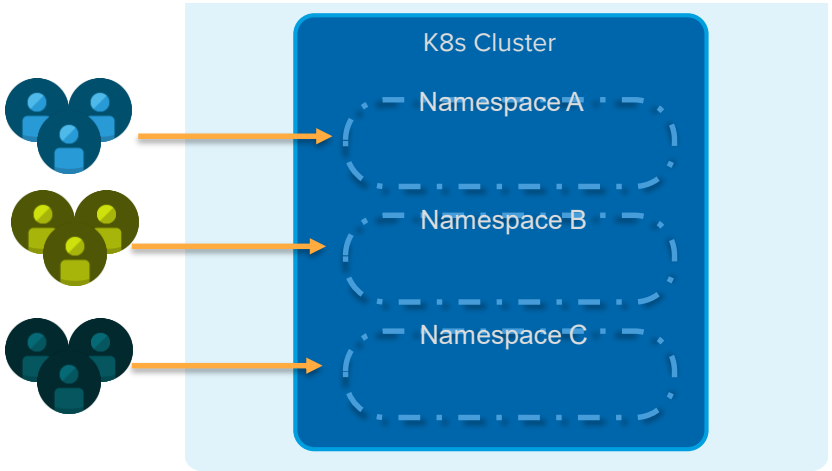
- Provisioning engine
- T-shirt sized clusters
- Self-service clusters
- Software update automation
- Load balancing
- Networking
- Multi-tenancy

