



# Cloud Native Applications

- One Platform for all Modern Workloads

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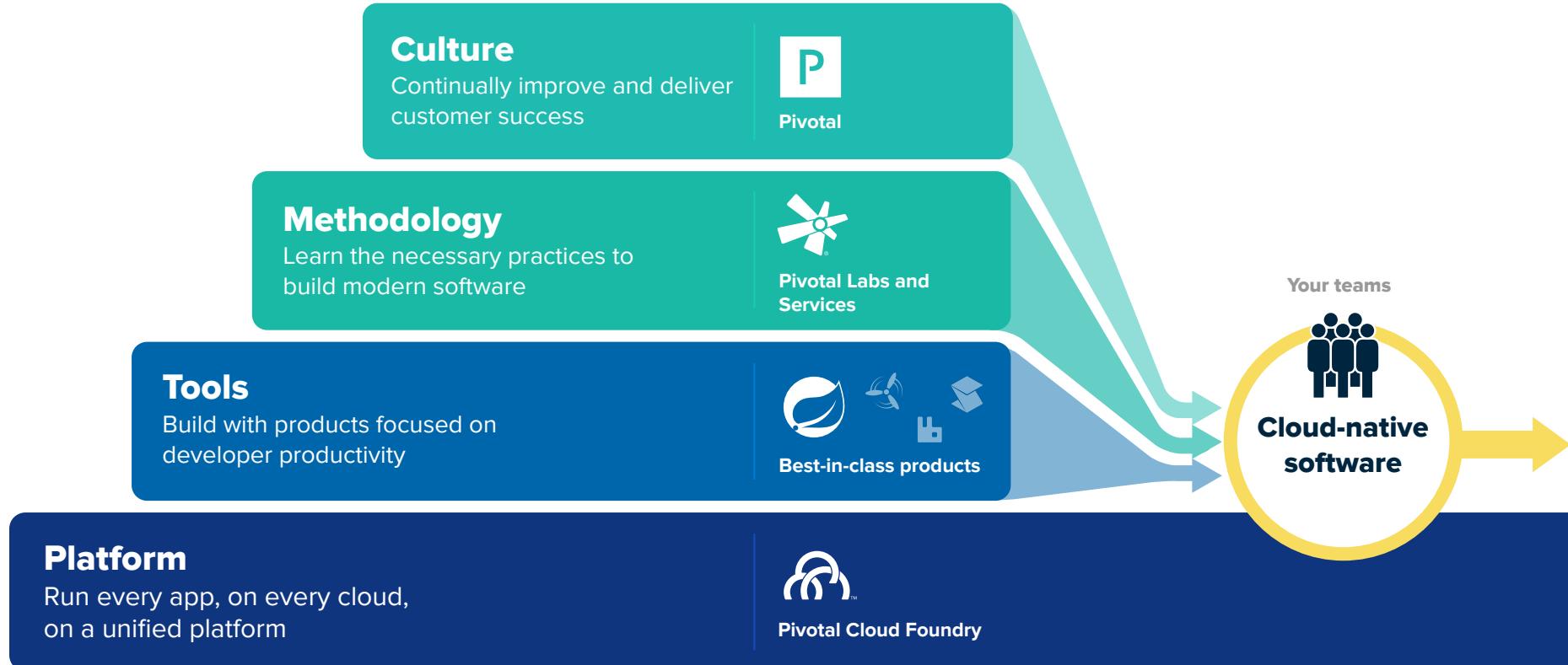
**Why us?  
We partner differently.**



**“Pivotal has been partnering differently since birth and way before it became fashionable.”**

— Greg Otto, Comcast

# Pivotal's partnership approach to software is holistic



Big bet

# Redefine the industry and capture market share

Pivotal

**DBS**

- Largest bank in SE Asia and 50% of market share in Singapore
- Named **Best Digital Bank** by Euro Money
- Built the world's largest banking API portal using PCF

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**6x faster** time to market

**10x increase** release cadence with **6x** decrease in effort

**0 downtime** since moving production to PCF in 2016

Big bet

# Rethink security by moving fast, not slow

Pivotal

## Wells Fargo

- Patch all PCF foundations **weekly**
- Repave largest PCF foundations in **4.5 hours**

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**22 apps** in production

**80 more apps** in non-prod

**2500+ app instances** running  
on **30+ foundations**

Big bet

# Compete with online banks and win

Pivotal

## Rabobank

- 8.3 million customers in 39 countries
- One of world's **highest rated** commercial banks
- Named **Safest Bank** by Global Finance
- 85 features in mobile app

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**PCF chosen as microservices platform** for entire bank

**4 foundations** and **100+ applications** in production managed by **3 people**

Big bet

# Compete against online retailers and win

Pivotal

## Dick's Sporting Goods

- eCommerce sales up 16% in Q3 2018
- Best-ever Black Friday sales period

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**25%** increase in developer productivity

**65%** faster web page load times

**0** hours spent on manual security patching

Big bet

# Rebuild culture around delivering value at speed

## U.S. Air Force

- Current and future conflicts won with data and technology
  - Projects resulted in millions of dollars of savings each week
- 

**18** different product teams

**Shipping software daily**  
rather than yearly

**Global deployments** of PCF

# What do these organizations have in common?

## → Executive buy-in

Leaders recognize the changing competitive landscape and know that success depends on major investments in people and technology.

## → Clear app modernization strategy

There is a value-driven approach to improving fault tolerance, scalability, performance, and functionality of existing software.

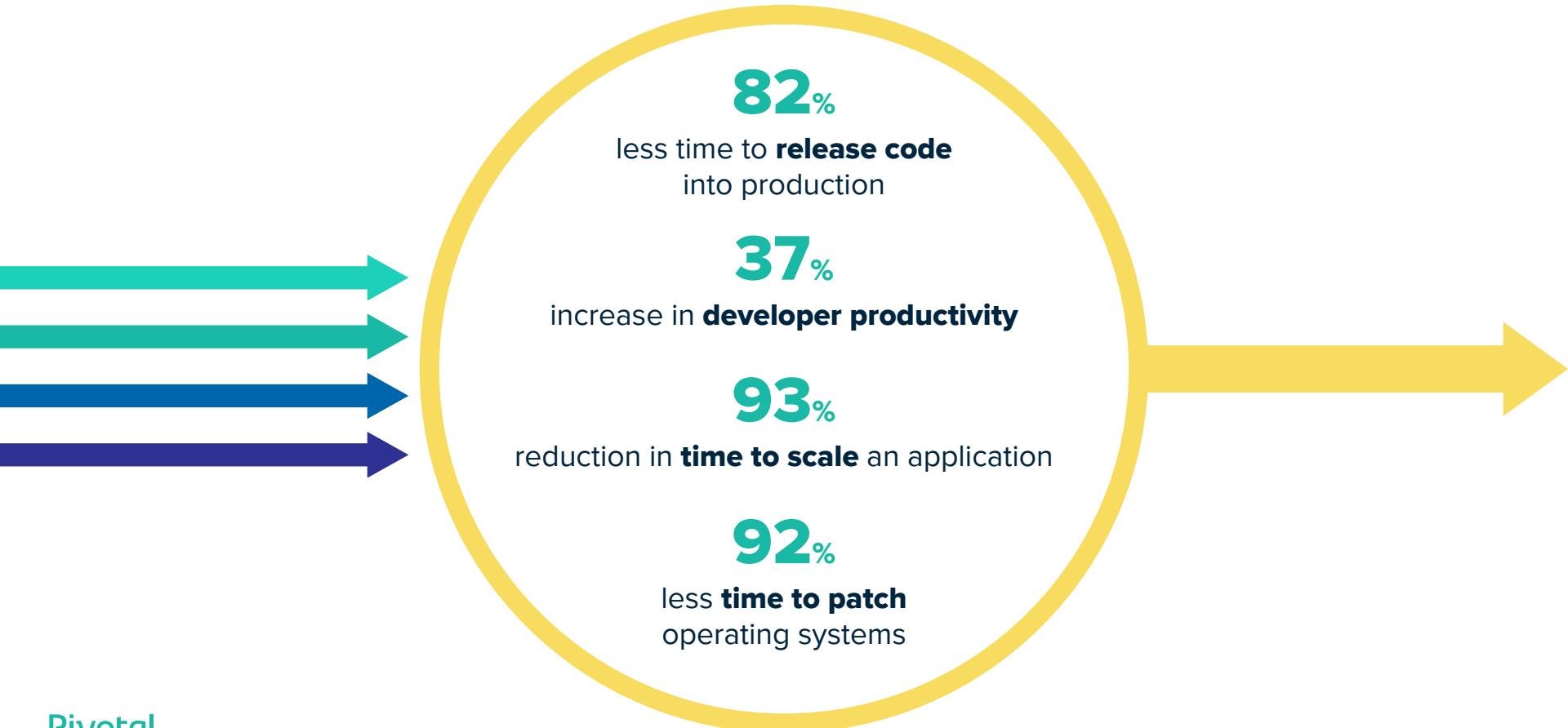
## → Commitment to secure software engineering and cloud-native operations

