Pivotal

Killer Kubernetes: Pivotal Container Service (PKS)

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Sr. Director of Technology
PKS Technical GTM Lead
February 2018

Me?

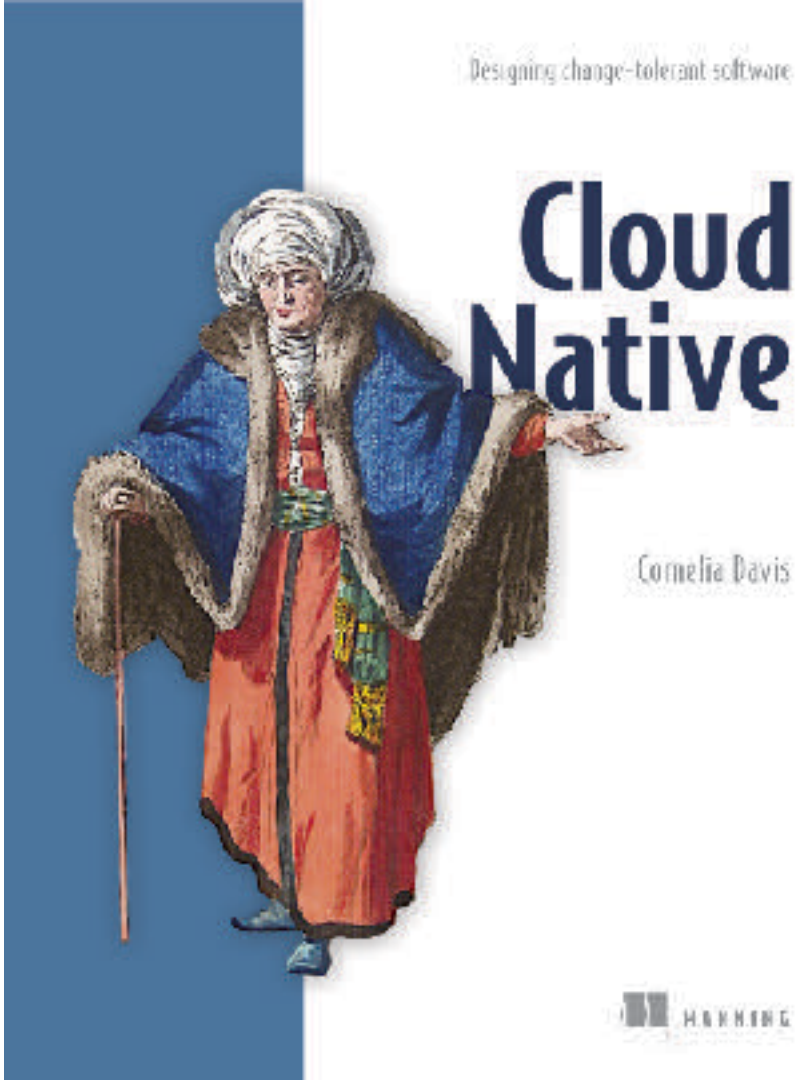
@cdavisafc

Developer (wasn't Ops)

Web architectures for >10 years

Cloud-native for 5+ years

Cloud Foundry for 5+ years



https://www.manning.com/books/cloud-native

Pivotal

The Transformation is Real

"This is an awesome [platform] team. **You are secretly changing the company from inside.**" - (EVP, Enterprise Services)

Upgrades during office hours with **zero downtime**; no Saturday tech bridge.

Security and **compliance** requirements **baked into** automated platform deployments.

5 **CVEs remediated** on the platform with zero downtime.

Your Platform Team has Delivered Real Value

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

What Workloads are Realizing these Benefits?

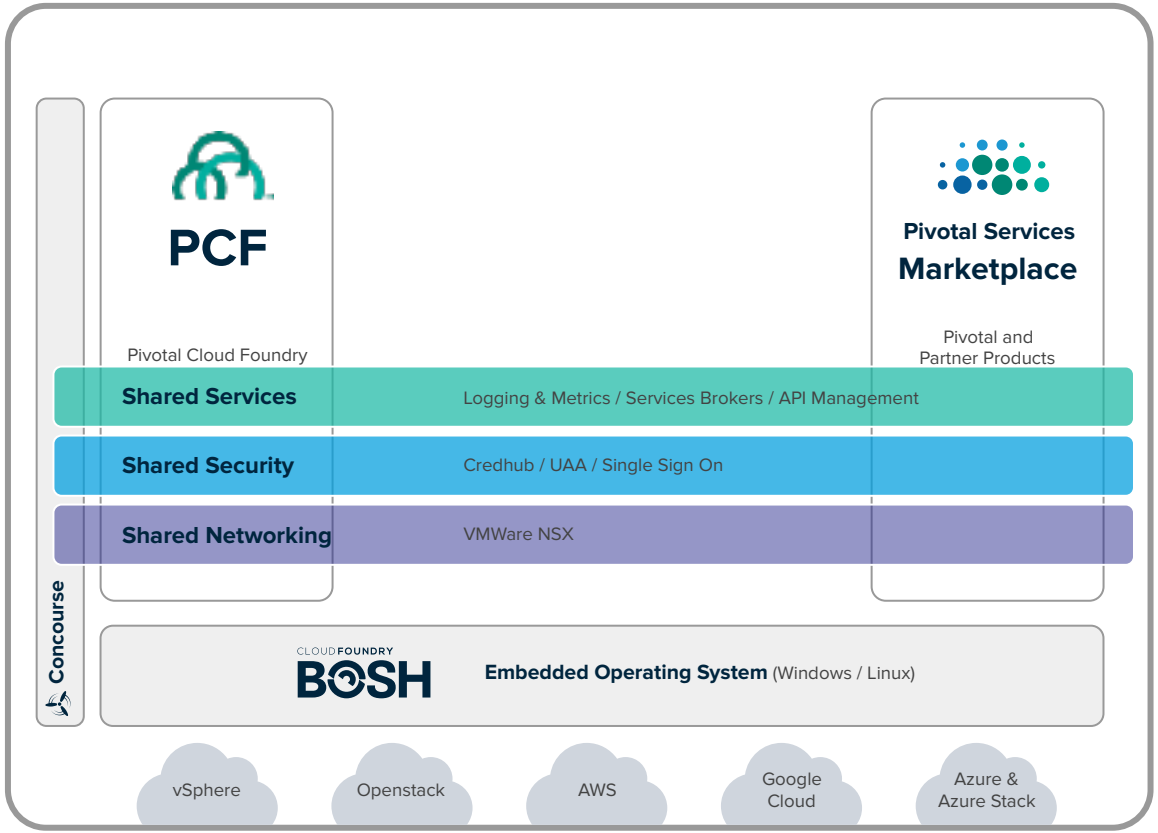
MICROSERVICES

Some DATA SERVICES

Some MONOLITHIC APPLICATIONS

PCF 1.x

What you've used to achieve success to date



Pivotal

What We'll Cover

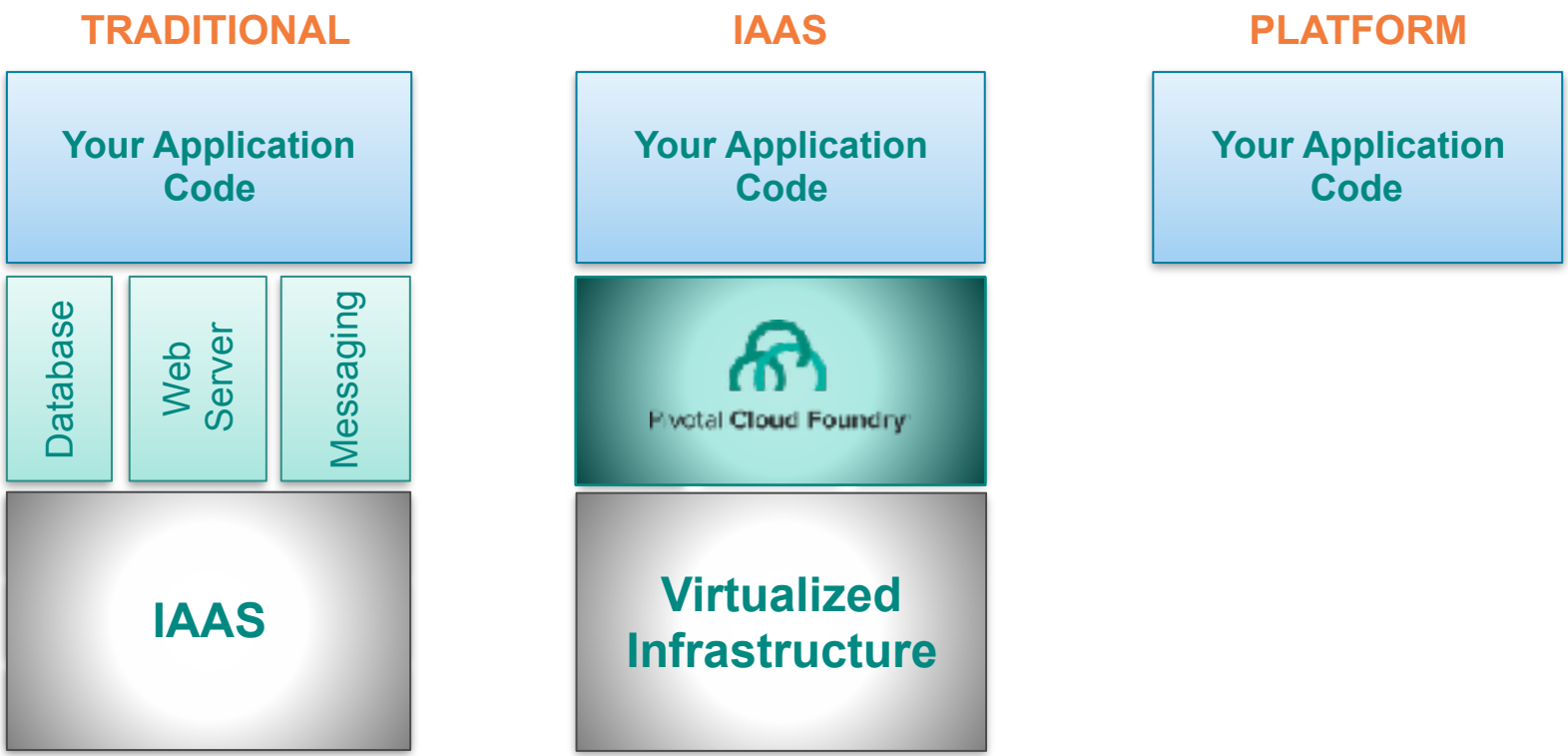
Swimlanes

What is PKS?

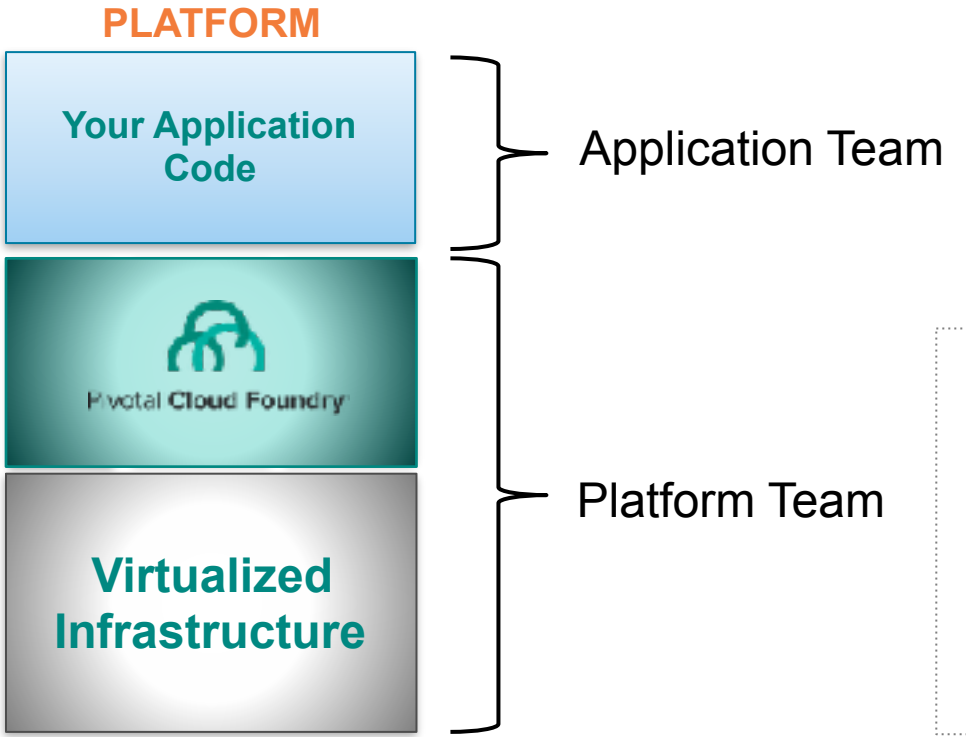
What can you **do** with PKS?

