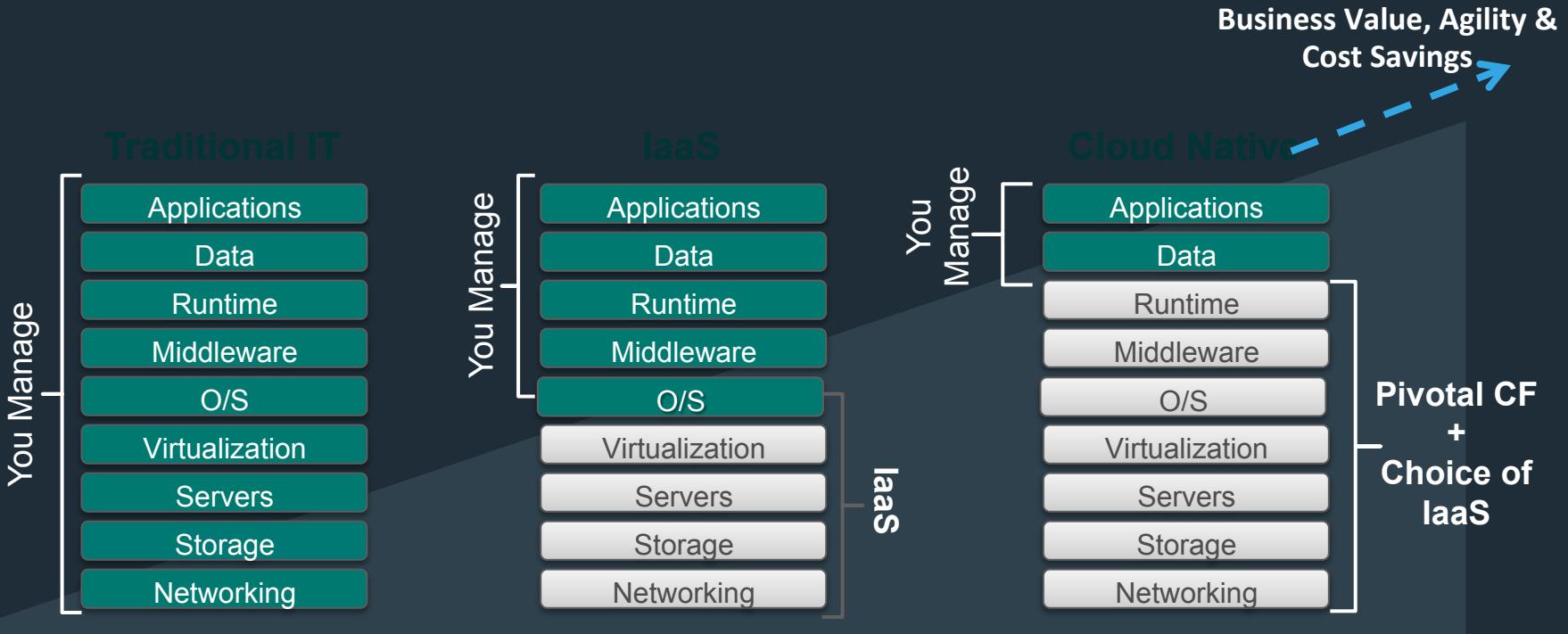


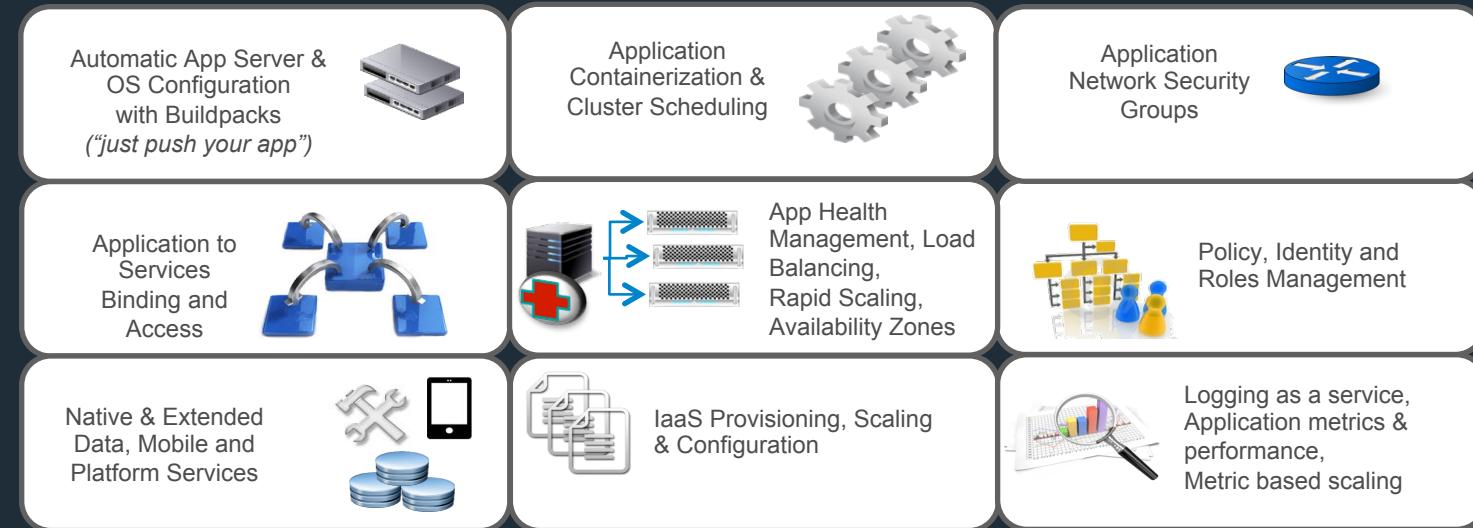
Pivotal Cloud Foundry

Architecture & Containers

Cloud Native Application Platforms