Agile teams continuously deliver secure, test-driven, user-centric software. Intense focus on automating operational toil and offering application-centric services via APIs.

## → Multi-cloud platform

They use proven platforms to run their software on the right abstraction, in the right cloud.

# The result is transformative





# Pivotal Platform



# The Pivotal Platform 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

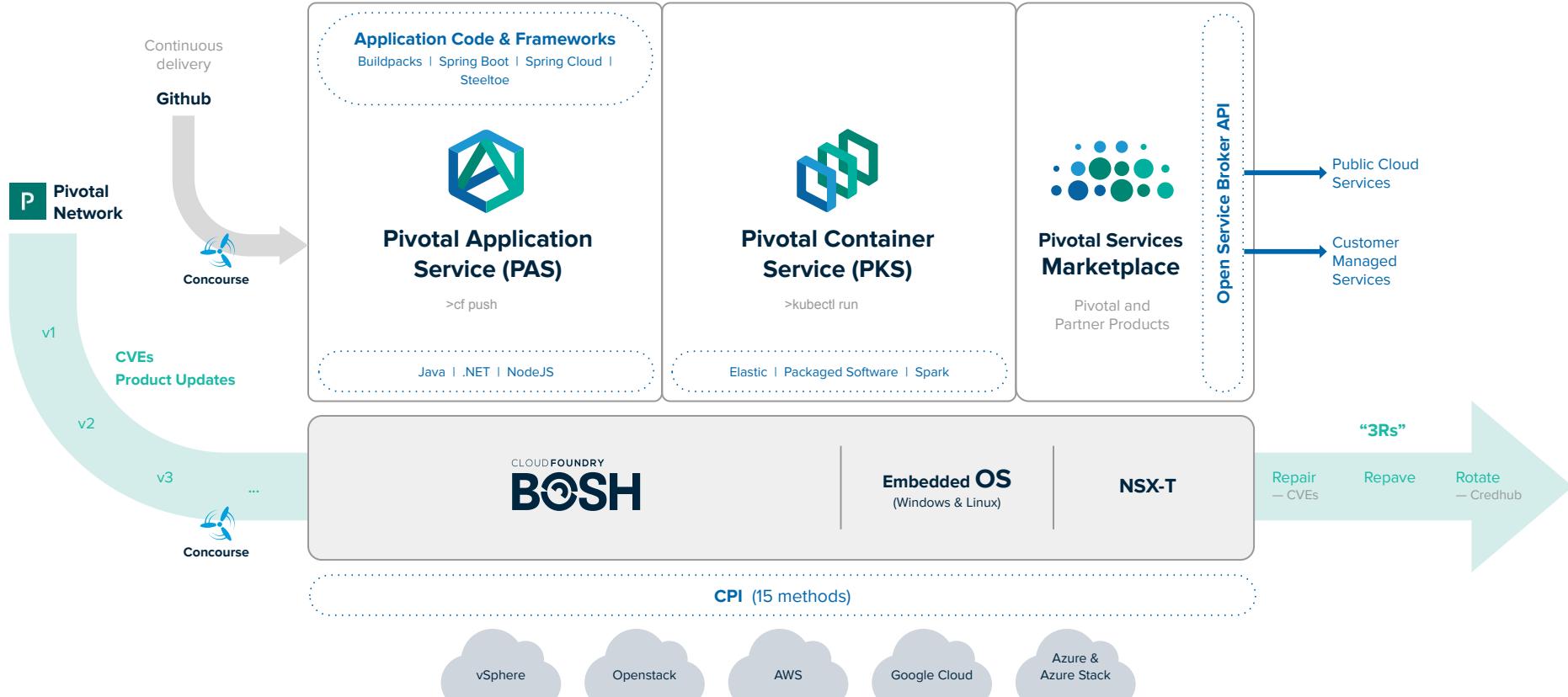
- Adopt a defense-in-depth approach
- Continuously update platforms to limit threat impact
- Apply the 3 R's → repair, repave, rotate