Hard vs soft multitenancy

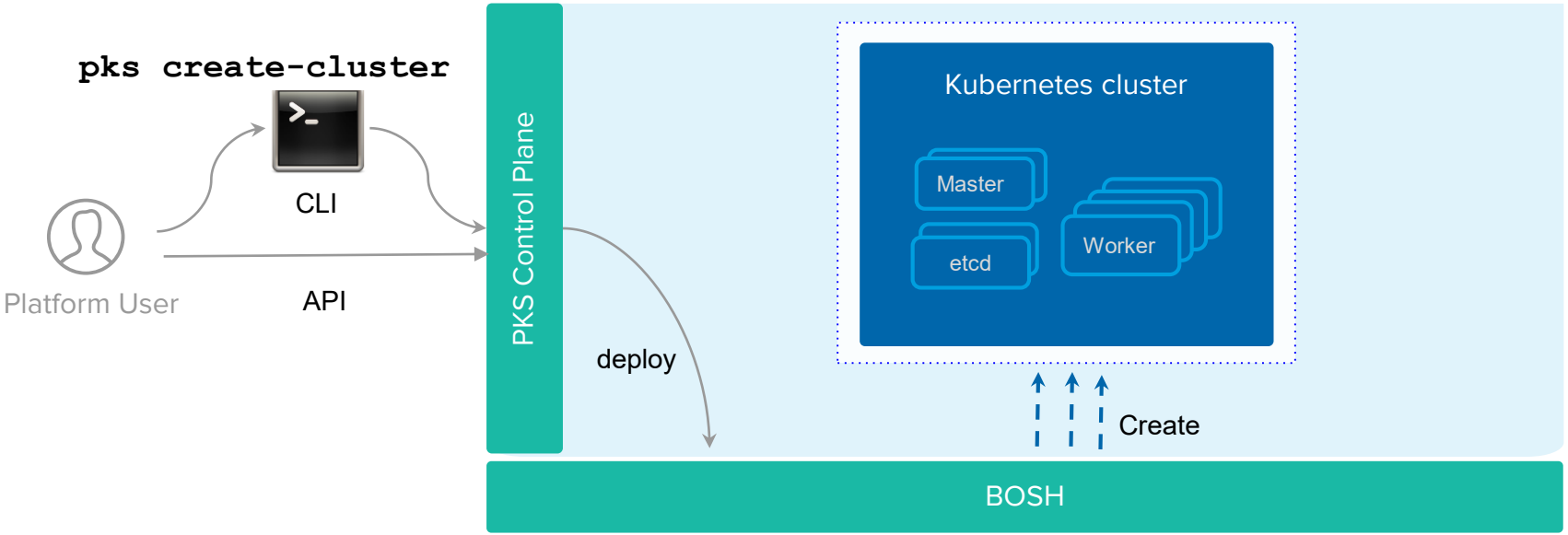
Multi-cluster
cluster-based



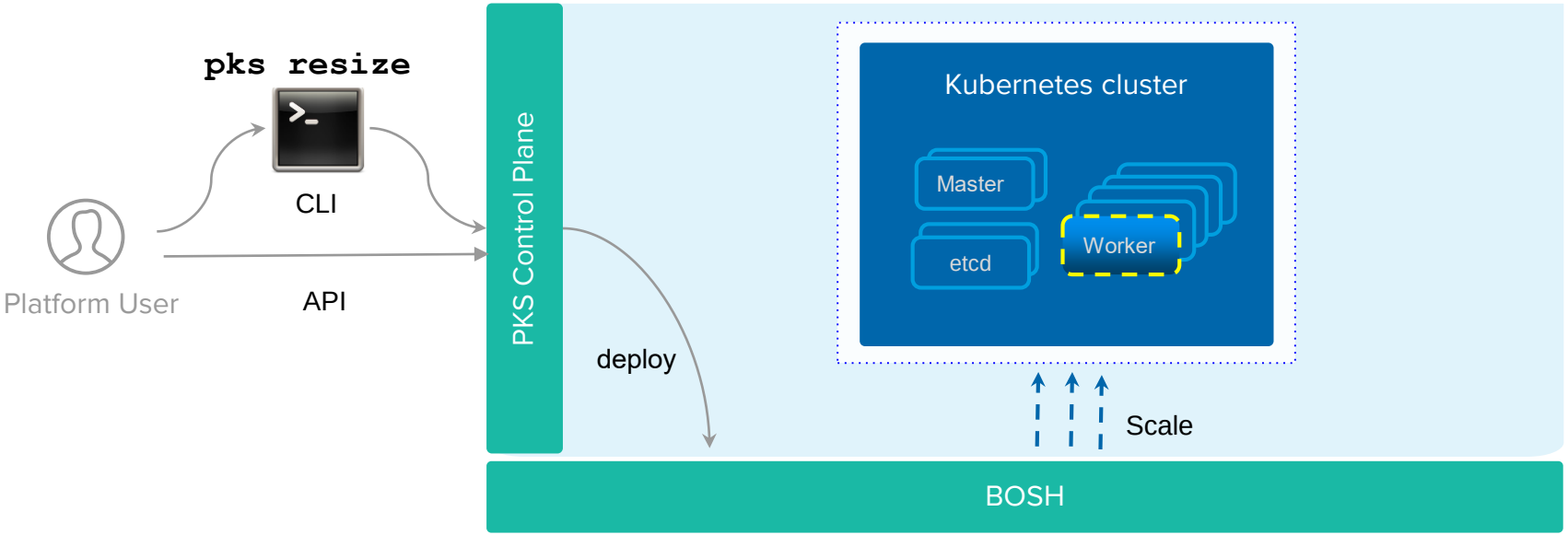
Single cluster
namespace-based



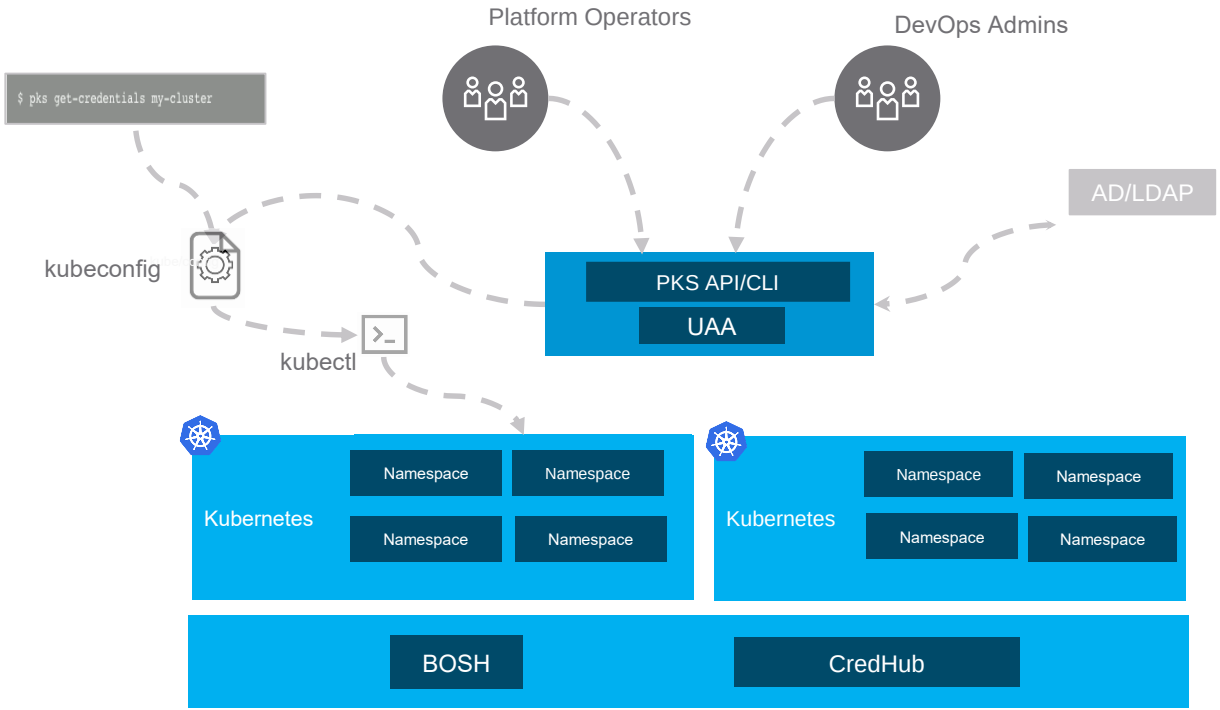
Creating a new kubernetes cluster



Scaling an existing kubernetes cluster

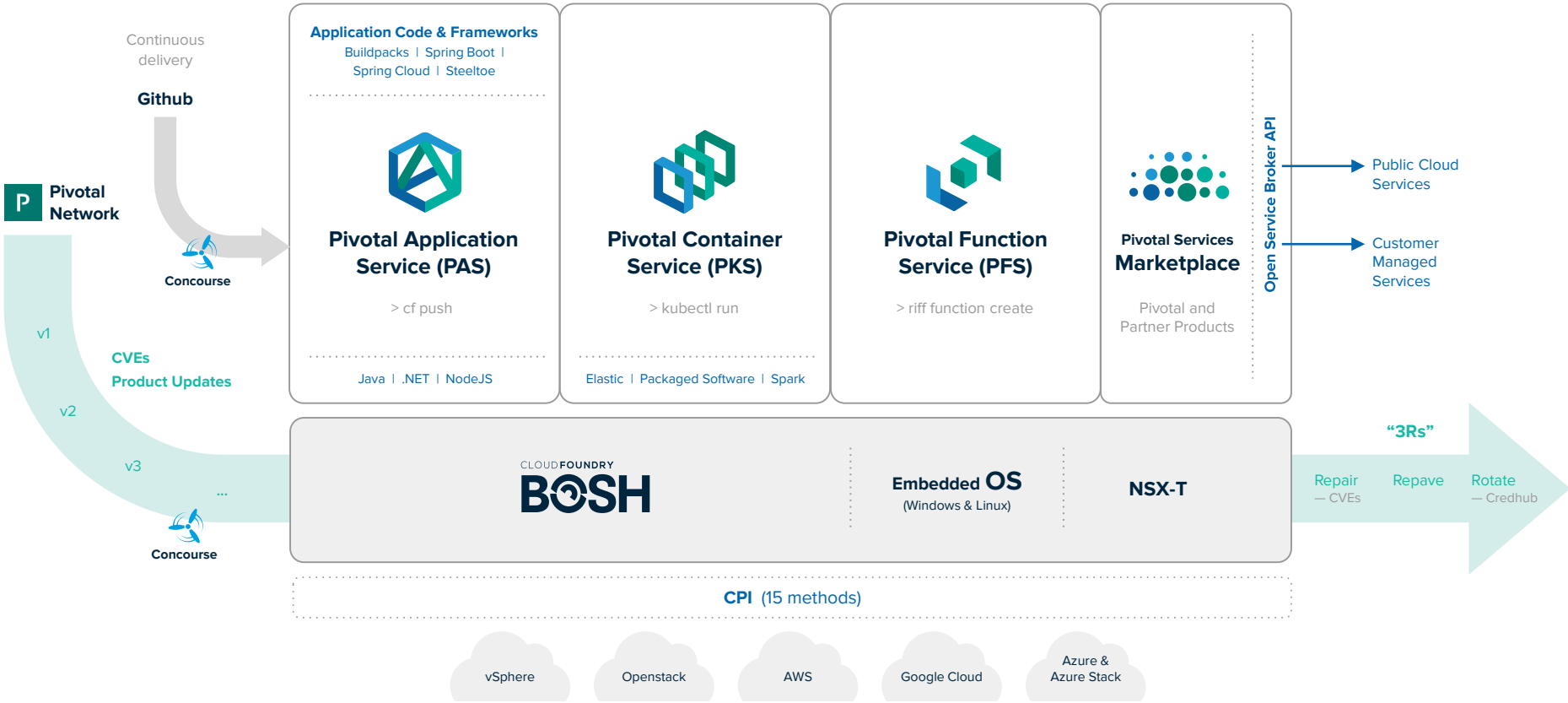


Centralized identity and access management



Pivotal

PCF - One platform for all your workloads



Pivotal

Pivotal Function Service (PFS): A Runtime for Functions

5 lines (5 sloc) | 120 Bytes

```
1  module.exports = x => {
2      const xx = x ** 2;
3      console.log(`the powerof2 result of ${x} is ${xx}`);
4      return xx;
5  }
```

Build | Serve | Event

Pivotal Function Service (PFS): A Runtime for Functions

Execute functions in response to events. Use PFS to handle web events, event-based integration, and large scale streaming data.