What **value** will you get from using PKS?

The Cloud Platform Evolution



Teams Delivering Outcomes



Iteratively building and delivering digital offerings to the consumer

Enabling the app teams all while maintaining
Security
Compliance
Resilience
Cost Efficiency

What is PKS?

Can we realize these benefits for other workloads too?

MICROSERVICES

Some DATA SERVICES

Some MONOLITHIC APPLICATIONS

CONTAINERS

COTS

More MONOLITHIC APPLICATIONS

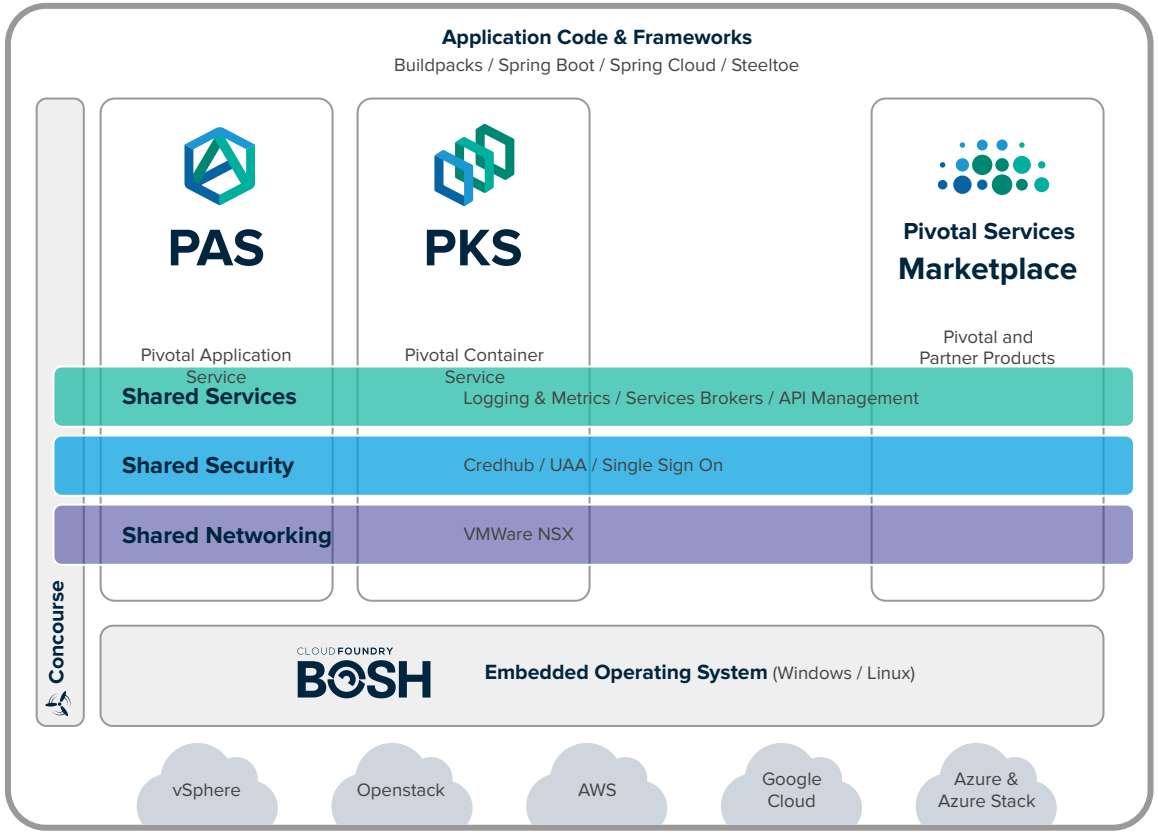
Stateful or MICROSERVICES Clusters

Any App
Every Cloud
One Platform

PCF 2.0 — for everything that matters

Pivotal

Pivotal Cloud Foundry®



Kubernetes is an open-source platform designed to automate deploying, scaling, and operating **application containers**.

With Kubernetes, you are able to quickly and efficiently respond to customer demand:

- Deploy your applications quickly and predictably.
- Scale your applications on the fly.
- Roll out new features seamlessly.
- Limit hardware usage to required resources only.

https://kubernetes.io/docs/concepts/overview/what-is-kubernetes/

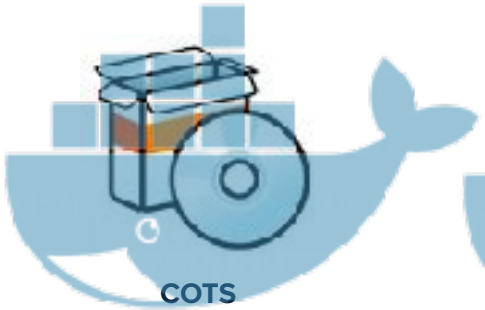
Can we realize these benefits for other workloads too?