## 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 Platform – one platform for all modern workloads



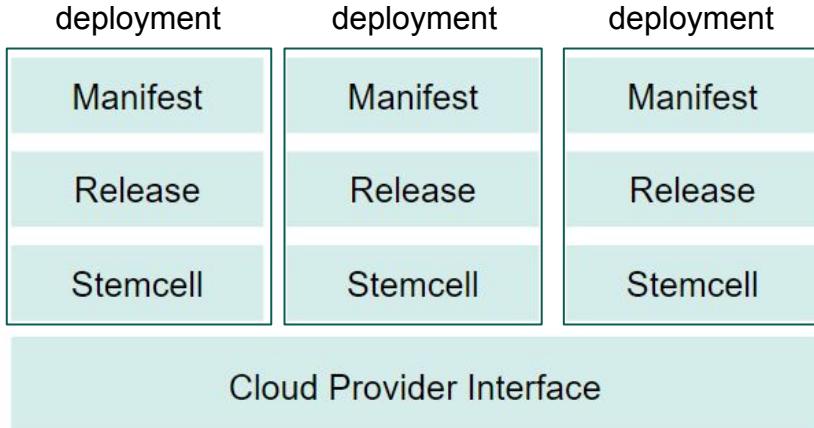
# BORG++ = BOSH → the heart of PCF



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



Pivotal

zookeeper.yml

```
---
name: zookeeper

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

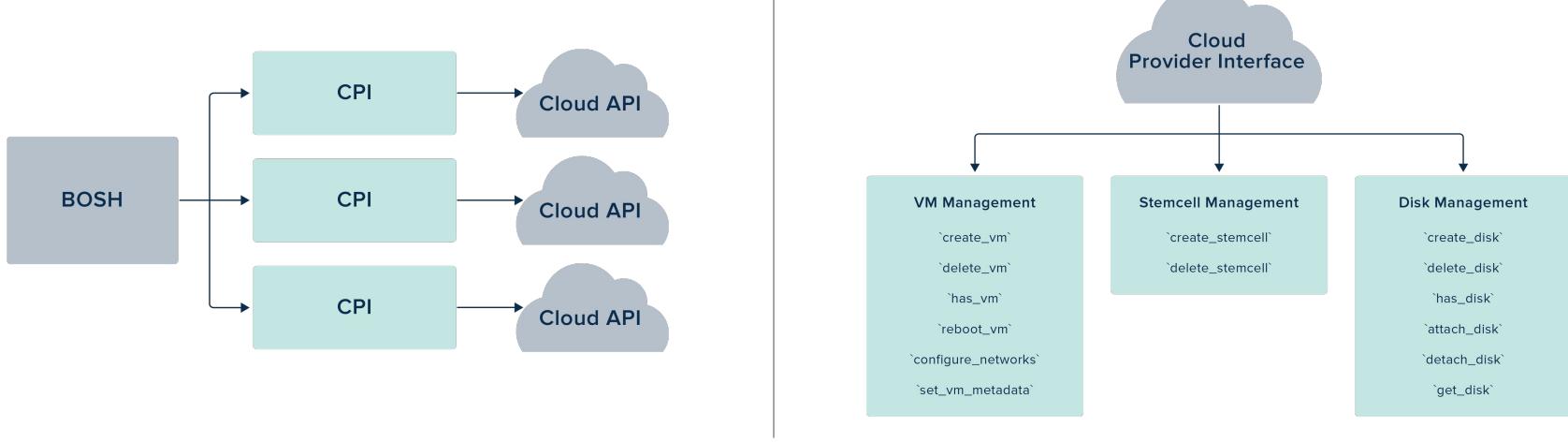
stemcells:
- alias: default
  os: ubuntu-trusty
  version: latest

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

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

- 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®

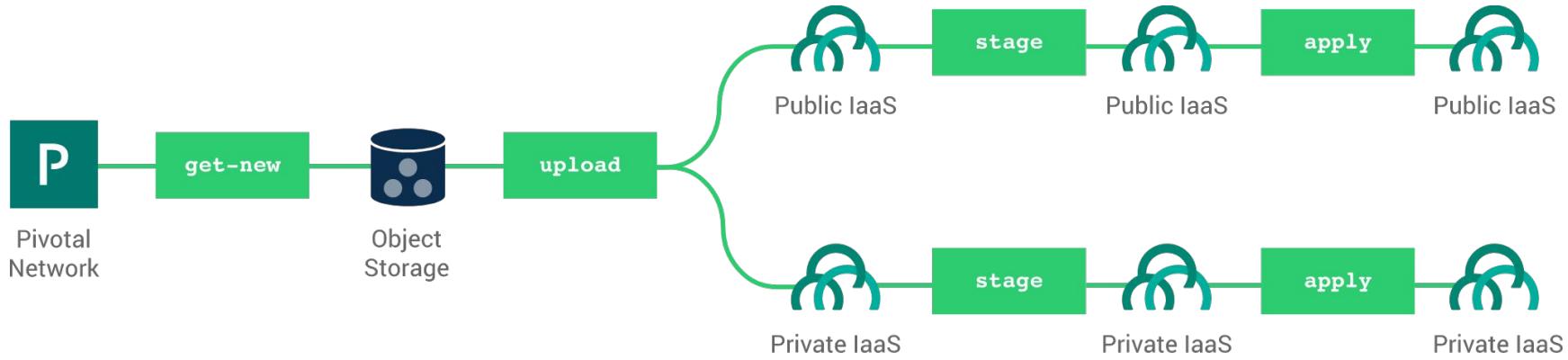
openstack.

Azure

aws

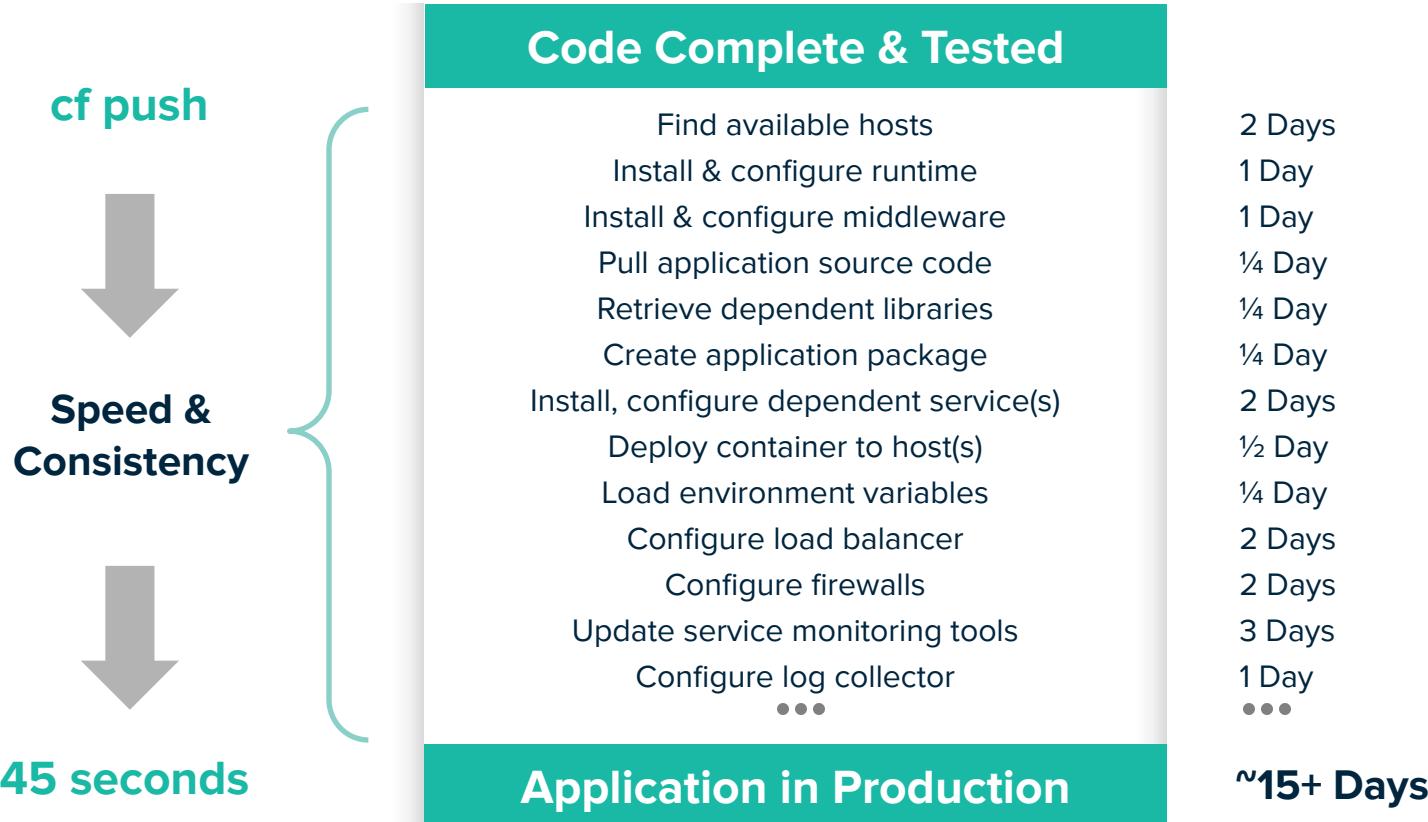
Google Cloud Platform

# Zero Downtime Updates for OS, CVEs, Patches with BOSH



# PAS: Runtime for Code

# No More Tickets — Self-Service Provision and Deploy



# Spring Boot + App Runtime

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The combination proven to boost velocity with enterprise development teams.

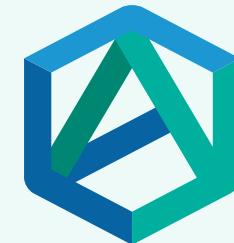


## Spring Boot

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](#)

# Pivotal Spring Runtime: Comprehensive Java Support

Included by default with PAS



# Spring Runtime

Software and support for **OpenJDK**, **Spring**, and Apache  
**Tomcat** for any enterprise

Pivotal's Java Experts

Support 24/7

Simple & Fair Pricing

# Steeltoe: Cloud Native .NET Microservices



**steeltoe**  
by Pivotal.