Trigger functions via HTTP/Message Broker — With PFS, you can quickly set up functions for a variety of events. PFS is architected to support pub/sub message delivery over messaging channels.

Run functions anywhere — PFS lets you easily run functions on-premises and in the public cloud for maximum flexibility.

Built on Knative — PFS is built on Knative, an open-source project led by Google. Knative simplifies how developers deploy functions atop Kubernetes and Istio.

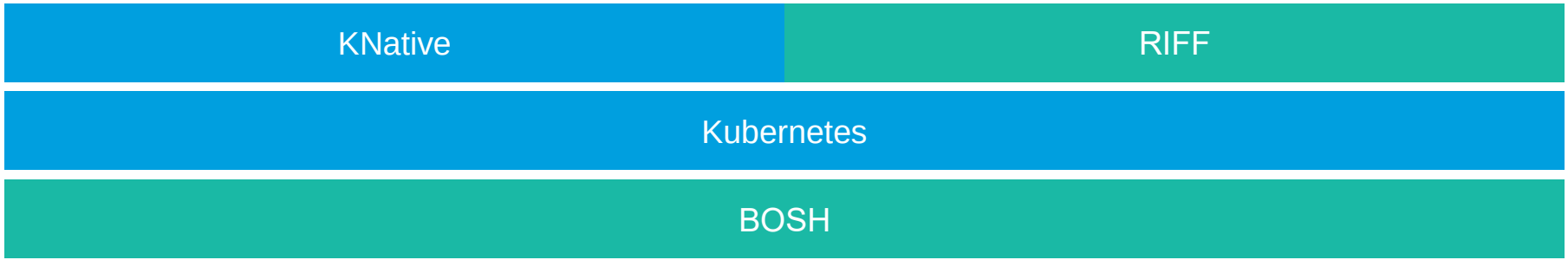
Pluggable build system — PFS features a source-to-container mechanism to simplify deployment. Use proven components like Cloud Foundry Buildpacks.

Pluggable event sources — PFS Event Sources facilitate the creation of Feeds from a variety of external event sources such GitHub webhooks, blob stores, and database services.