MICROSERVICES

Some DATA SERVICES

Some MONOLITHIC APPLICATIONS

CONTAINERS

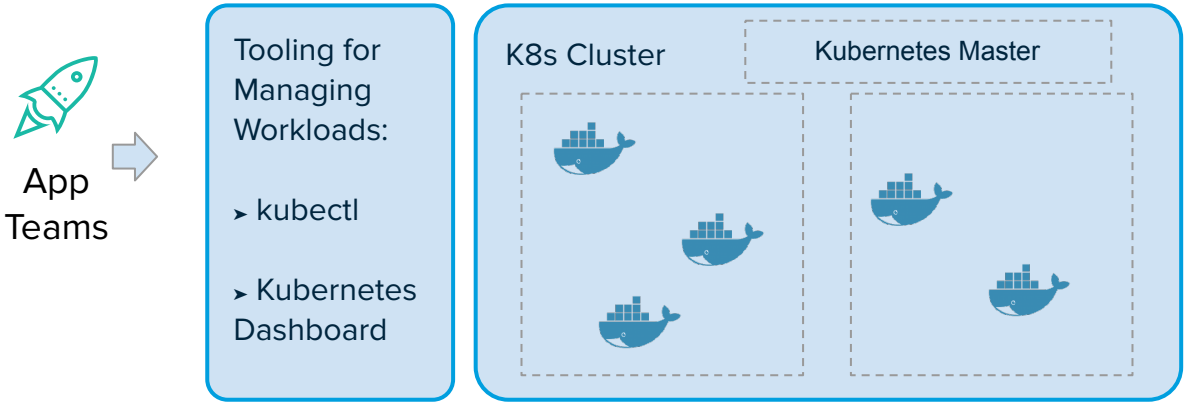


COTS

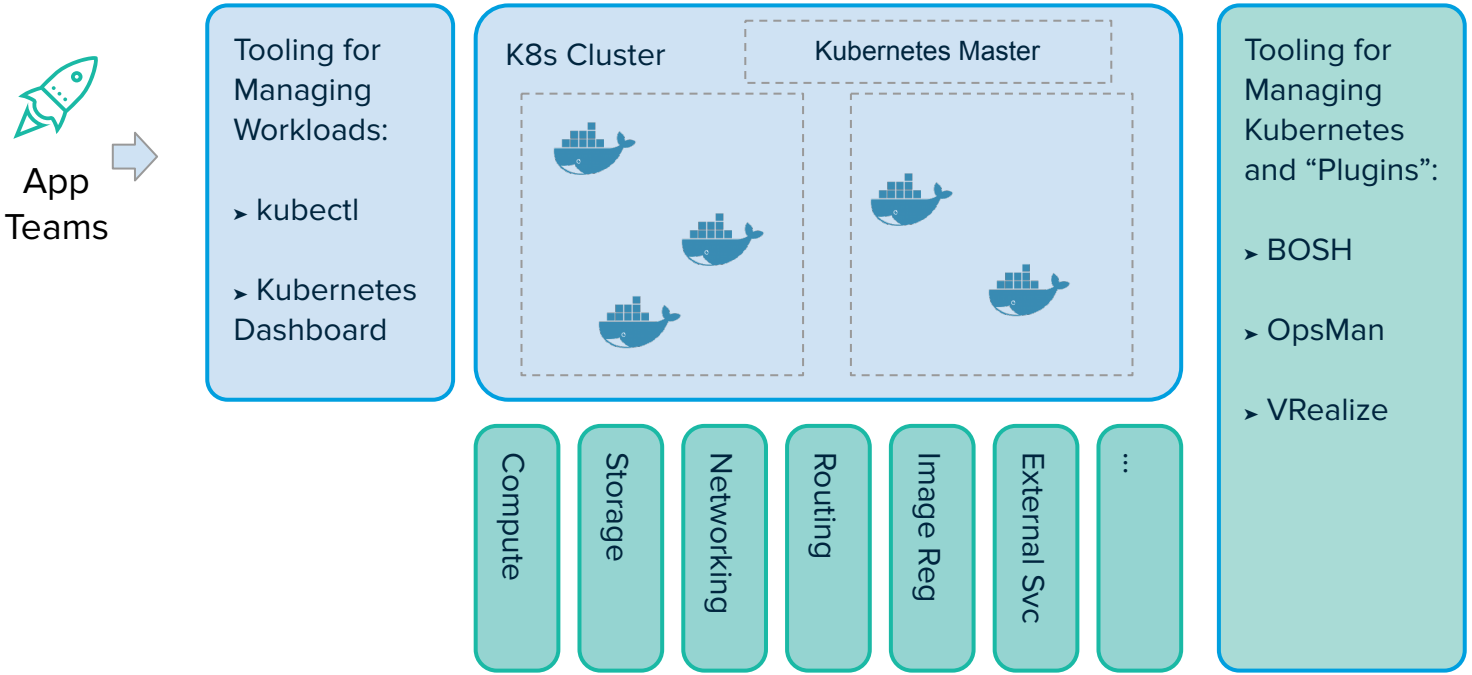
More MONOLITHIC APPLICATIONS

Stateful or MICROSERVICES Clusters

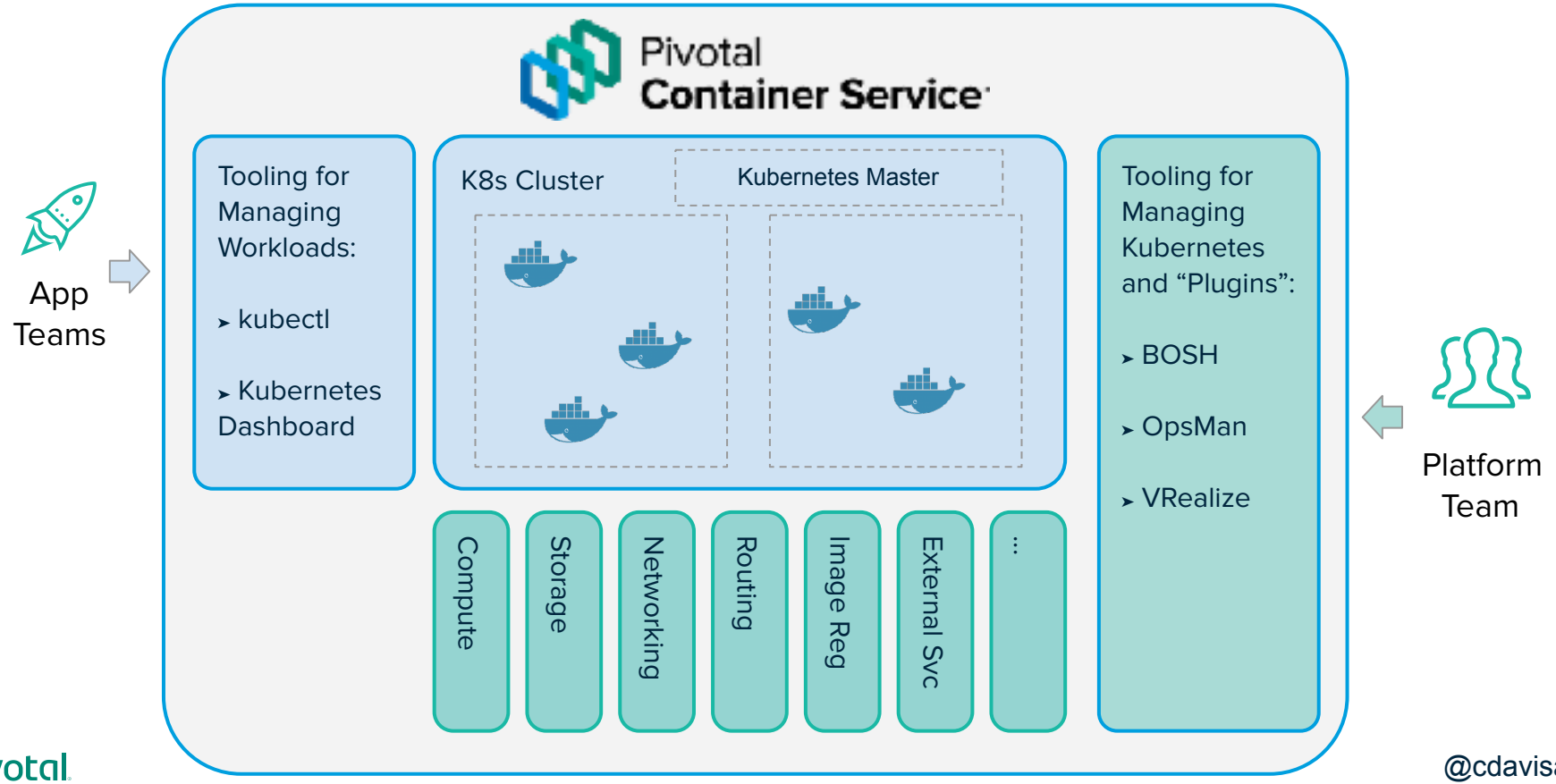
Kubernetes is a Runtime for Containerized Workloads

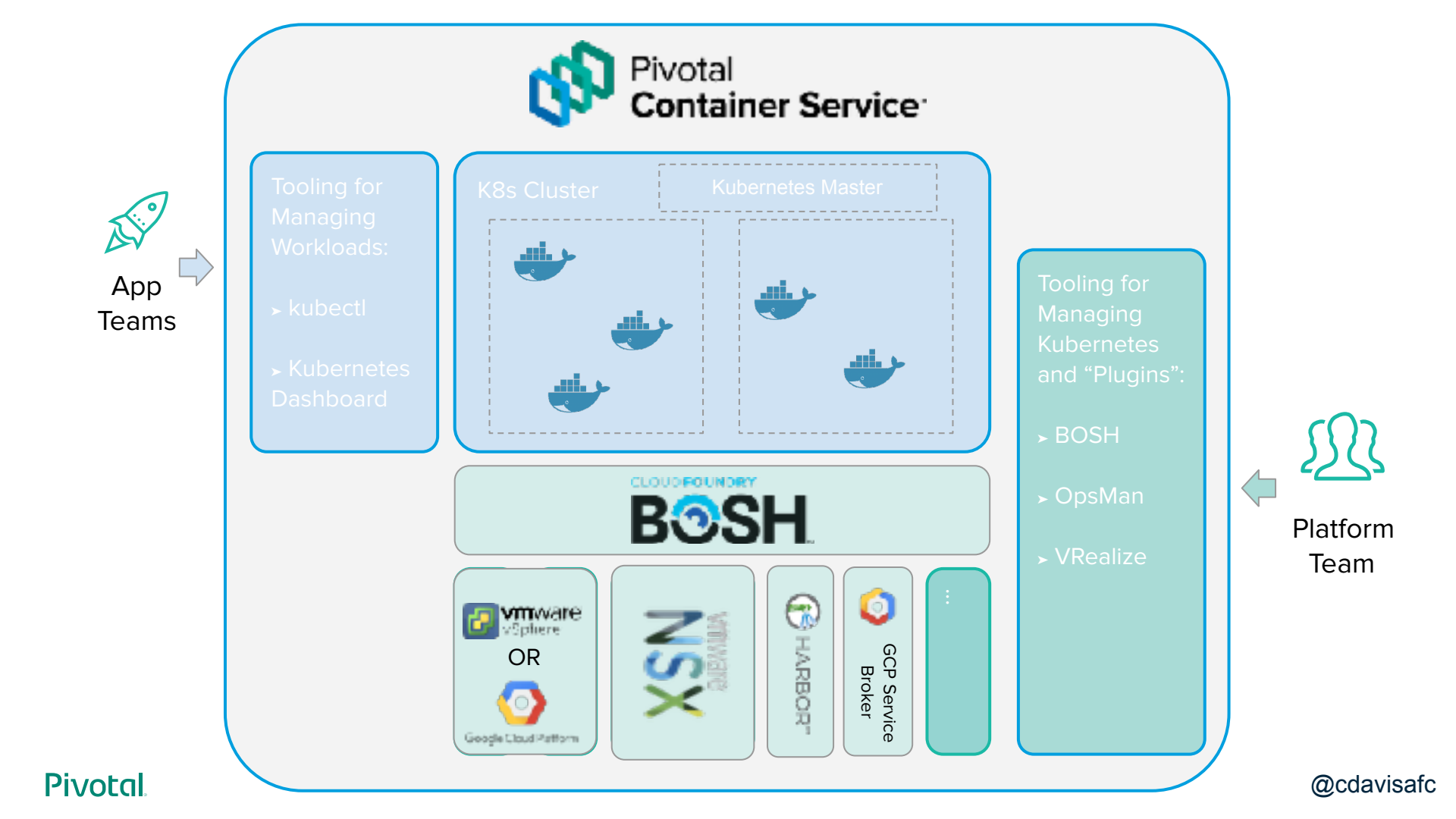


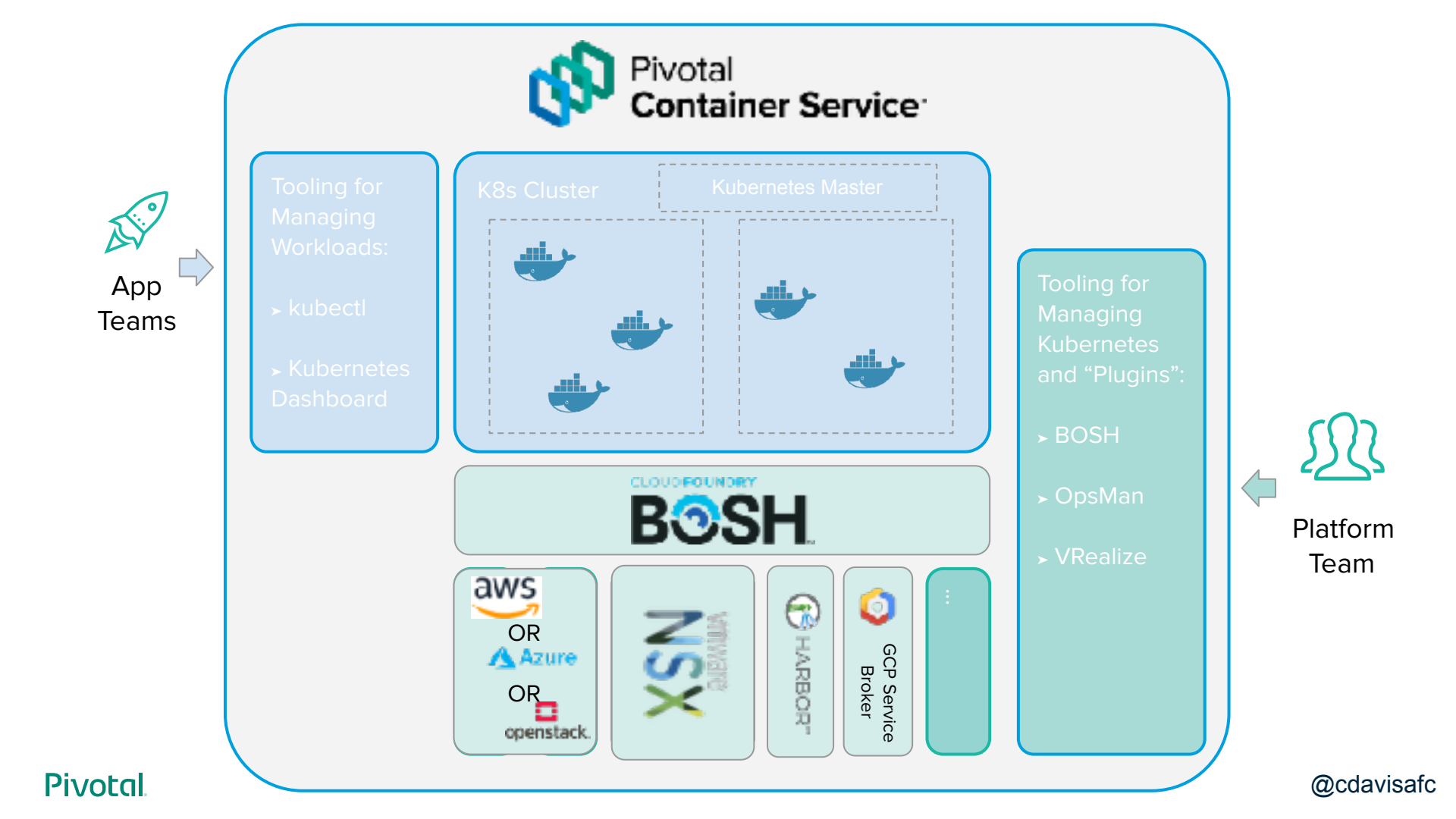
But we need more than a runtime



PKS is a Complete, Enterprise Grade Kubernetes Platform




Pivotal Container Service
App Teams
Tooling for Managing Workloads:
kubectl
Kubernetes Dashboard
K8s Cluster
Kubernetes Master
CLOUD FOUNDRY
BOSH
vmware vSphere
OR
Google Cloud Platform
VMWARE NSX
HARBOR
GCP Service Broker
Tooling for Managing Kubernetes and "Plugins":
BOSH
OpsMan
VRealize
Platform Team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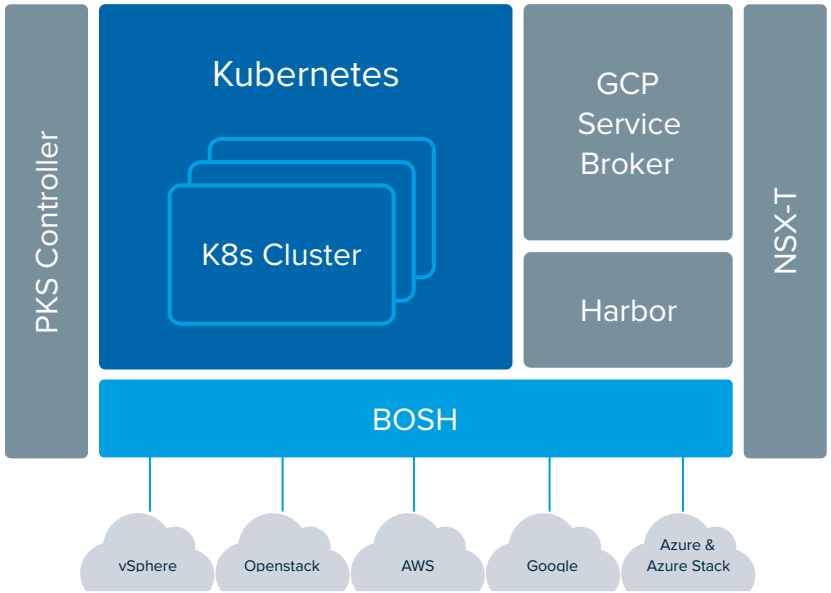
CLOUD FOUNDRY BOSH
aws
OR
Azure
OR
openstack
NSX
HARBOR
GCP Service Broker
Tooling for Managing Kubernetes and "Plugins":
BOSH
OpsMan
VRealize
Platform Team

Pivotal Container Service™



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. Built-in health checks, scaling, auto-healing and rolling upgrades.