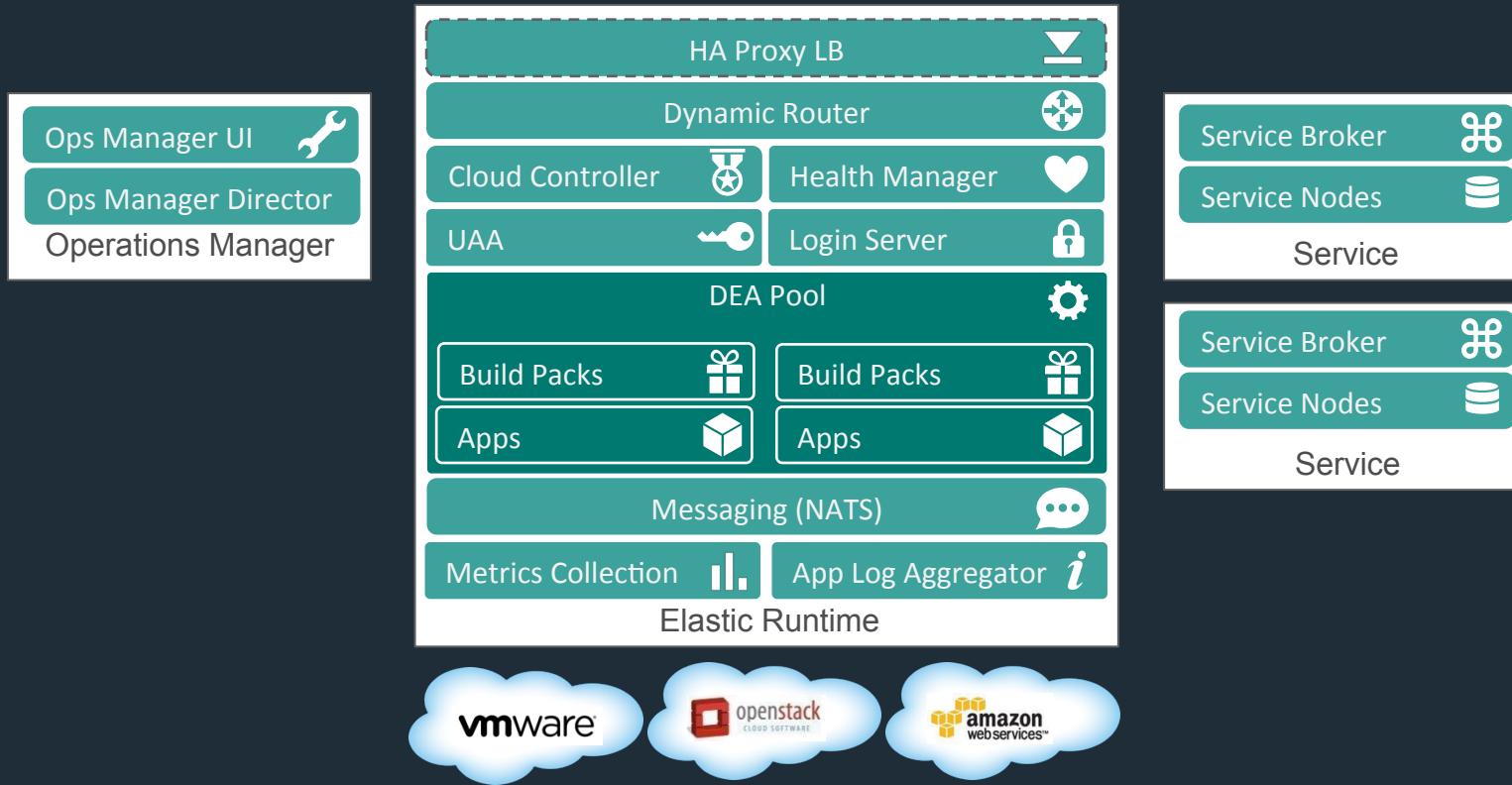
Pivotal CF: Technical Capabilities



Deploy, Operate, Update & Scale with minimal downtime on choice of IaaS