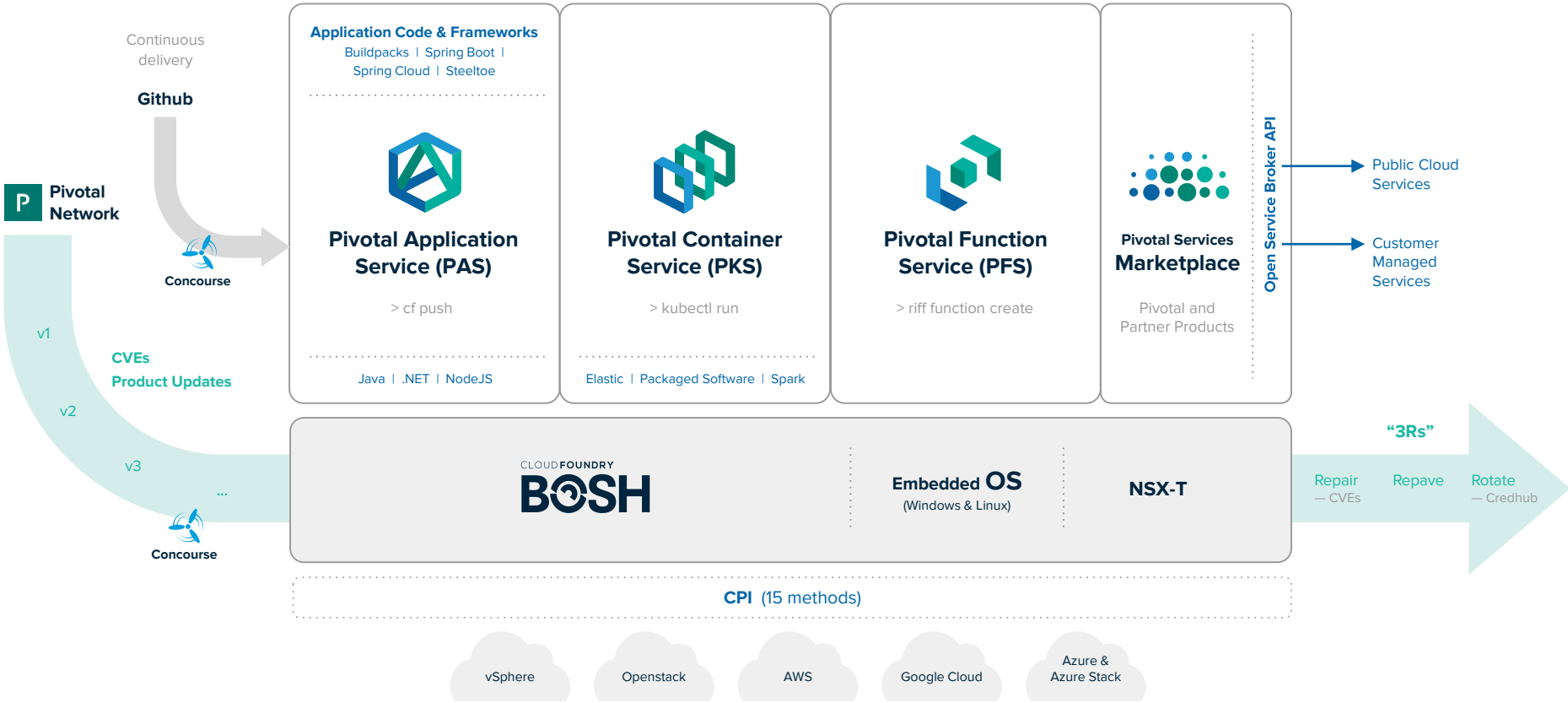
Pluggable event brokers — PFS can be connected easily with popular message brokers such as Kafka, Google Pub/Sub, and RabbitMQ.

PFS - based on solid fundamentals to deliver more value efficiently

Less Code	Auto Build	Auto Run	Auto Wire
Function-invoker model	Buildpacks Revisions CI/CD	0-N autoscaling	Event channels & routes



PCF - One platform for all your workloads



Pivotal

Extend Apps with Brokered Services from Pivotal

MySQL for PCF

- Enterprise-ready MySQL for your developers
- Automate database operations in developer workflows
- Leader-follower for DR
- **NEW:** HA via Galera clustering, TLS encryption

Pivotal Cloud Cache

- High performance, in-memory, data at scale for microservices Look-aside caches & HTTP session state caching
- WAN replication
- **NEW:** TLS encryption, CredHub integration

RabbitMQ for PCF

- Easily connect distributed applications with the most widely deployed open source message broker
- Enable connected scalable, distributed applications
- **NEW:** Service Instance Sharing, TLS encryption

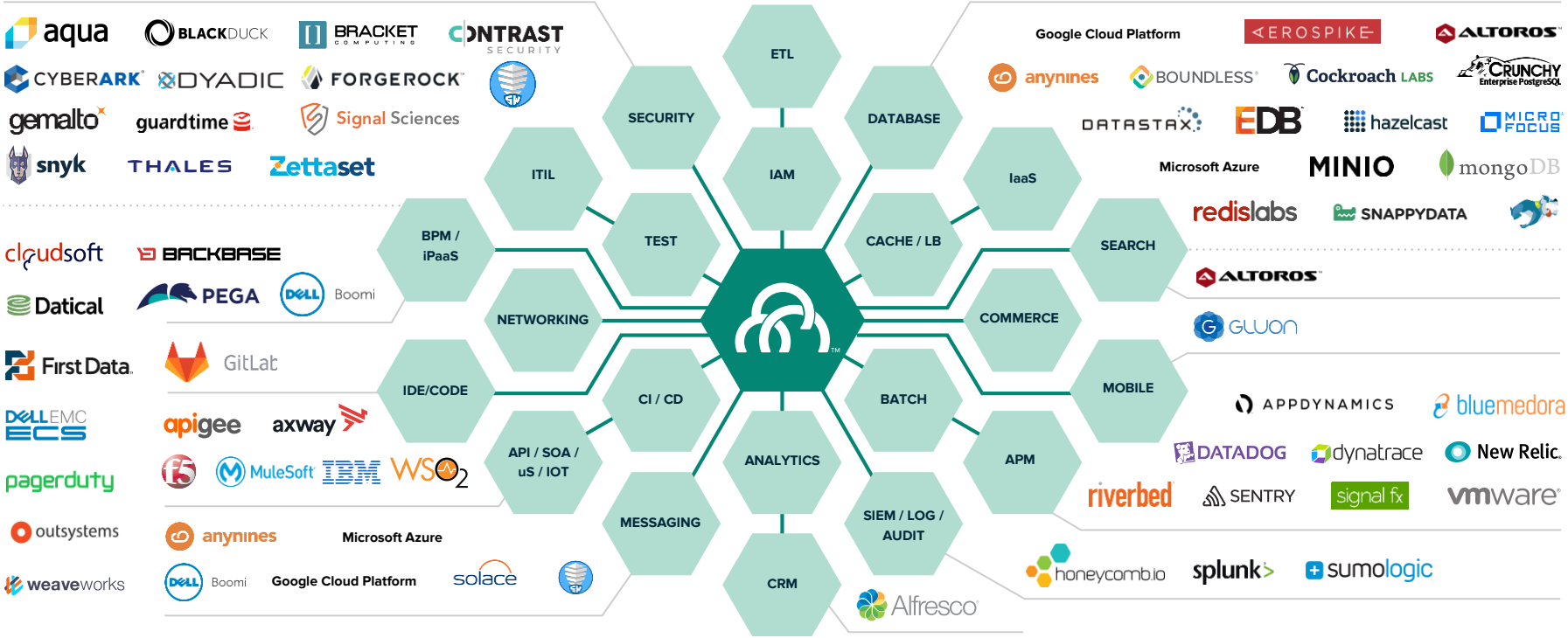
Redis for PCF

- In-Memory cache and datastore, configured for the enterprise
- Efficient provisioning matched to use cases
- **NEW:** On-demand service instance metrics.