An open source project that enables .NET developers to implement best practices for resilient microservices in the cloud.

- Client libraries for .NET and .NET Core framework apps
- Service Discovery, via Eureka
- Config Server, via Spring Cloud Config Server
- Circuit Breaker, via Hystrix
- Cloud Connectors to common CF services
- Management endpoints
- Application metrics
- Distributed tracing

# Add Spinnaker to Your Pivotal Platform Deployment



Open source, multi-cloud continuous delivery. Releasing software changes with high velocity and confidence.

## Works with PAS and Enterprise PKS

- Zero-downtime blue/green deployments
- Multi-foundation view of applications
- Manifest-based deployment
- Application management actions and pipeline stages
- Clone stage for promotion of applications across environments
- Pipeline stages to deploy/destroy services
- Binding applications to services as part of deploy stages
- Artifact framework for triggering and assembling deployments
- Artifactory and Nexus integrations
- Artifact traceability from build to deployed assets
- Concourse trigger type

# Embrace an Autonomous Platform

## Snowflake Automation

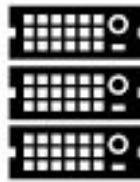


- Ad hoc, Fragile Automation
- Procedural Scripted Runbooks
- Complex/Custom Configurations
- Failure Sensitive Infrastructure
- Version control & repository
- Difficult to Port/Replicate
- Script Maintenance Overhead

Manual, Slow, Inflexible, Error-Prone



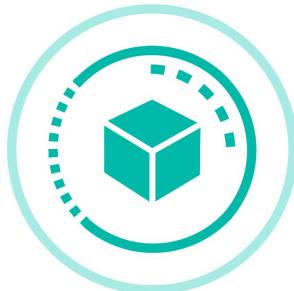
## Autonomous Platform



- ✓ Consistent Declarative Contracts