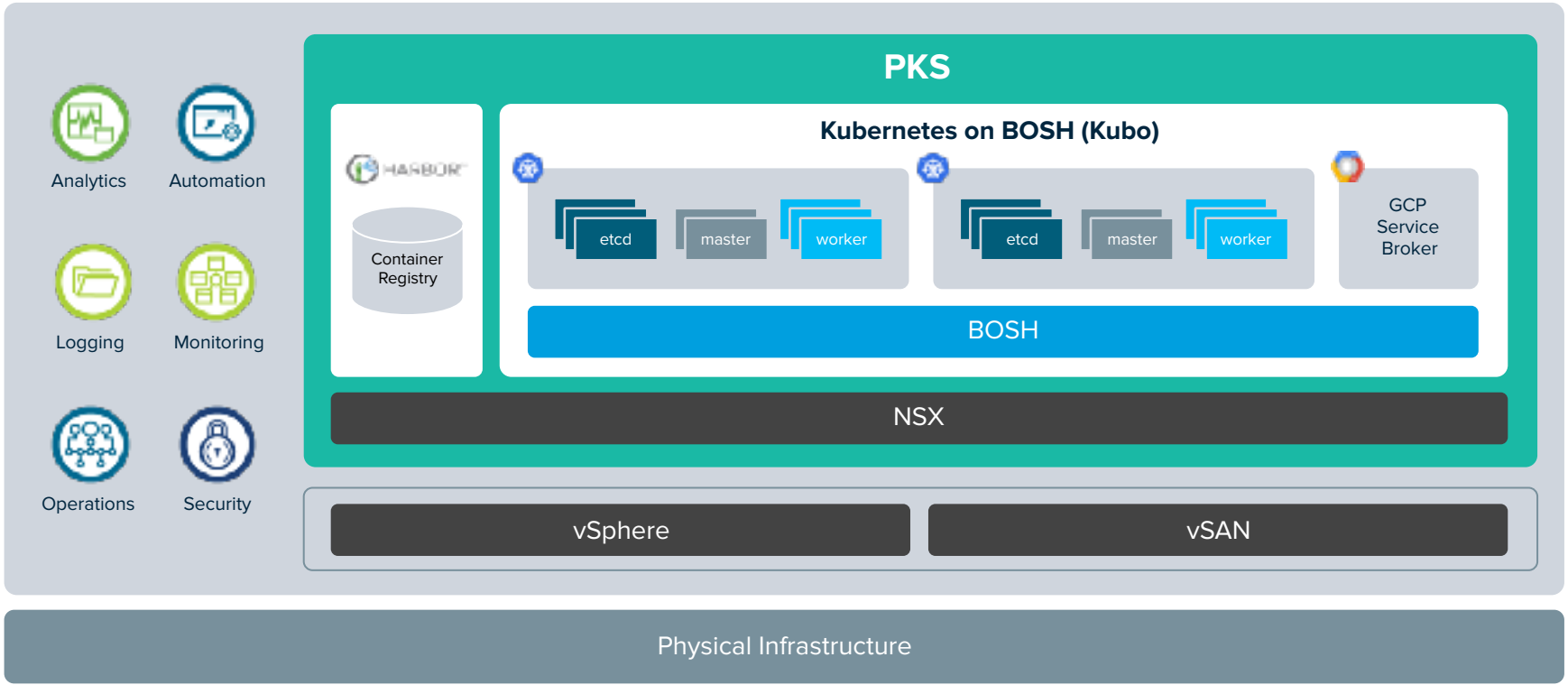
Multicloud — BOSH provides a reliable and consistent operational experience. For any cloud.

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

GCP APIs access — The GCP Service Broker allows apps to transparently access Google Cloud APIs, from anywhere. Easily move workloads to/from Google Container Engine (GKE).

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

The Pivotal value proposition



Operational Challenges with any platform

Day 1 - Build

Multi-cloud Provide a reliable and smooth experience for any cloud.

Open APIs Allow platform operations from different toolsets and the creation of CD pipelines.

Consistency Provide a consistent setup experience, across different cloud environment configurations.

Setup time How long does it take to setup a real world working environment? Think hours, not weeks.

Day 2 - Operate

Patches Patching platform components with thousands of apps running should feel normal.

Scaling Seamlessly scale platform components to accommodate changing demand.

Upgrades. How do you roll out new versions of the platform with the lights on?

Operating Effort Operating a platform should require very few resources and minimum manual intervention. Otherwise, is it really providing operational benefits?

What can you do with PKS?

PKS Capabilities and Value

Product Capabilities

Benefits to the Platform Team (PKS Provider)

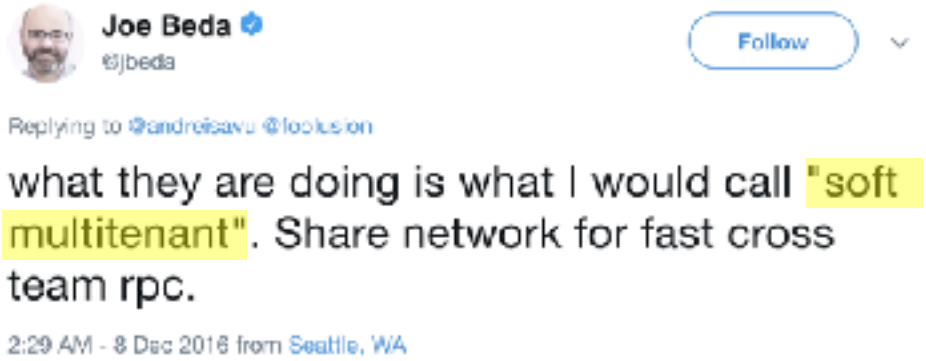
- Provide a **container solution**
- **Complete solution** - no assembly required
  - OS, Registry, K8s, networking, storage
- **Control the Kubernetes** you make available
  - Plans
- **Turnkey solution**
  - Ops Manager, Tile
  - PKS API
  - Operability through vRealize Suite
- **Enterprise Control/Security**
  - Embedded OS
  - CVEs
  - NSX-T
  - Harbor
  - Tenancy
- **Multi-cloud**

Benefits to the App Team (PKS Consumer)

- **Get Kubernetes** - Self-service creation, scaling and deletion, observation, plans
- They can **run their Workloads**
  - CNCF Conformance
  - Constant Compatibility
  - Service Mesh
  - CI Workloads (i.e. Jenkins)
  - Stateful services (i.e. Elastic Search)
  - ... and more
- **Complete Solution**
  - Compute, storage, network
  - Multi-cloud
- **Developer Productivity Tools** (*** by 1.1)
  - Service Catalog
  - GCP Service broker

Tenancy

Let’s talk about Multi-tenancy a bit



Multi-tenancy models remain weak in Kubernetes alone

We provide solutions for this today

Two models supported

No other "on prem" solution has this!!!

Multi-tenant clusters

- Leverage Kubernetes namespaces

Limitations with Kubernetes alone

- Noisy neighbors (workloads can affect other tenants)
- Share the same network
- Share DNS
- Shared Configuration
- …

We add

- Network microsegmentation with NSX-T
  - Eliminating "Share the same network"

Single-tenant clusters

It is having an API for creation and management that enables this!!!

- Every tenanty get's their own cluster

Addresses limitations

- Single tenant worker VMs (depend on the hypervisor to ensure host is properly shared)
- Every cluster has own network segment
- Every cluster has own DNS
- Every cluster has own configuration
- …

I ❤ BOSH

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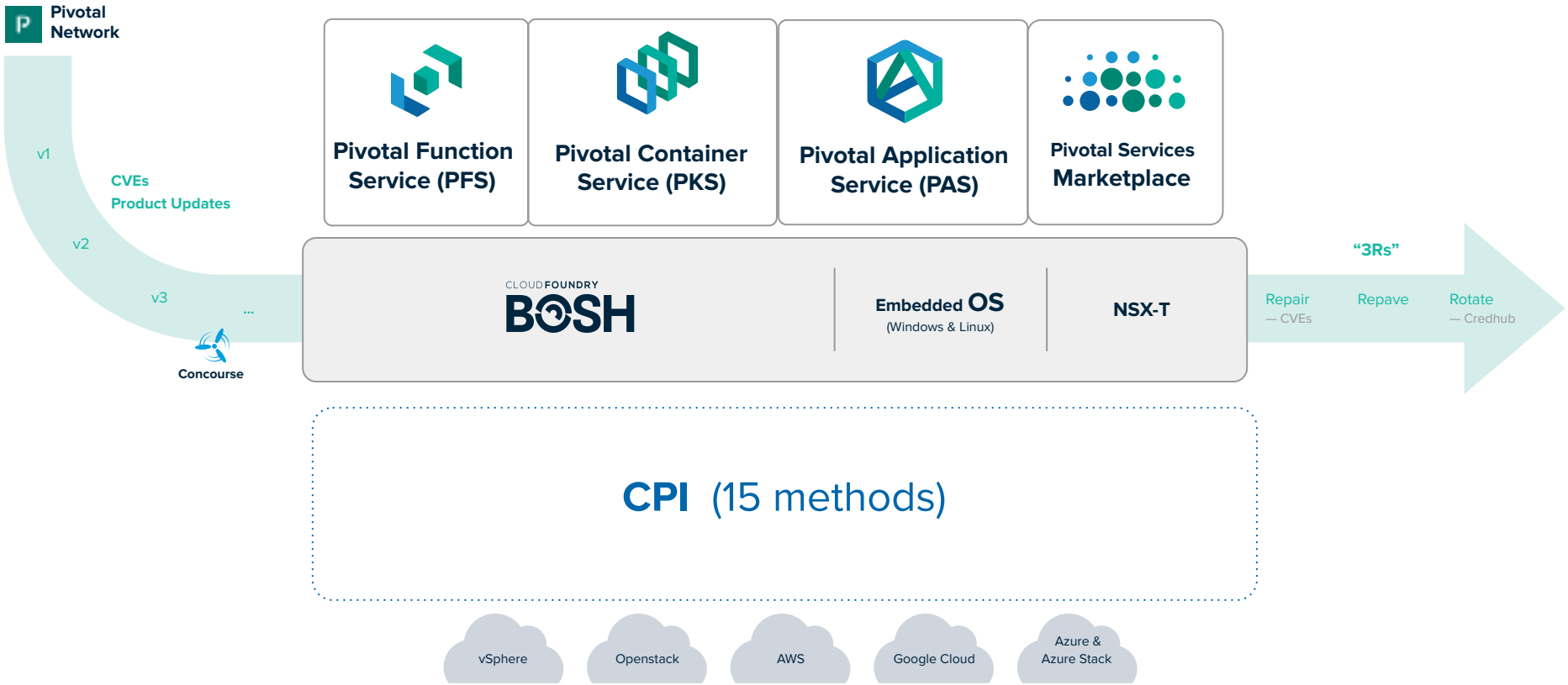
Pivotal Network
v1
CVEs
Product Updates
v2
v3
...
Concourse
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CPI (15 methods)
vSphere
Openstack
AWS
Google Cloud
Azure &
Azure Stack