BOSH Managed | **On-Demand Provisioning** | **Dedicated Instances** | **Custom Service Plans**

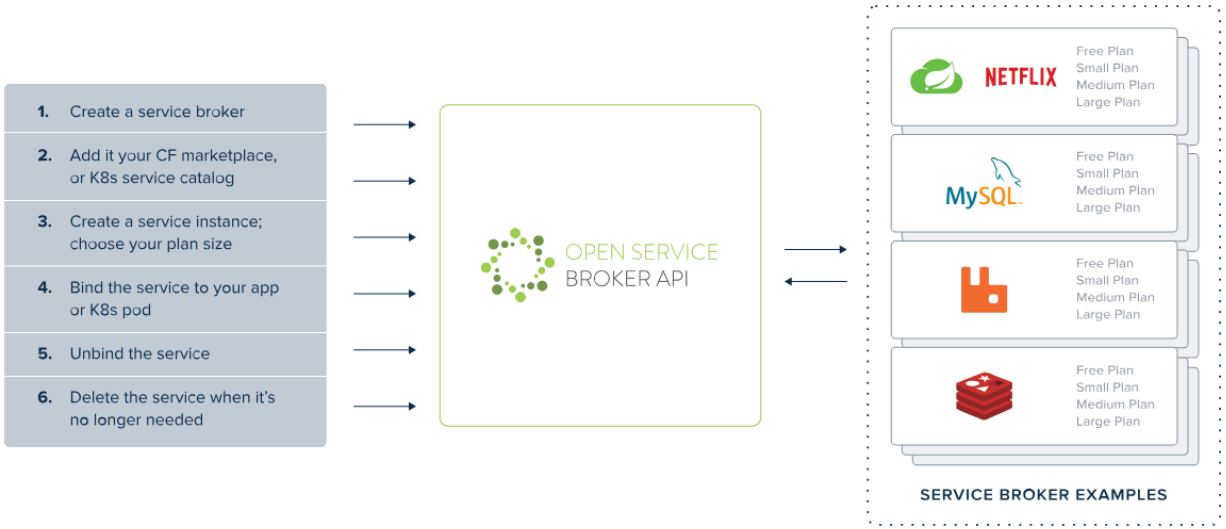
Pivotal

ISV Ecosystem Momentum Drives Platform Advantage



Pivotal

Open Service Broker API: Easily Add Services to Apps and Containers



Multiplatform & Multicloud | Simple & Structured | Connect Anything

Flexible Deployment Models

Extend Apps with Popular Services

Supports the Permissions of Cloud Foundry and Kubernetes

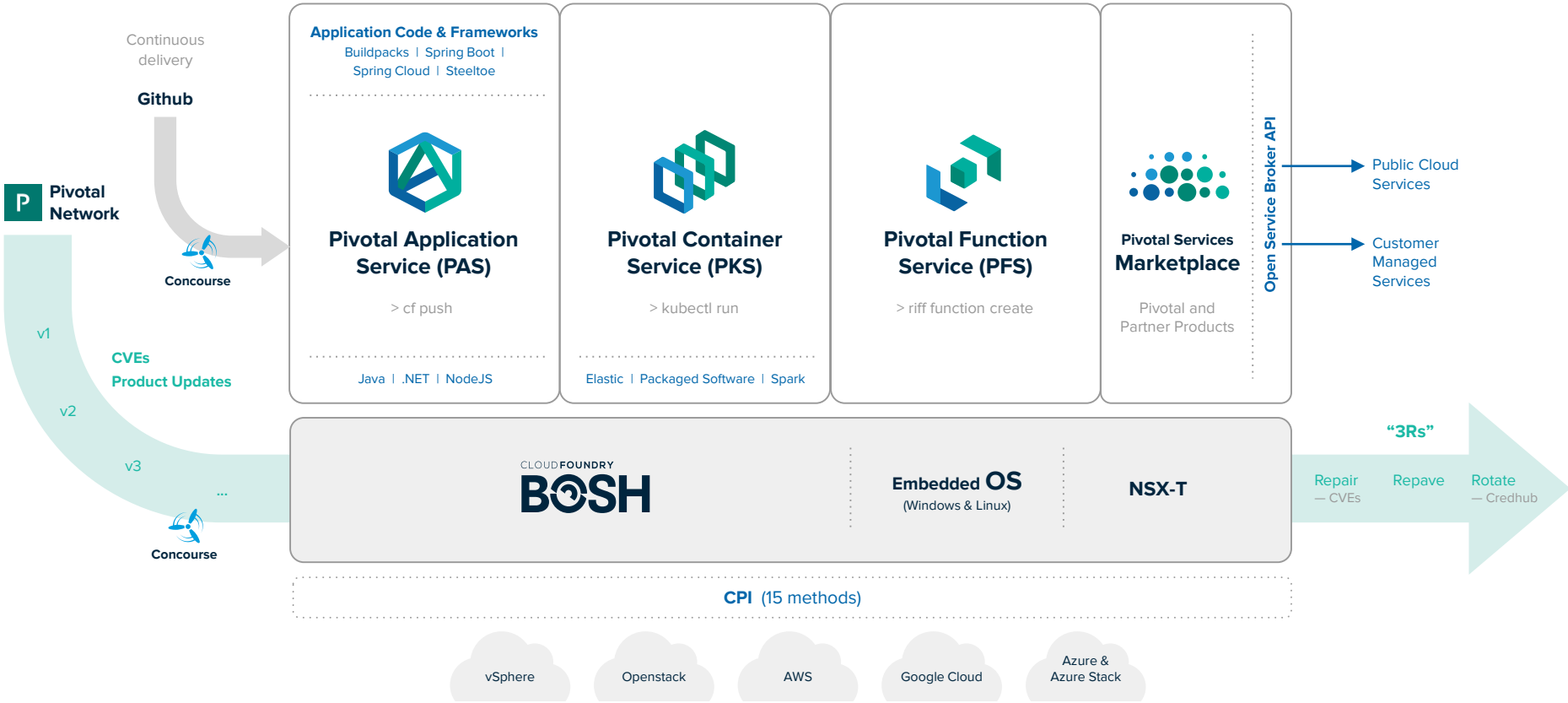
OSBAPI Supports Unique Credentials for Every App