- ✓ Adaptable, repeatable platform
- managed DevOps processes
- ✓ Developer + Ops Friendly Constructs
- ✓ Easy to move/re-architect apps
- ✓ Infrastructure Failure Agnostic

Intelligent, Fast, Flexible, Safe

# Pivotal Platform Automation Simplifies Updates & Upgrades



Building blocks for teams to create a repeatable and reusable automated pipeline for upgrading and installing Pivotal Platform foundations.

- Works with Concourse and leverages Concourse tasks
- Contains and extends om commands (the Ops Manager API)
- Provides an example pipeline to show how to string together tasks
- Provides a way to extract configuration files, so tasks can support multi-foundation environments.
- IaaS agnostic. Tasks are consistent across IaaS targets.
- Reusable tasks. Run tasks over and over, instead of having to make manual changes.

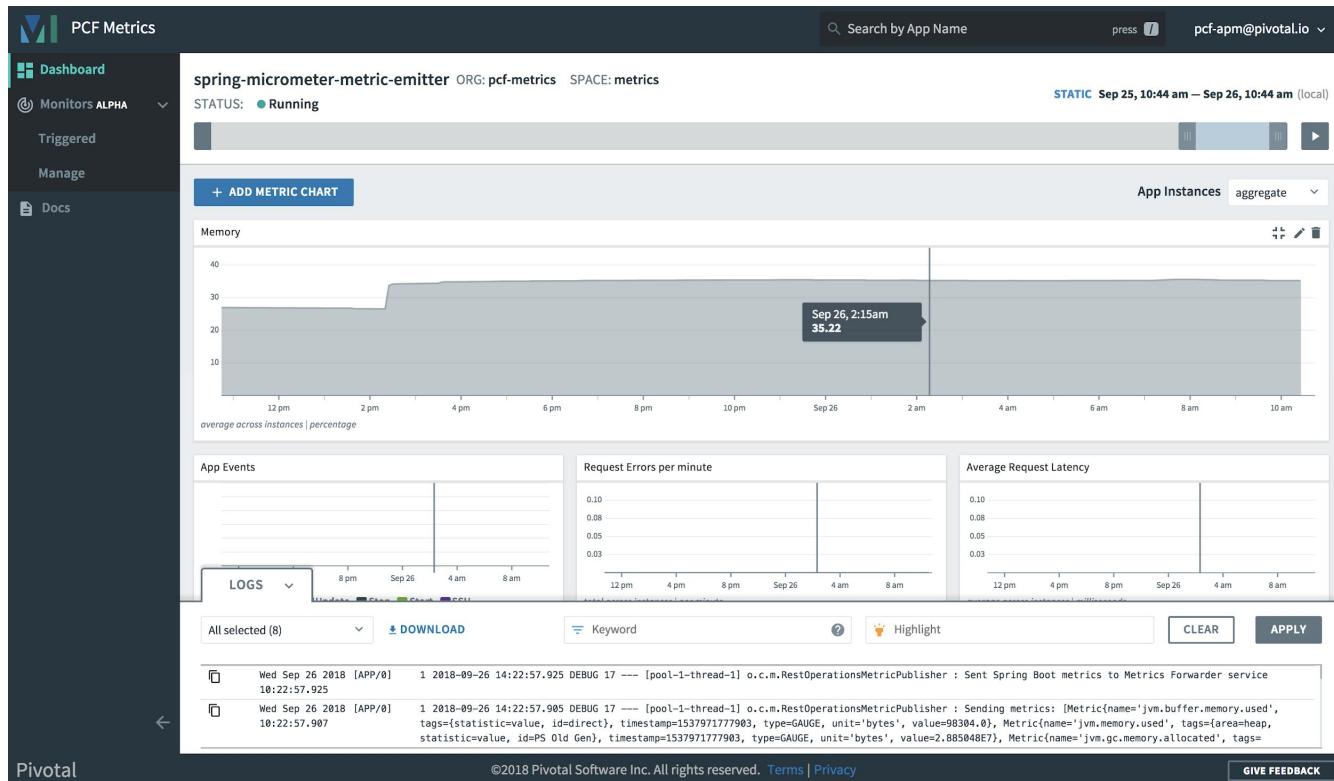
# Pivotal Platform Metrics: Quickly Troubleshoot Cloud-Native Apps

Stores and graphically represents logs, metrics, and event data from applications running on Pivotal Platform

Gain a better view into application health and performance

Diagnose system failures and related issues in minutes, not hours

Real-time streaming metrics to study post-deployment behavior



# Pivotal Platform Healthwatch: An Operational Dashboard

The product monitors and displays important data about the platform's performance, and sends alerts when thresholds are exceeded.

The screenshot shows the Pivotal Platform Healthwatch interface for Acme Corporation West, version 1.4.0. The dashboard is divided into several sections:

- Header:** PCF Healthwatch: Acme Corporation West, version 1.4.0.
- Left Sidebar:** DASHBOARD, Pivotal Core KPIs, FOUNDATION, PIVOTAL APP SERVICES, ALERT HISTORY.
- Middle Section:** Pivotal Core KPIs grid with 12 cards:
  - All Jobs (FND)
  - BOSH Director (FND)
  - Ops Manager (FND)
  - Canary App (PAS)
  - Routing (PAS) - 1 alert, end user impact
  - App Instances (PAS) - 2 alerts, end user, developer impact
  - CLI (PAS) - 3 alerts, developer impact
  - Logging (PAS)
  - Capacity (remaining) (PAS)
  - MySQL (PAS)
  - Routing (IST) - 9182082018740182094812
  - Capacity (remaining) (IST) - 9182082018740182094812
  - Routing (IST) - Some Custom Vanity Name Here
  - Capacity (remaining) (IST) - Some Custom Vanity Name Here
  - Routing (IST) - 428382020282309238021
- Right Section:** UTC-06:00 Last auto update 12:40 pm, Alert Stream (critical, warning, recovered). It lists 15 alerts categorized by icon and color:
  - CLI Health Check Push Fail (today 12:40 pm)
  - CLI Health Check Start Fail (today 12:40 pm)
  - CLI Health Check Logs Fail (today 12:40 pm)
  - Capacity Memory: Free Chunks (4 GB) 2 (today 12:40 pm)
  - Routing Exhausted Connections By Router 12 (today 12:40 pm)
  - Compute Performance Locker Active Presences 4 (today 12:40 pm)
  - Logging Transport Loss Rate 79,232 (today 12:14 pm)
  - Healthwatch Number of Ingestor Dropped Metrics 231 (today 12:14 pm)
  - Category Metric Push Fail (yesterday 11:05 pm)