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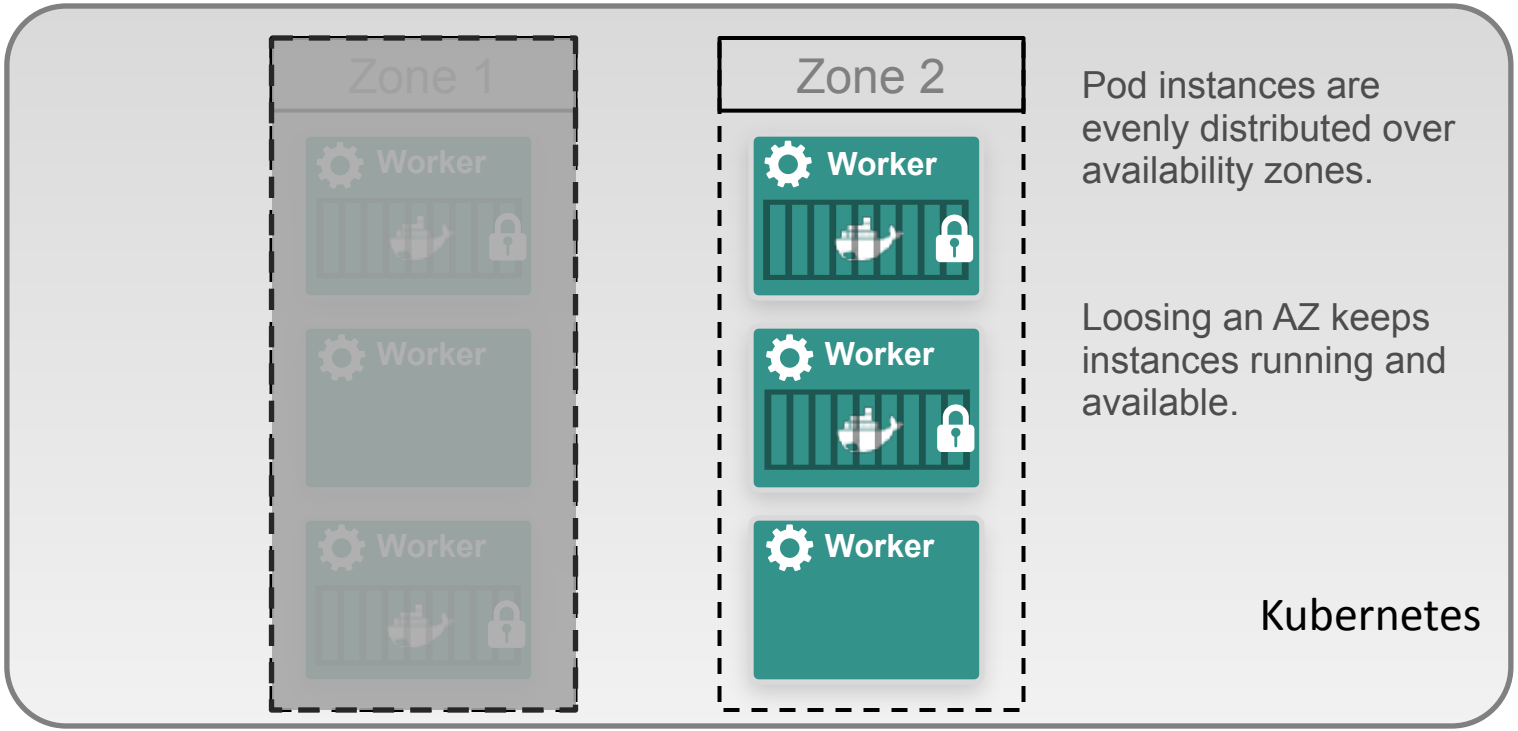
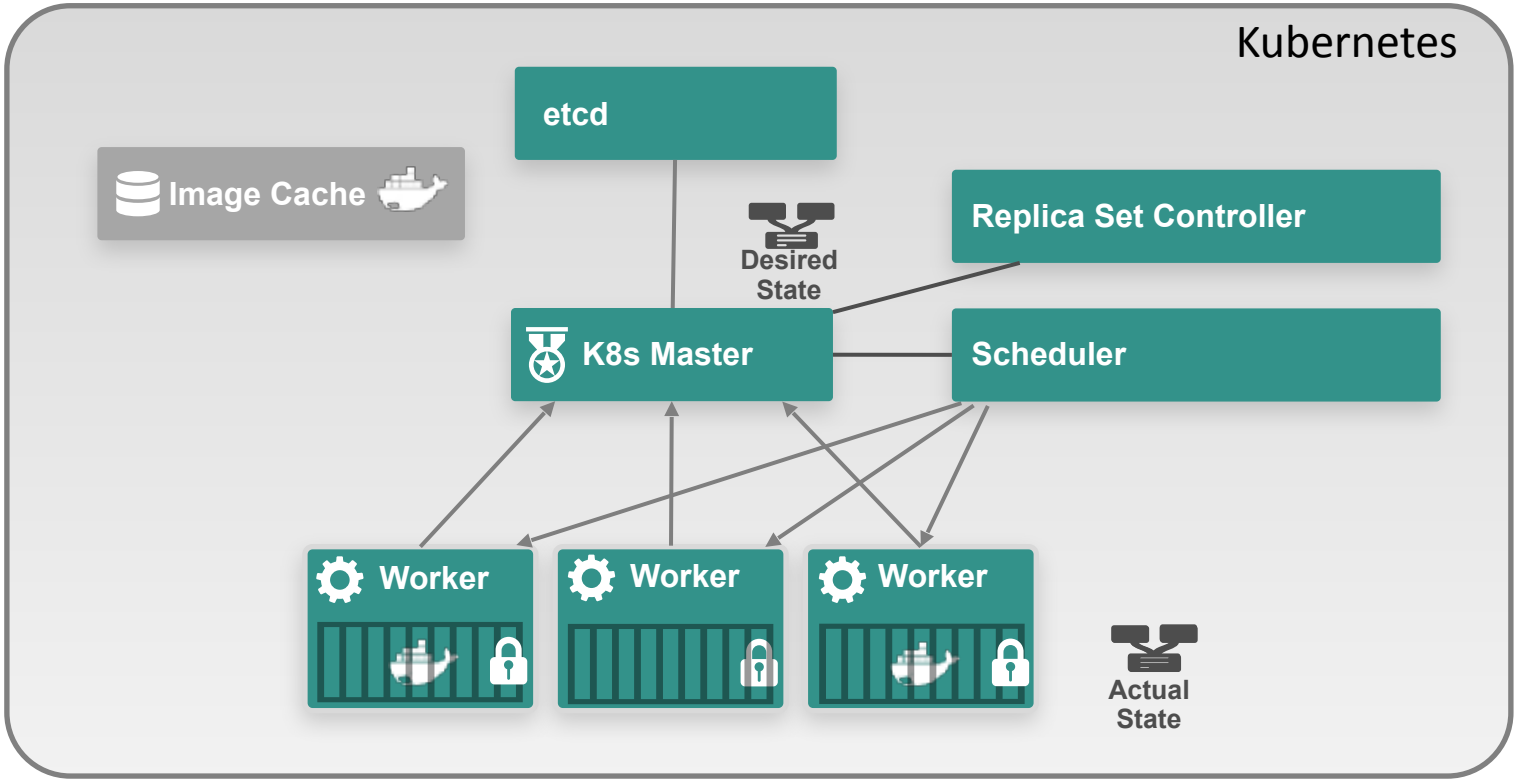
Availability

Remember the four levels of HA?

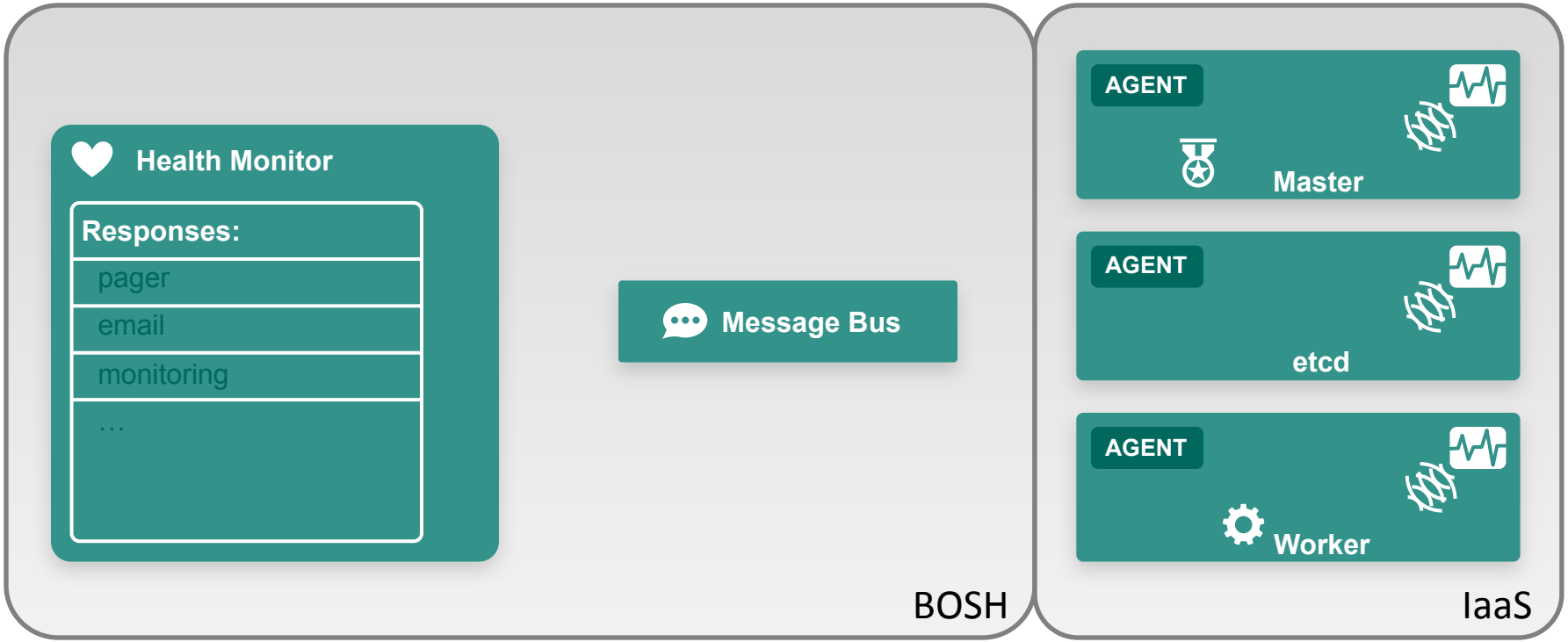
Pods and Availability Zones



Lost Pod Instances Replaced



Kubernetes Processes are Monitored



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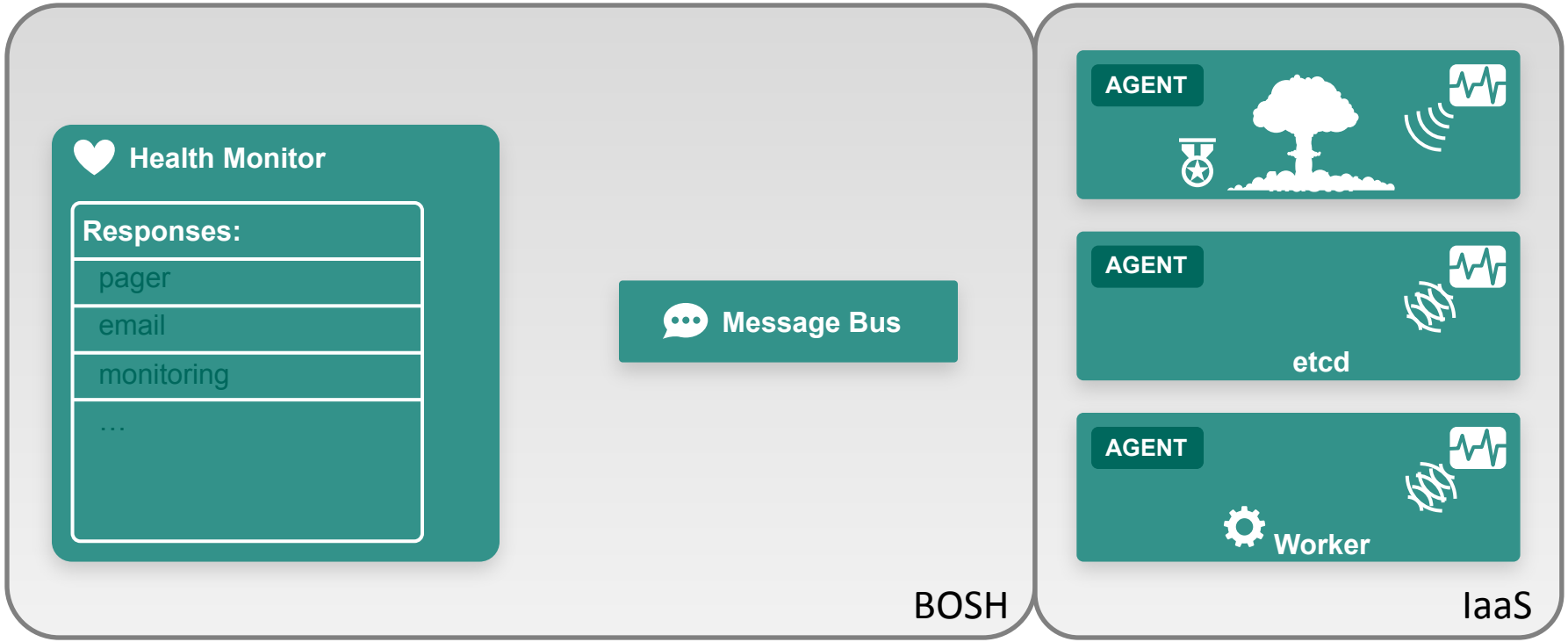