Simple Configuration

Open Source

Pivotal

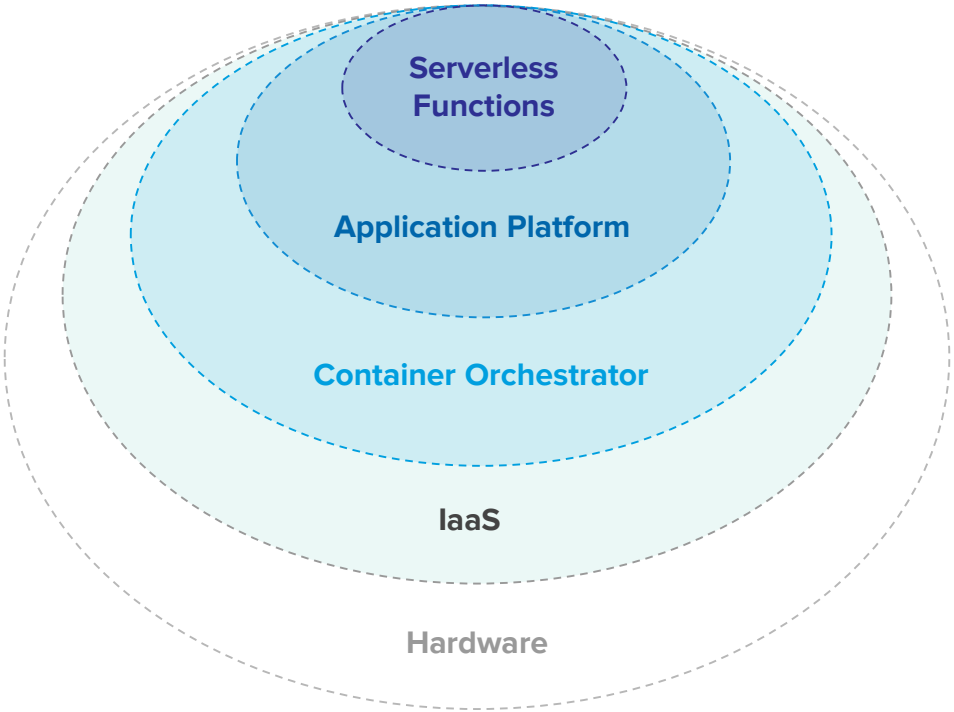
PCF - One platform for all your workloads



Pivotal

You get to choose the right level of abstraction

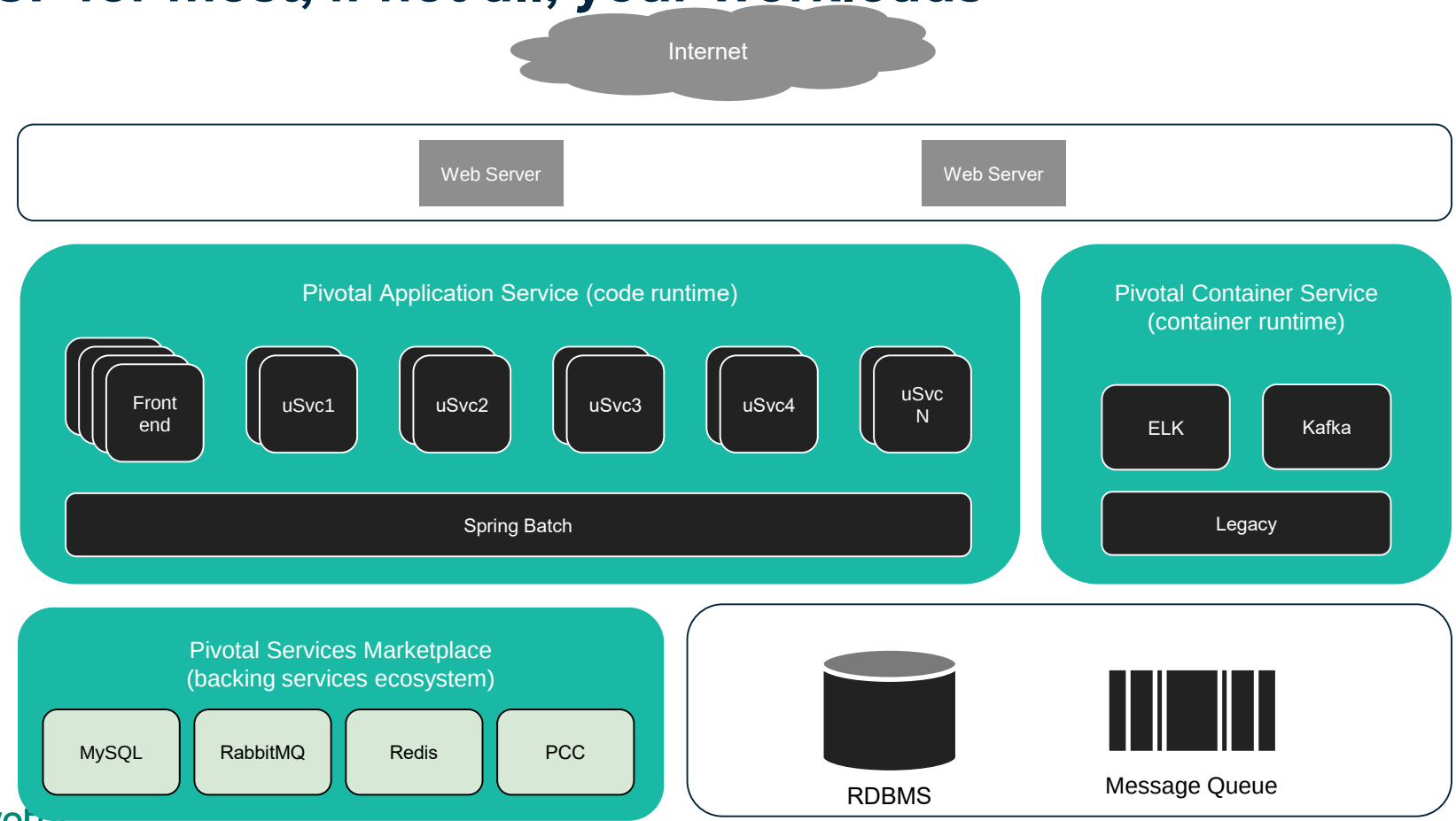
Higher flexibility and less enforcement of standards