  - Category Metric [value] (yesterday 8:12 pm)
- Bottom Navigation:** Documentation, Log Out.

# PKS: Runtime for modernized COTS and Heritage Apps



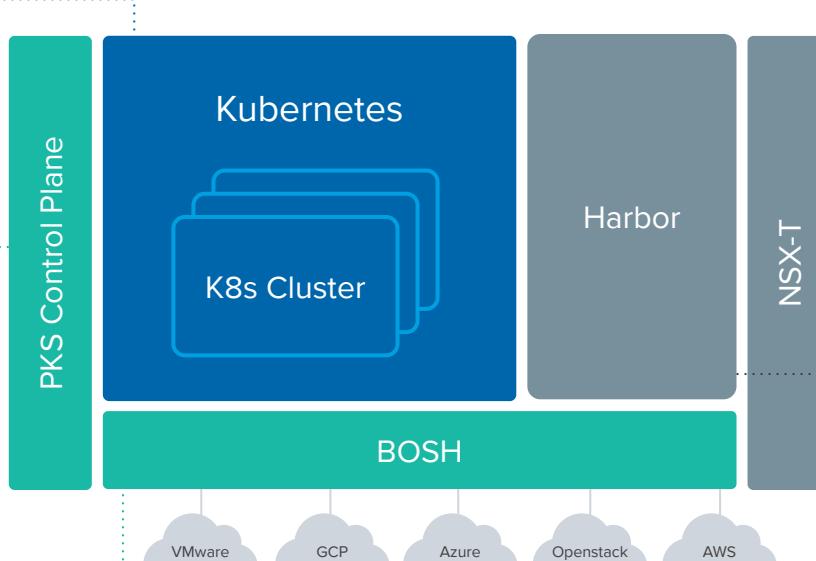
## Enterprise-Grade Kubernetes

### Built with open-source Kubernetes

Constant compatibility with the latest stable release of Google Kubernetes Engine—no proprietary extensions.

### PKS Control Plane

Use the PKS CLI and API to create, operate, and scale your clusters.



### BOSH

Reliable and consistent operational experience for any cloud.

### NSX-T

Network management, security, and load balancing out-of-the-box with VMware NSX-T. Multi-cloud, multi-hypervisor.

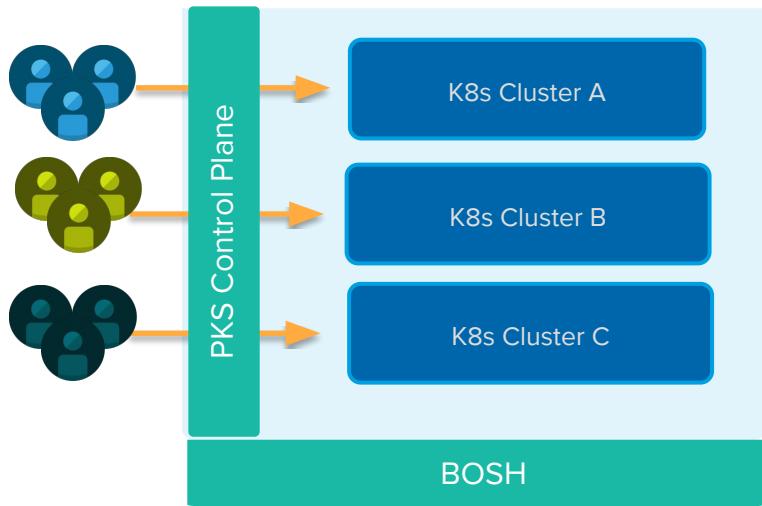
### Harbor

An enterprise-class container registry. Includes vulnerability scanning, identity management, and more.

# Hard vs soft multitenancy

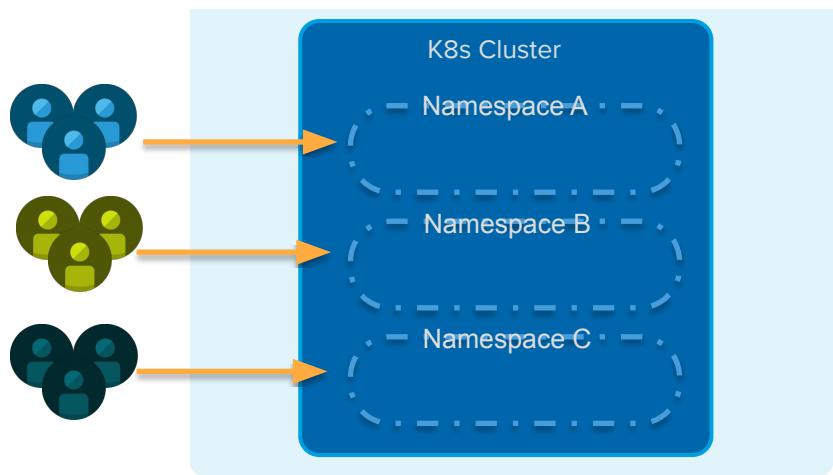
## Multi-cluster

cluster-based

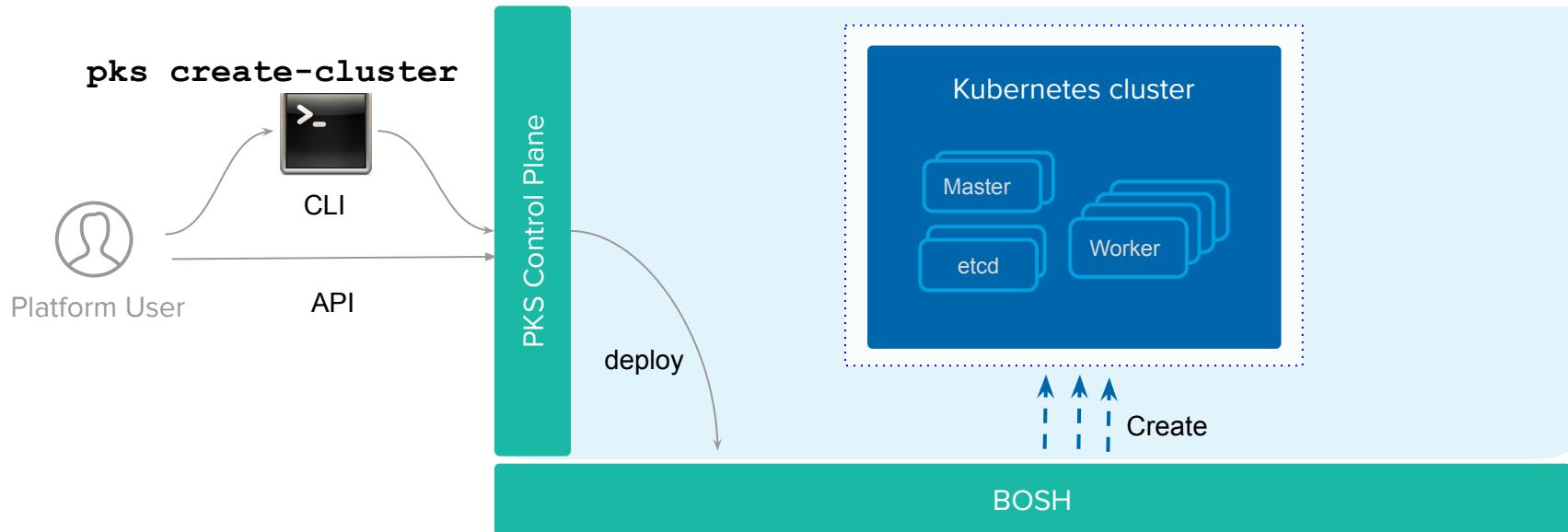


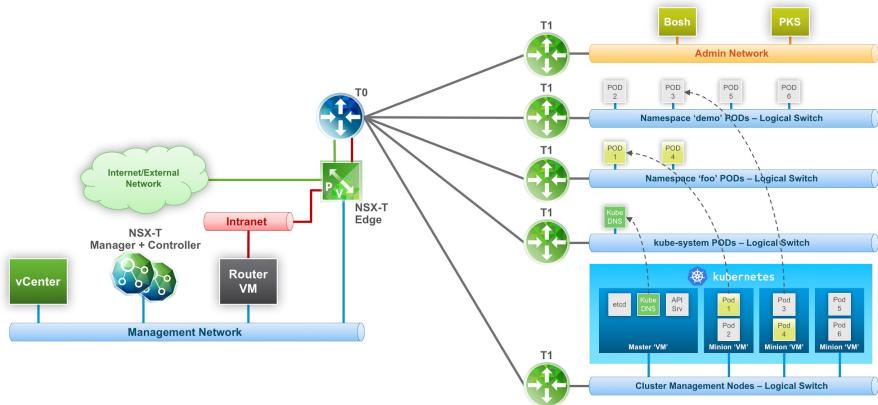
## Single cluster

namespace-based



# Creating a new kubernetes cluster





Unified VM to Container Networking

On-demand network virtualization

Microsegmentation

Full Network Visibility

Enterprise Support

Pod-Level Container Networking

Load Balancing

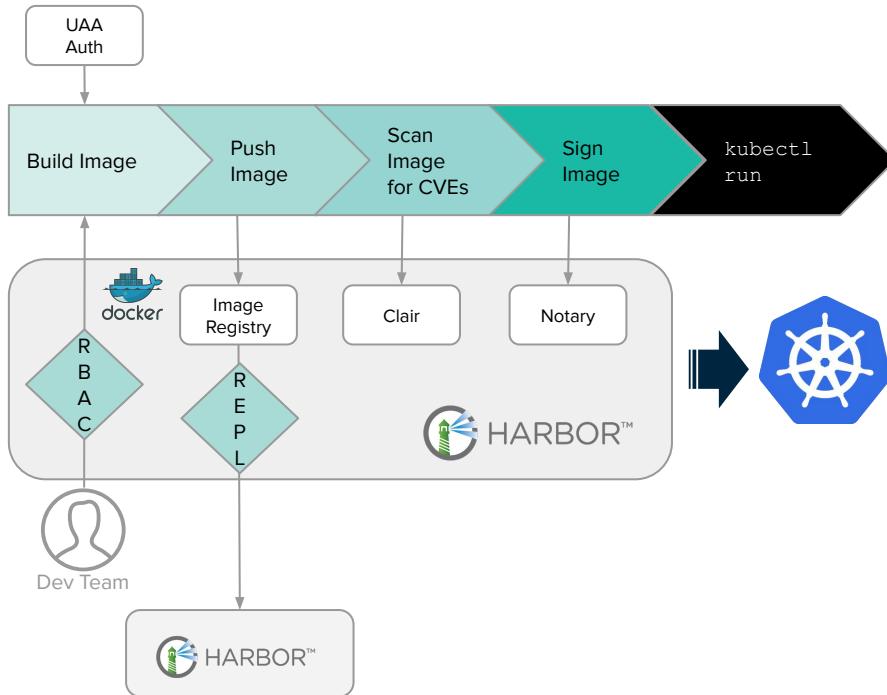
Network Security policies

Tenant - level isolation

Unique logical switch per K8s namespace



## An enterprise-class registry server for Docker images



Role-Based Access Control (RBAC)

LDAP/AD Integration

Image Vulnerability Scanning