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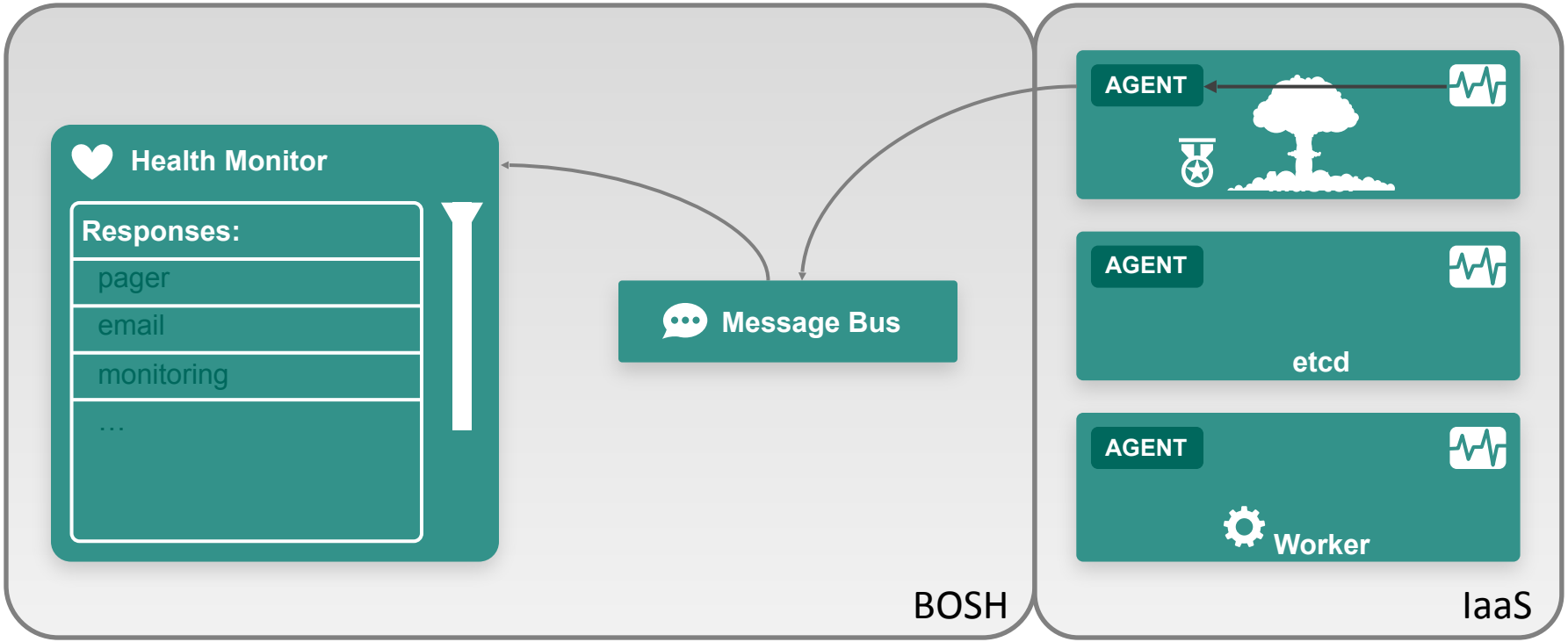

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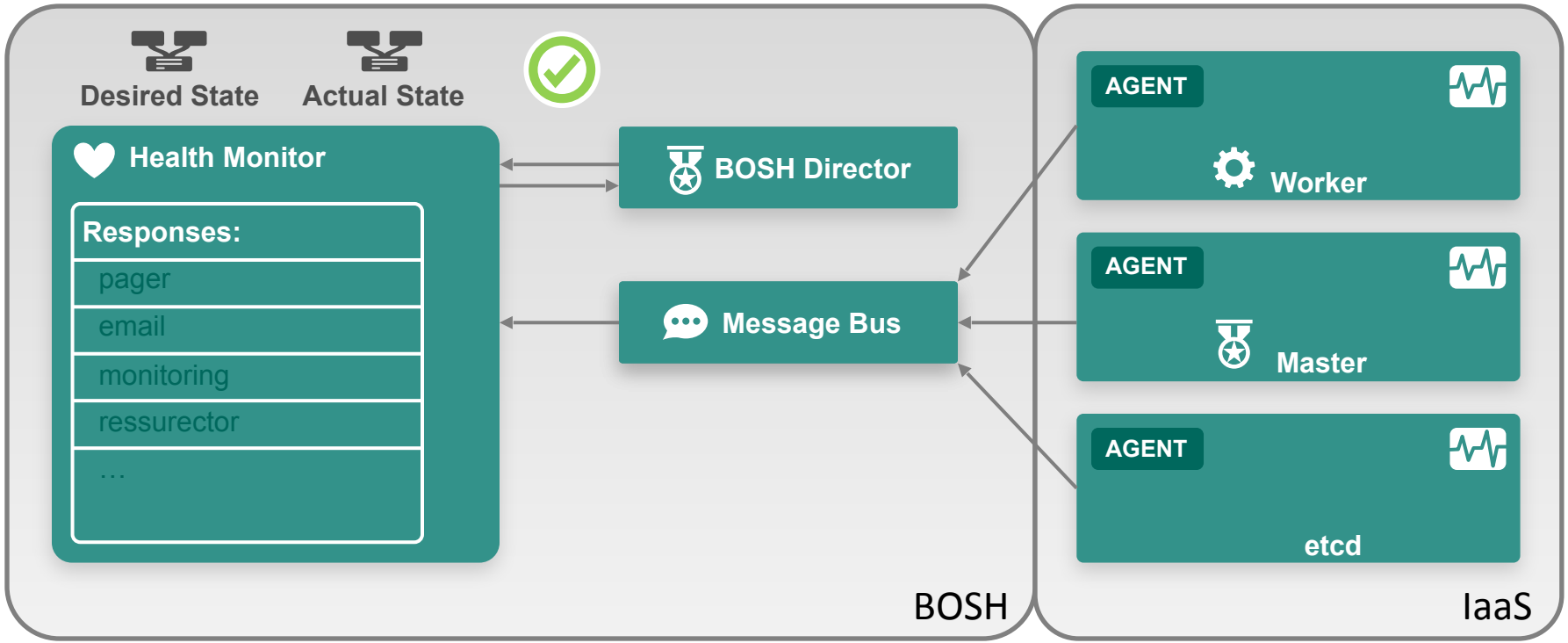

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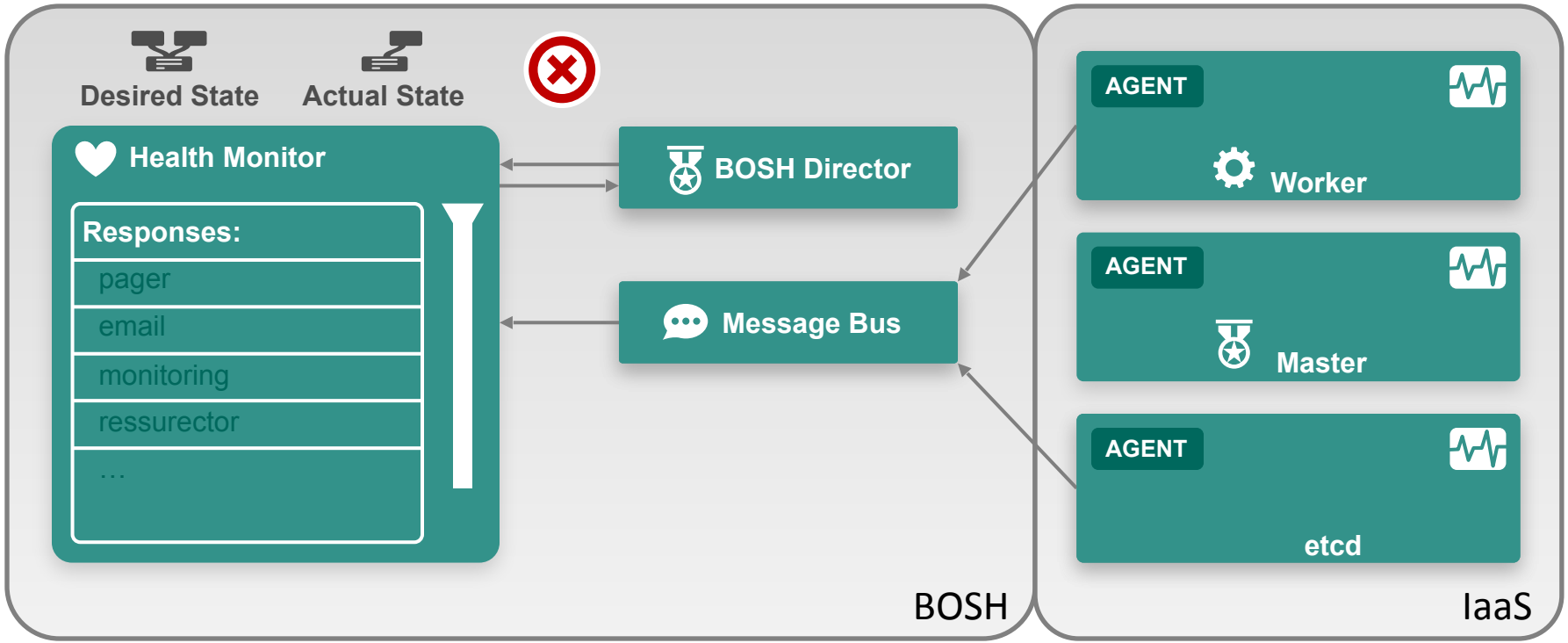

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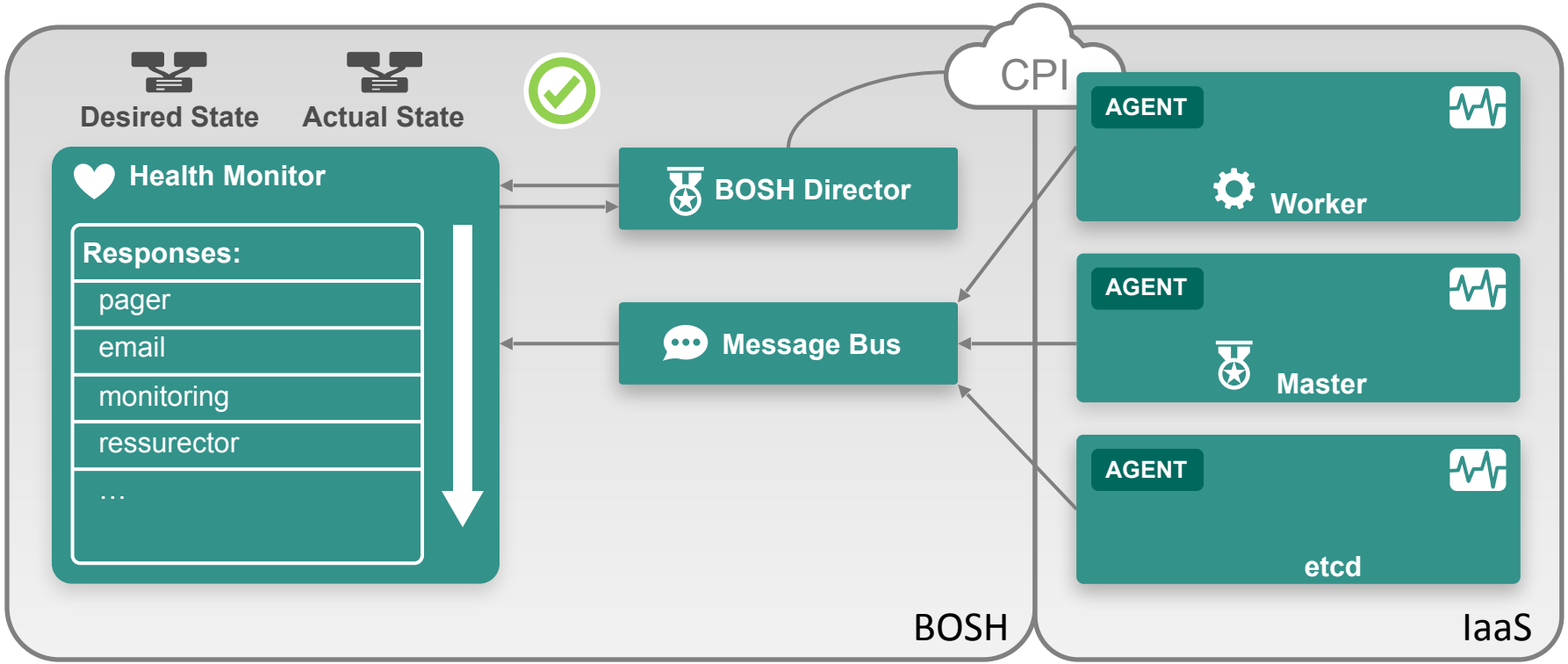