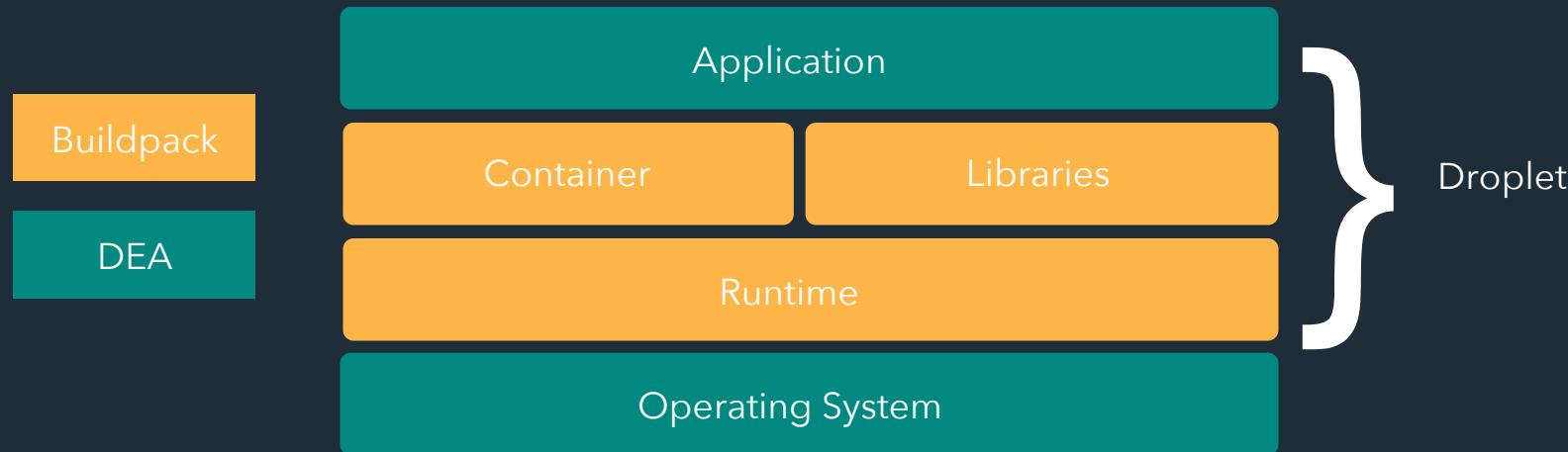


Pivotal CF Architecture



Staging and Buildpacks

Buildpacks are responsible for preparing the machine image for an application.