Notary Image Signing

Policy-Based Image Replication

Graphical User Portal & RESTful API

Image Deletion & Garbage Collection

Auditing

# PSM: Validated Ecosystem

# Extend Apps with Brokered Services from Pivotal



## MySQL for Pivotal Platform

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



## Pivotal Cloud Cache

- High performance, in-memory, data at scale for Spring microservices
- Look-aside caches & HTTP session state caching
- WAN replication
- **NEW:** Deep integration with Spring Boot



## RabbitMQ for Pivotal Platform

- Easily connect distributed applications with the most widely deployed open source message broker
- Enable connected scalable, distributed applications
- **NEW:** Simpler TLS setup

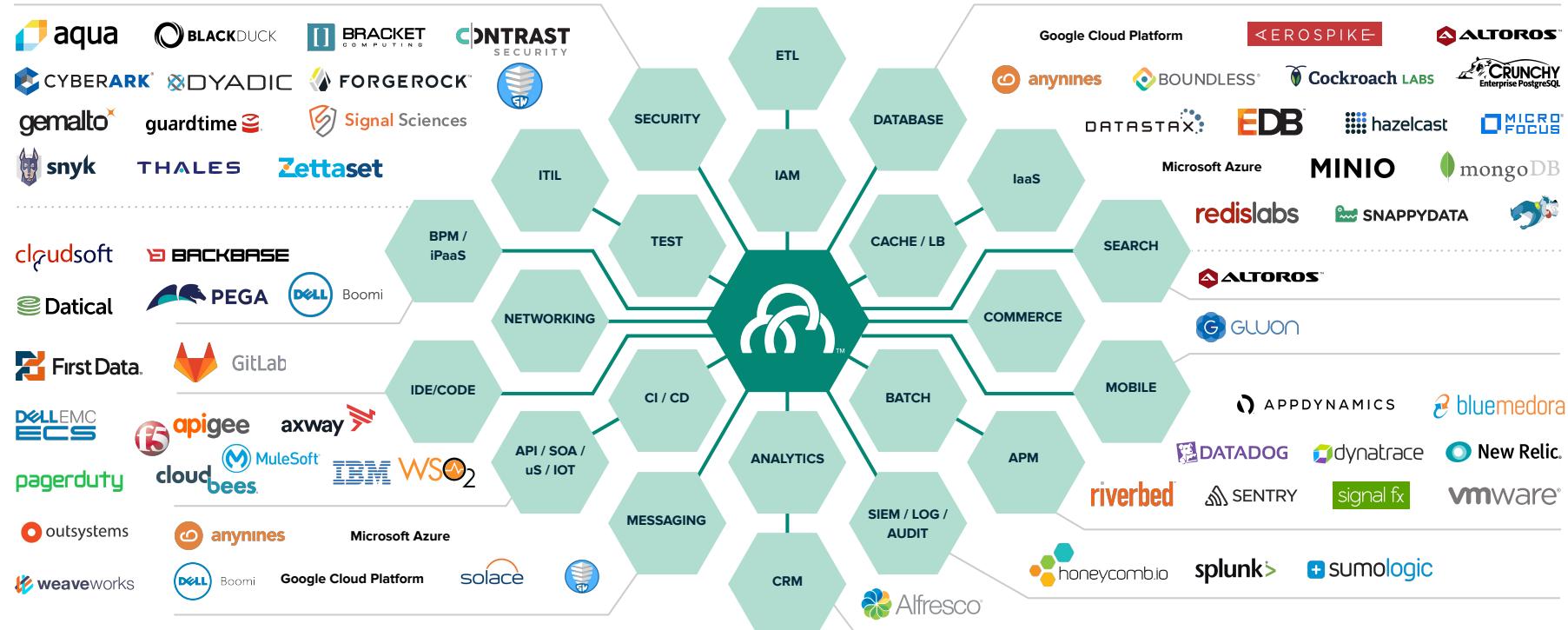


## Redis for Pivotal Platform

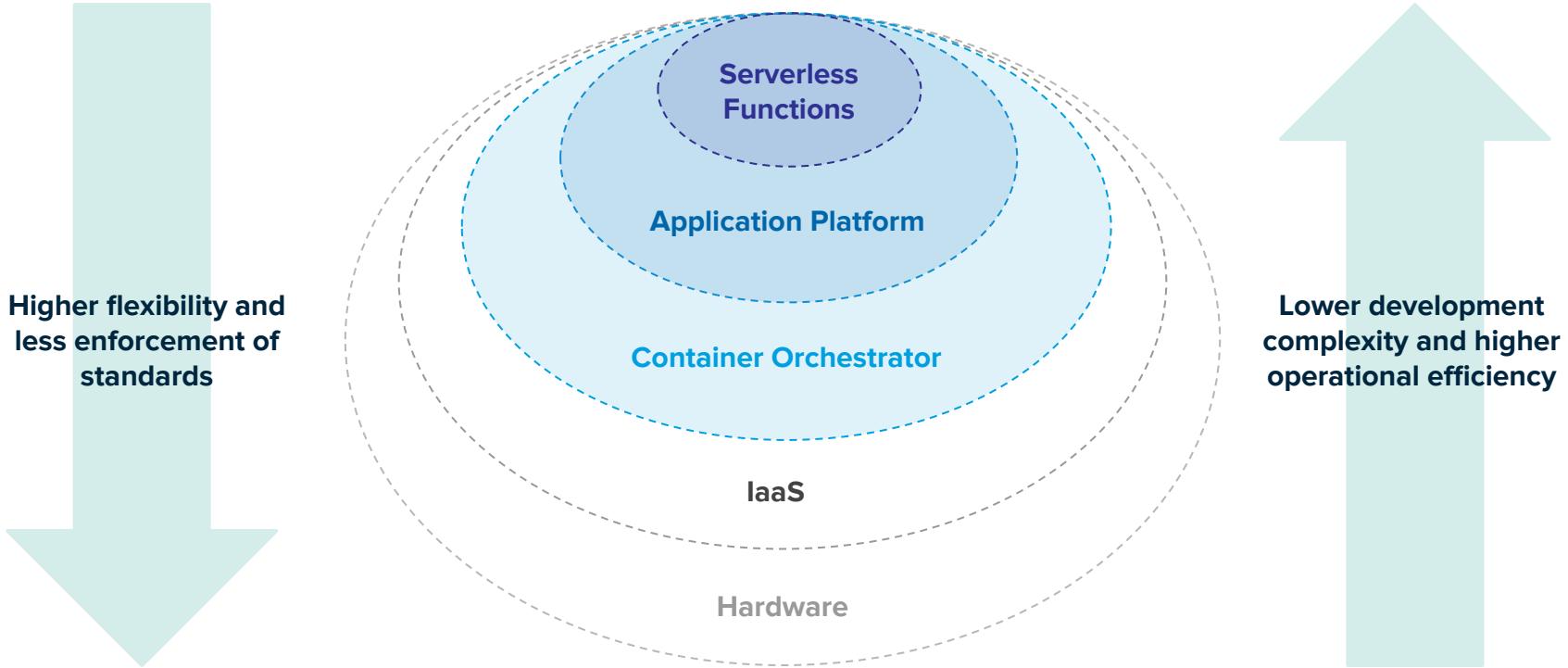
- In-Memory cache and datastore, configured for the enterprise
- Efficient provisioning matched to use cases
- **NEW:** Random service instance placement across AZs.

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

# ISV Ecosystem Momentum Drives Platform Advantage

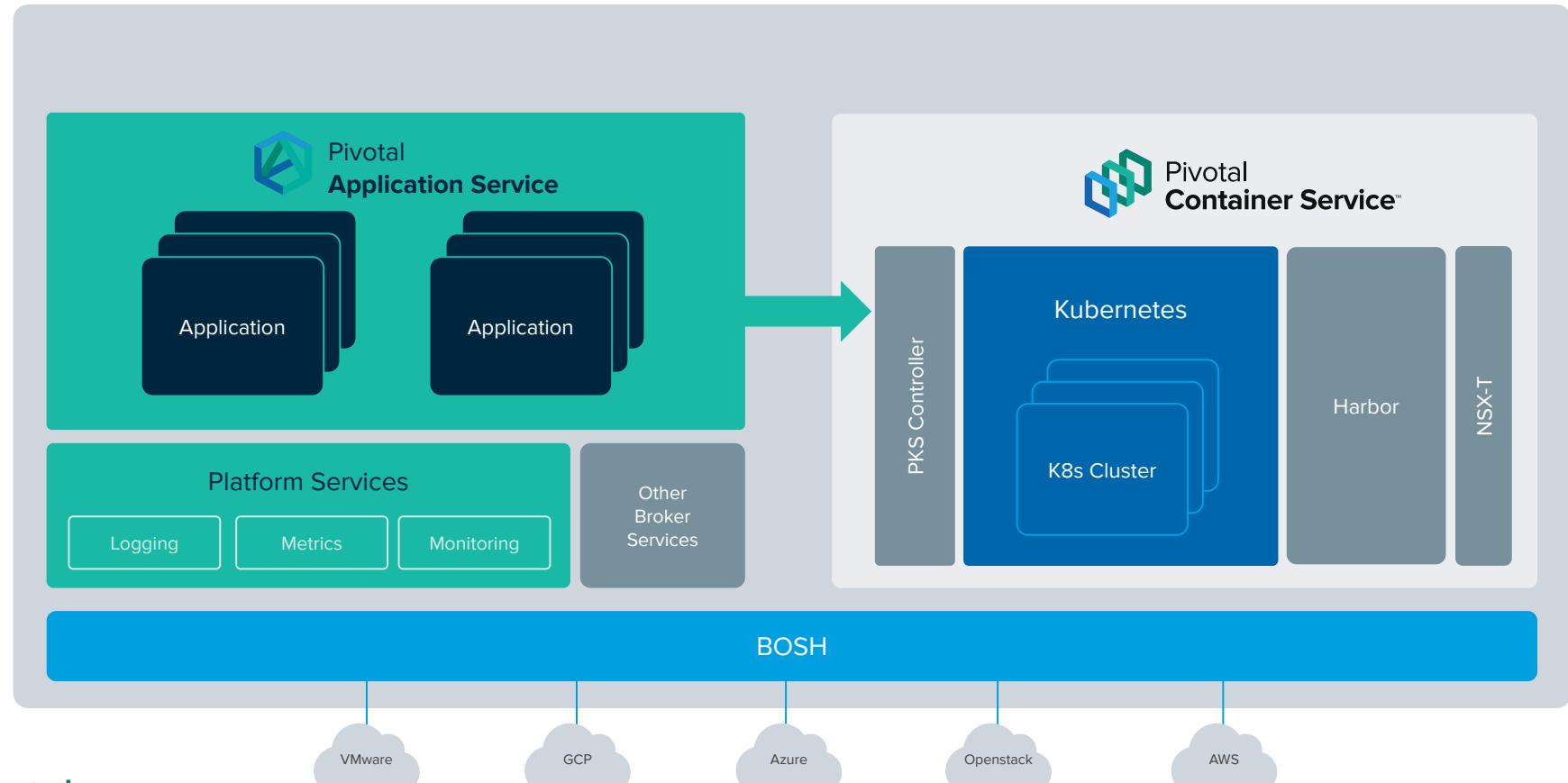


# Pivotal Platform: The Bigger Picture

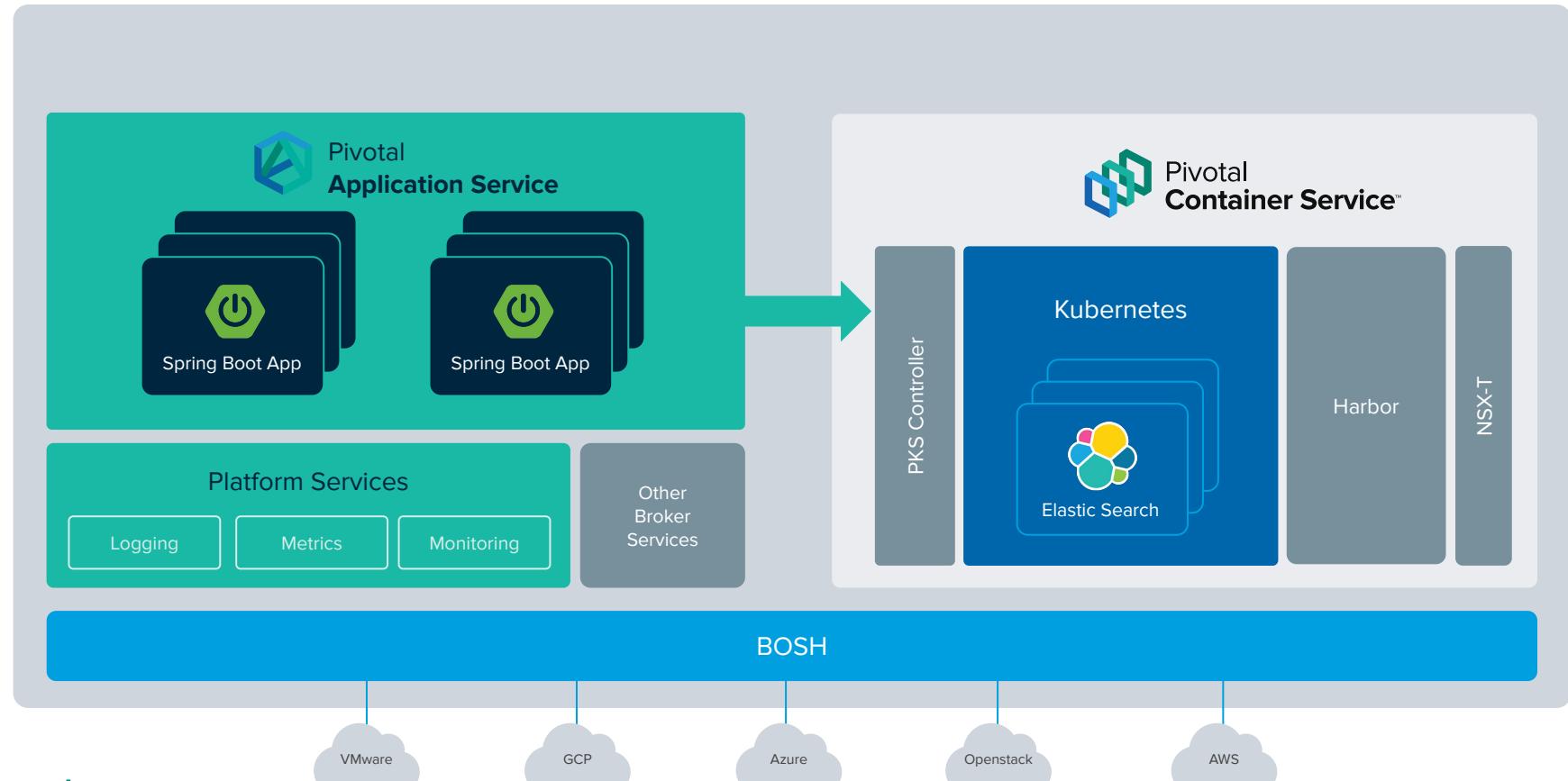


**Strategic goal:** Push as many workloads as technically feasible to the top of the platform hierarchy

# Leveraging more than one abstraction



# Sample Use Case





# Pivotal®

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Transforming How The World Builds Software