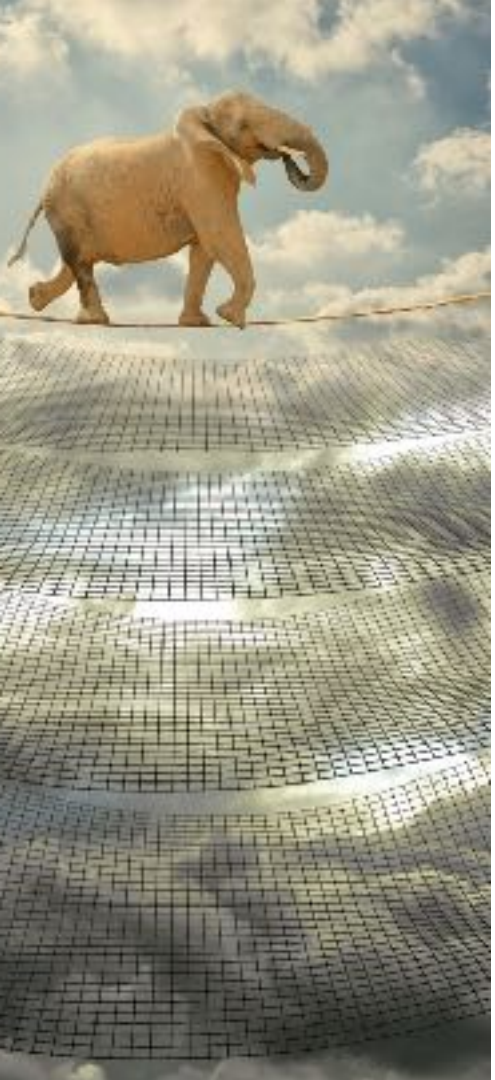

Four levels of HA in PKS

Kubernetes (workload management):

- Distribution across availability zones
- Application health management and recovery

BOSH (cluster management):

- Process monitoring, recovery and alerting
- Virtual machine health monitoring, recovery and alerting

We kinda know what's up here!

PAS (workload management):

- Distribution across availability zones
- Application health management and recovery

Kubernetes (workload management):

- Distribution across availability zones
- Application health management and recovery

BOSH (cluster management):

- Process monitoring, recovery and alerting
- Virtual machine health monitoring, recovery and alerting

BOSH (cluster management):

- Process monitoring, recovery and alerting
- Virtual machine health monitoring, recovery and alerting

We've been doing this in PAS for 5 years!!!

So, yeah…

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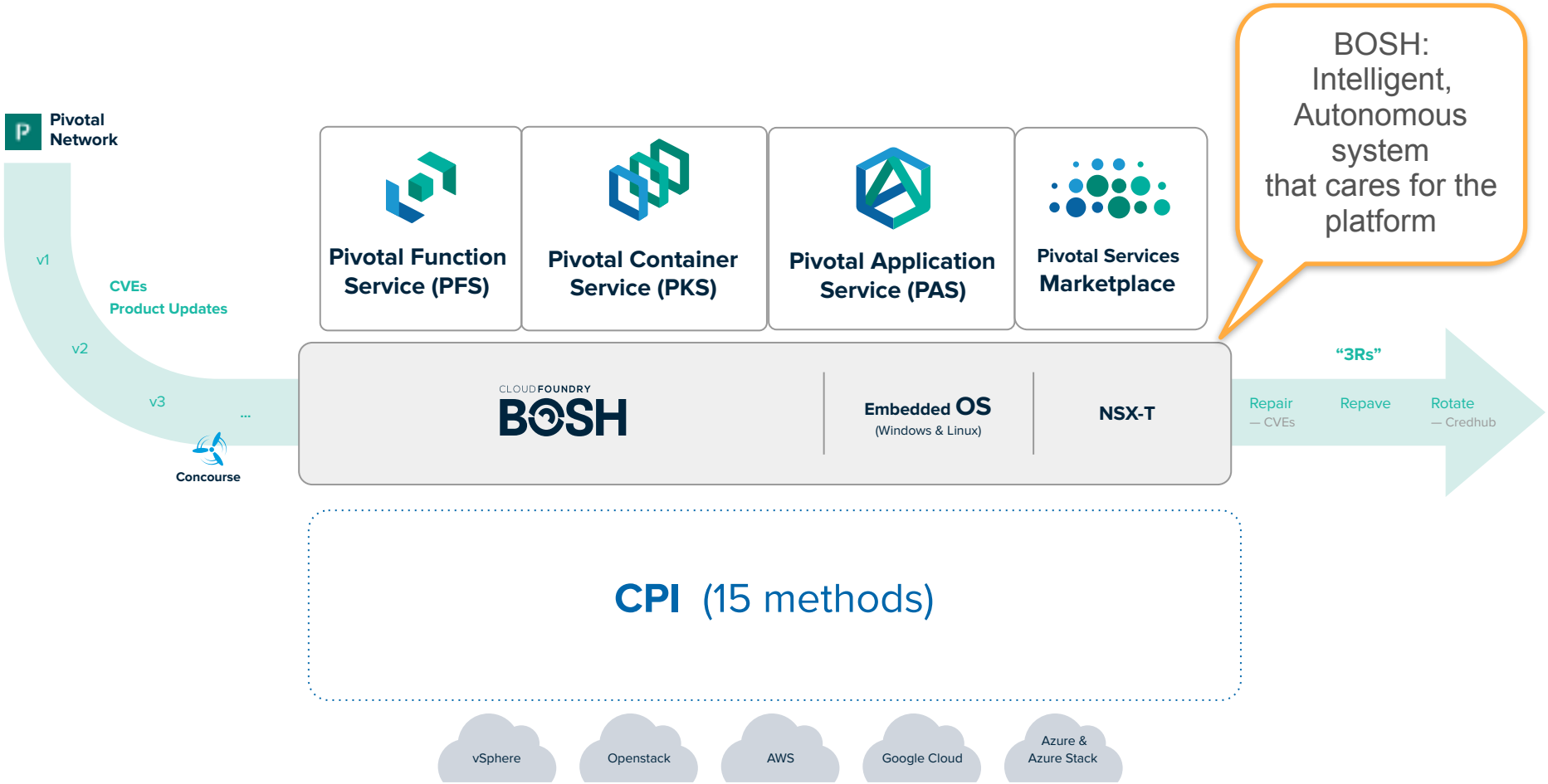
PKS does for your Kubernetes
what
Kubernetes does for your apps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BOSH: Intelligent, Autonomous system that cares for the platform
CLOUD FOUNDRY BOSH
Embedded OS (Windows & Linux)
NSX-T
"3Rs"
Repair — CVEs
Repave
Rotate — Credhub
CPI (15 methods)
vSphere
Openstack
AWS
Google Cloud
Azure & Azure Stack

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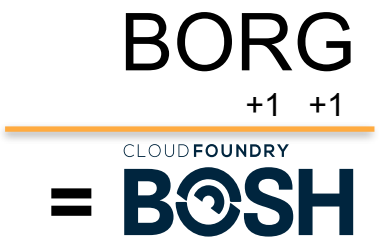
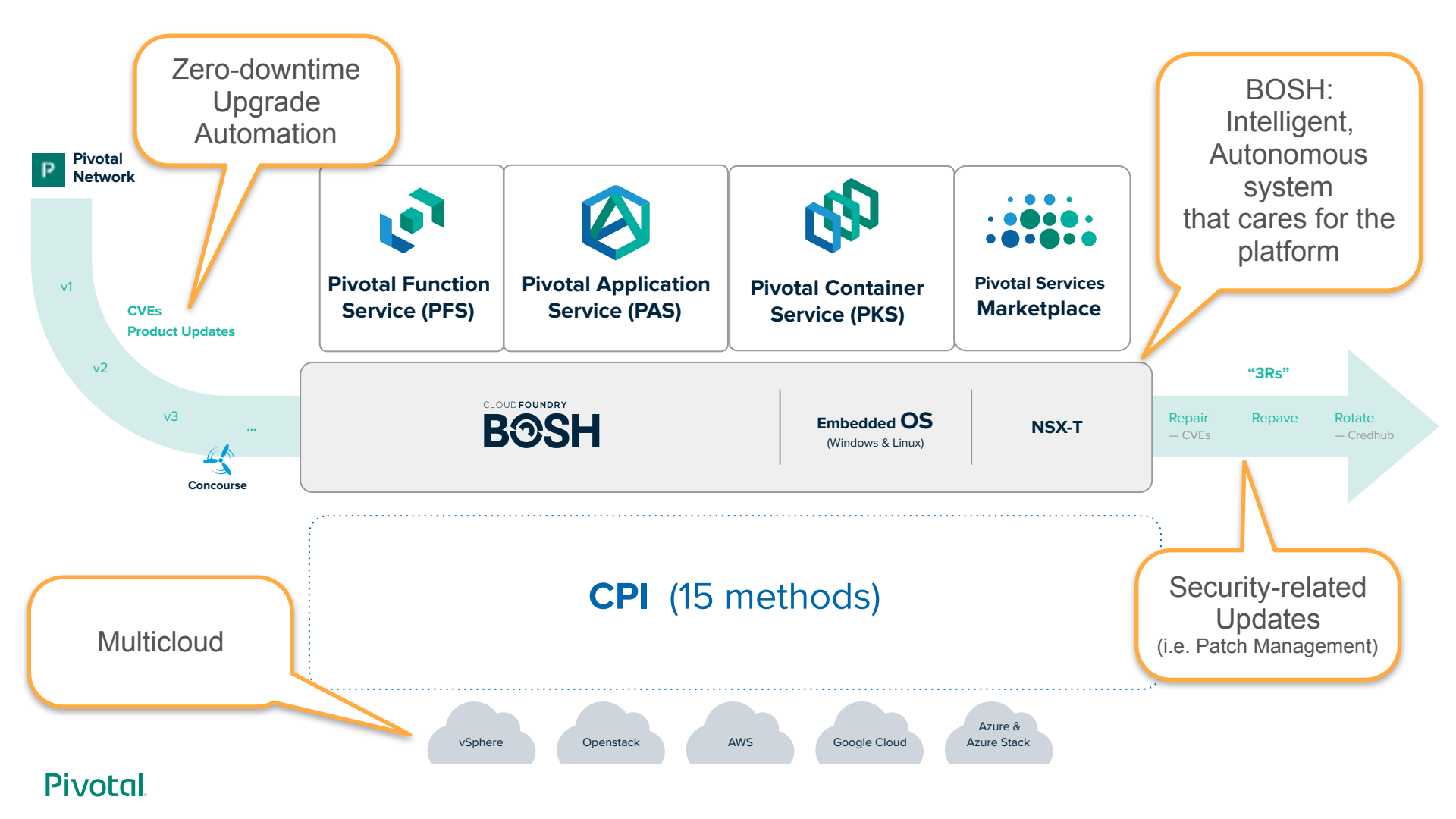
Cloud Foundry BOSH