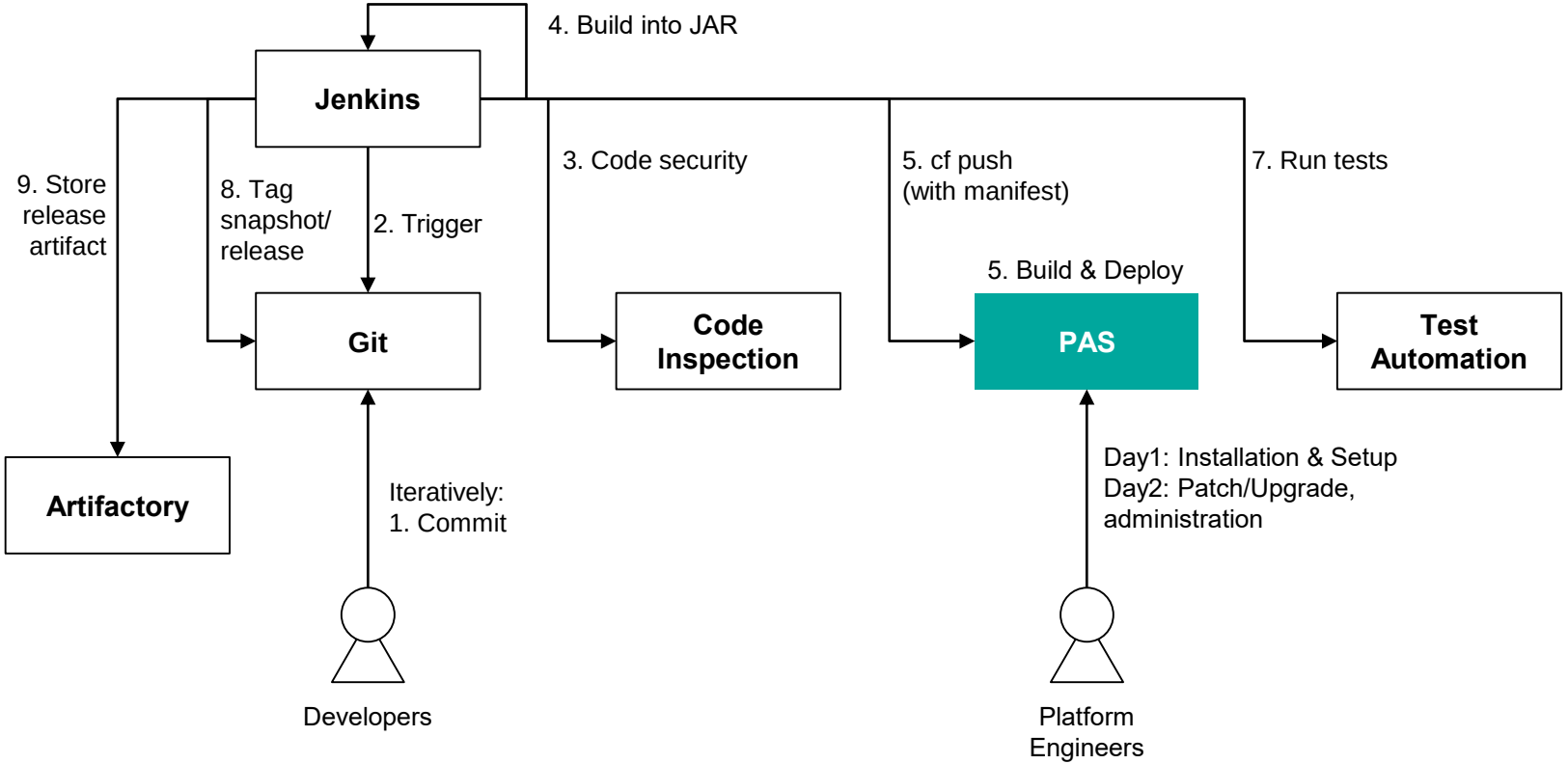
Lower development complexity and higher operational efficiency