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



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


Zero-downtime Upgrade Automation
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CPI (15 methods)
Multicloud
vSphere
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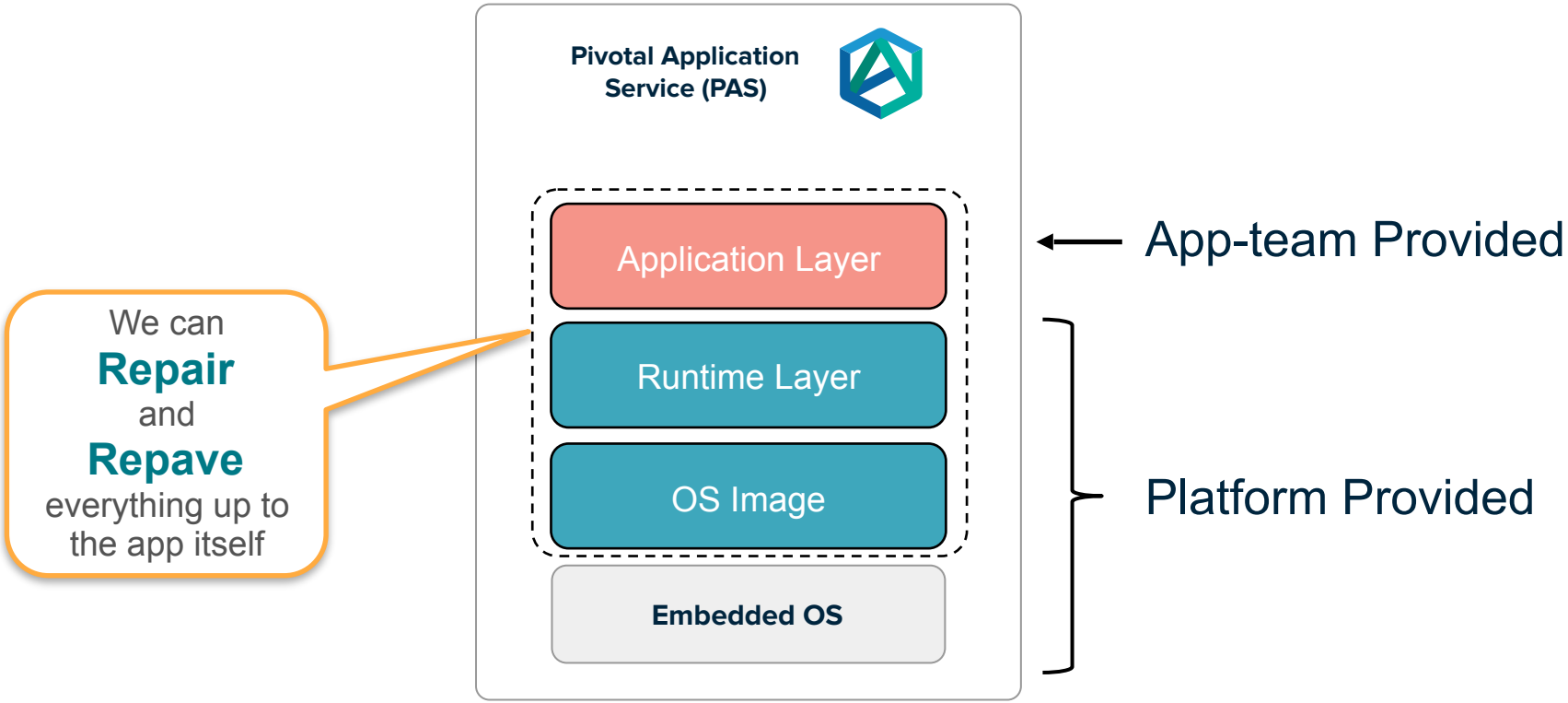
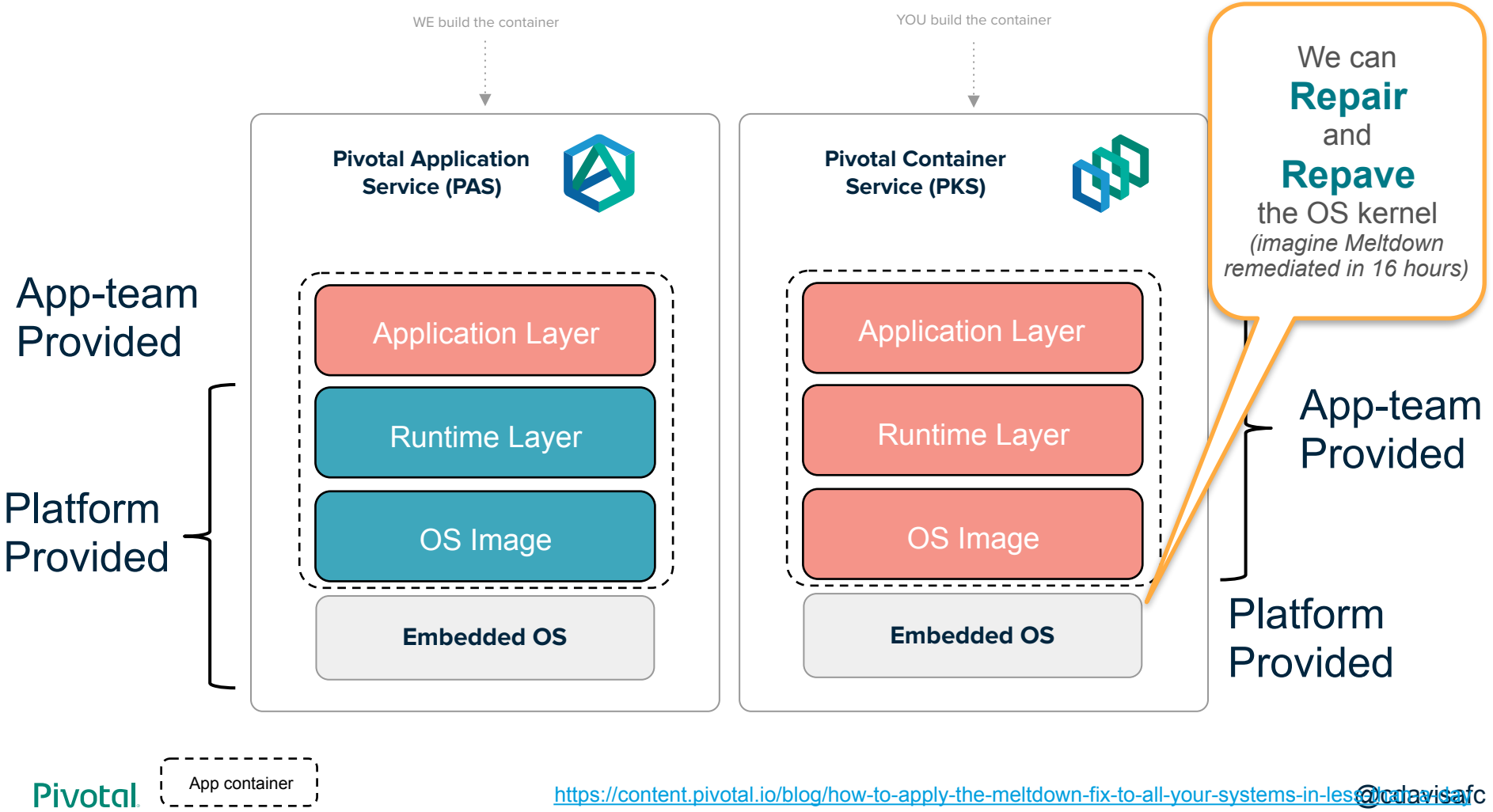
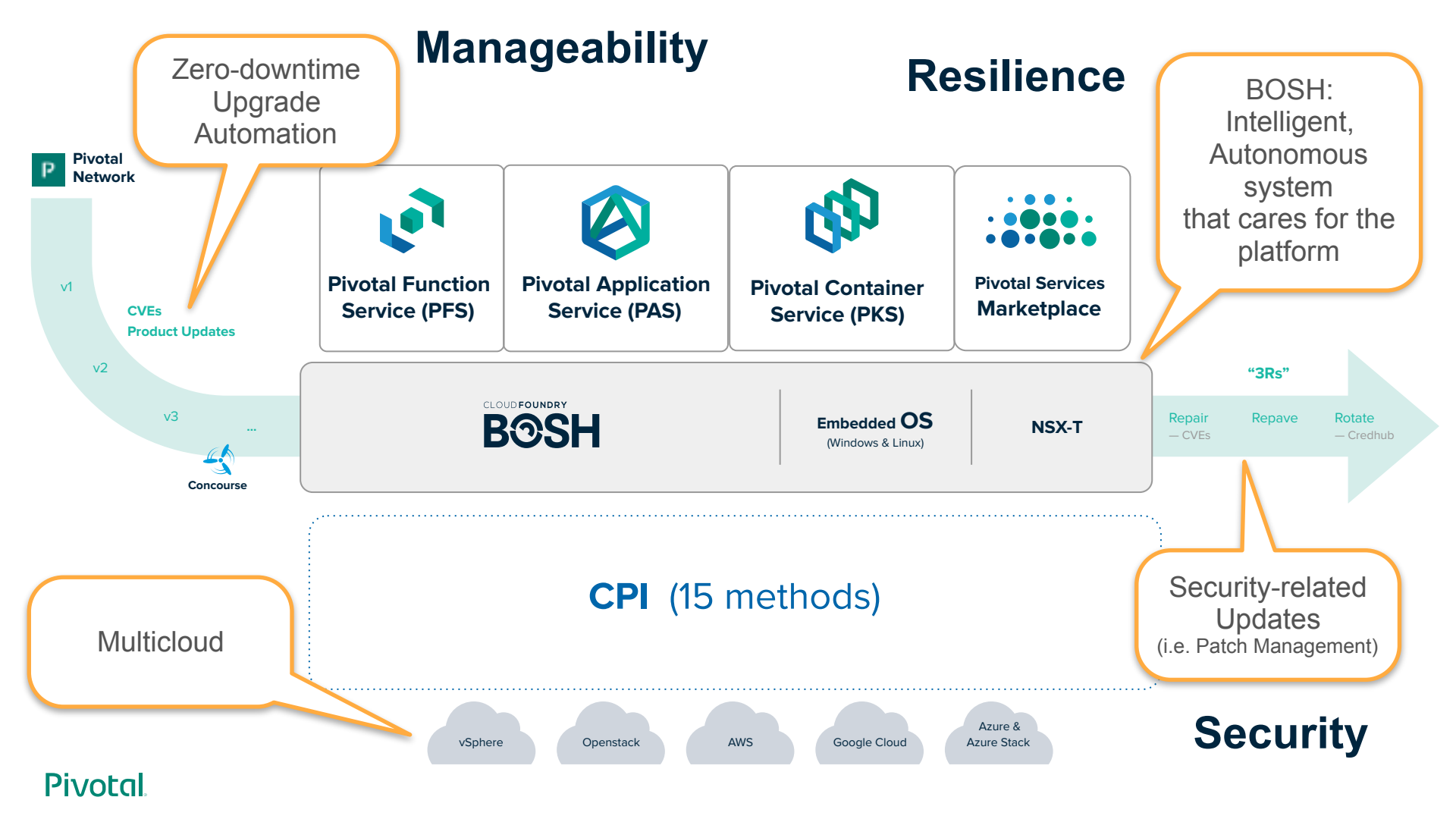
AWS
Google Cloud
Azure & Azure Stack
Security-related Updates (i.e. Patch Management)
Pivotal


Pivotal Application Service (PAS)
Application Layer
Runtime Layer
OS Image
Embedded OS
App-team Provided
Platform Provided
We can
Repair
and
Repave
everything up to the app itself
Pivotal
App container


WE build the container
YOU build the container
Pivotal Application Service (PAS)
Pivotal Container Service (PKS)
We can
Repair
and
Repave
the OS kernel
(imagine Meltdown remediated in 16 hours)
App-team Provided
Platform Provided
Application Layer
Runtime Layer
OS Image
Embedded OS
Application Layer
Runtime Layer
OS Image
Embedded OS
App-team Provided
Platform Provided
Pivotal
App container
https://content.pivotal.io/blog/how-to-apply-the-meltdown-fix-to-all-your-systems-in-less-than-a-day
@davisafc


Manageability
Resilience
Zero-downtime Upgrade Automation
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Multicloud
Security-related Updates (i.e. Patch Management)
vSphere
Openstack
AWS
Google Cloud
Azure & Azure Stack
Security
Pivotal

Cloud-manage your Kubernetes!!

Key Differentiators

API for Kubernetes cluster lifecycle management

Autonomous **Self-Healing Systems** - BOSH, PAS and Kubernetes

BOSH CPI: **Multi-cloud**

BOSH CPI: Lifecycle management - **upgrades and updates**

Embedded OS: **Patch management**

Complete Application Platform - Container creation, routing, observability, tenancy, ...

Complete Kubernetes Platform - Load balancing, storage, networking, image registry, ...

Thank you

Pivotal Application Service (PAS)

Pivotal Container Service (PKS)