How PCF might look like for you
Pivotal

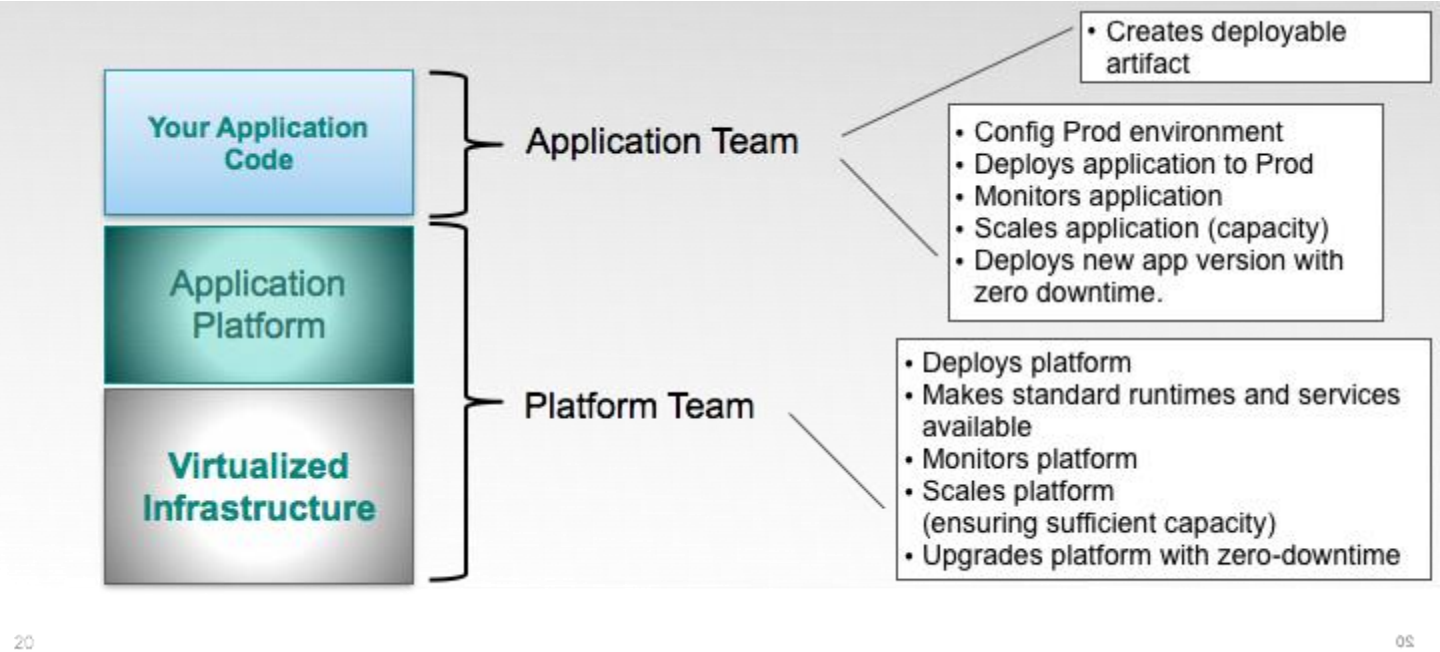
PCF for most, if not all, your workloads



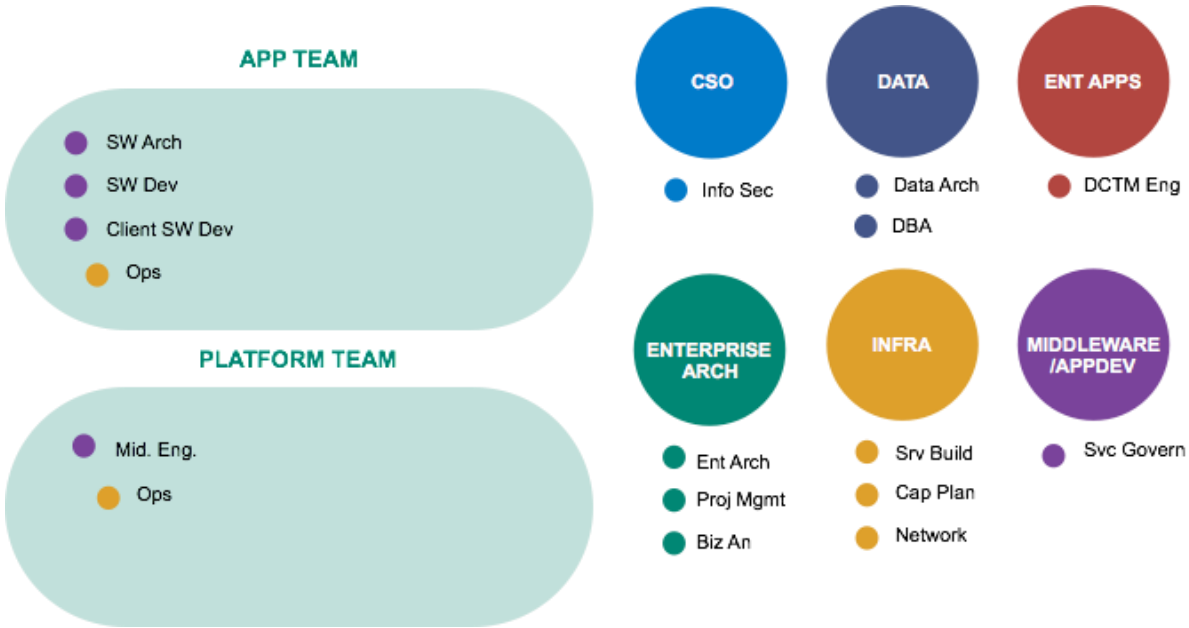
PAS in example CI/CD process



New tribes for PCF



Example mapping to IT roles



[Video: Who Does What? Mapping Cloud Foundry Activities and Entitlements to IT Roles — Cornelia Davis]

Code quality with Pivotal

Best Practices

Test Driven Development
Pair Programming

Standardized environments

Buildpacks
BOSH
PaaS, CaaS, FaaS

Continuous feedback and improvements

Zero downtime deployment
Canary, Bluegreen deployment
PCF Metrics

Incentives on code quality
Measure and reward improvements
Active testing of production software (e.g. bug bounty, Red Teaming, external code review, Chaos Eng)
App Performance Management

Transforming How The World Builds Software