Buildpacks

Buildpacks installed into a Cloud Foundry instance or loaded from an external location at app deployment time

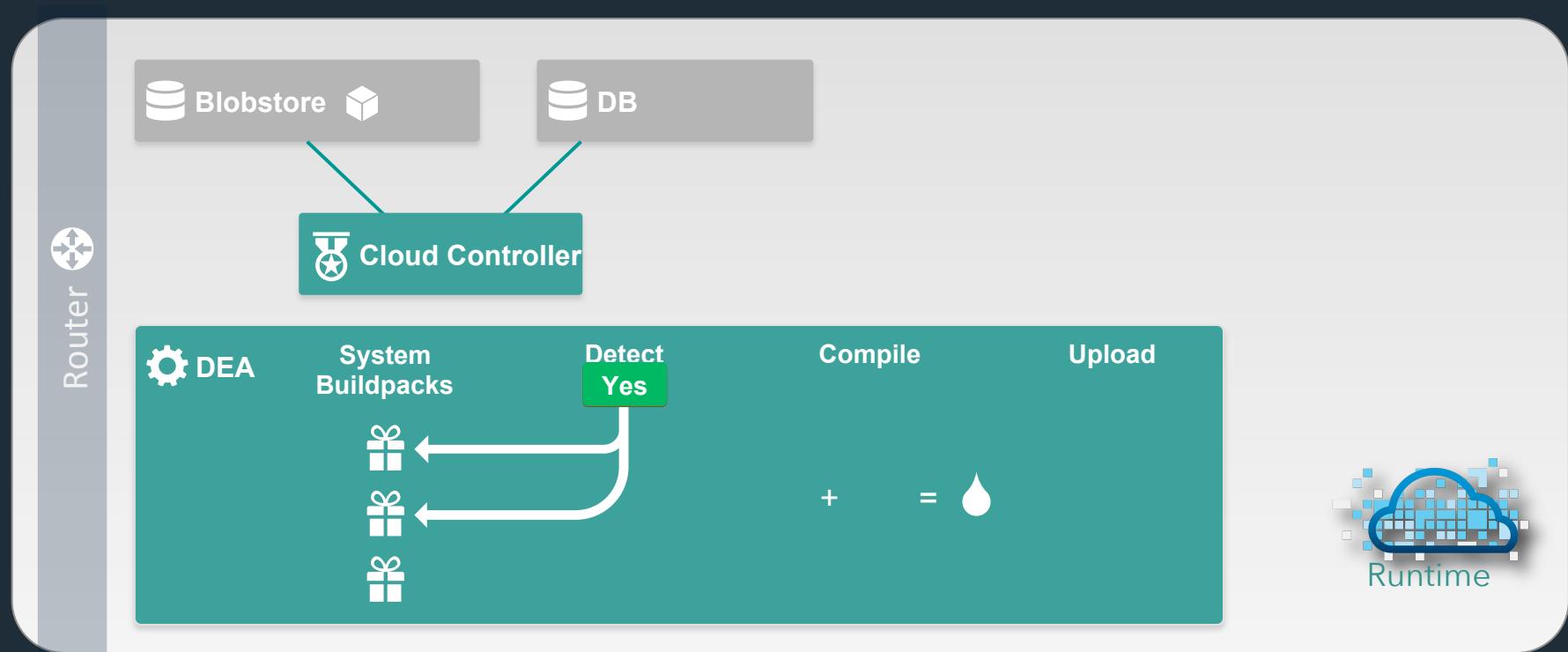
Buildpacks provided by public Cloud Foundry

- Java
- Ruby
- Node.js
- Go
- Python
- PHP

[Cloud Foundry Community Buildpack](#)

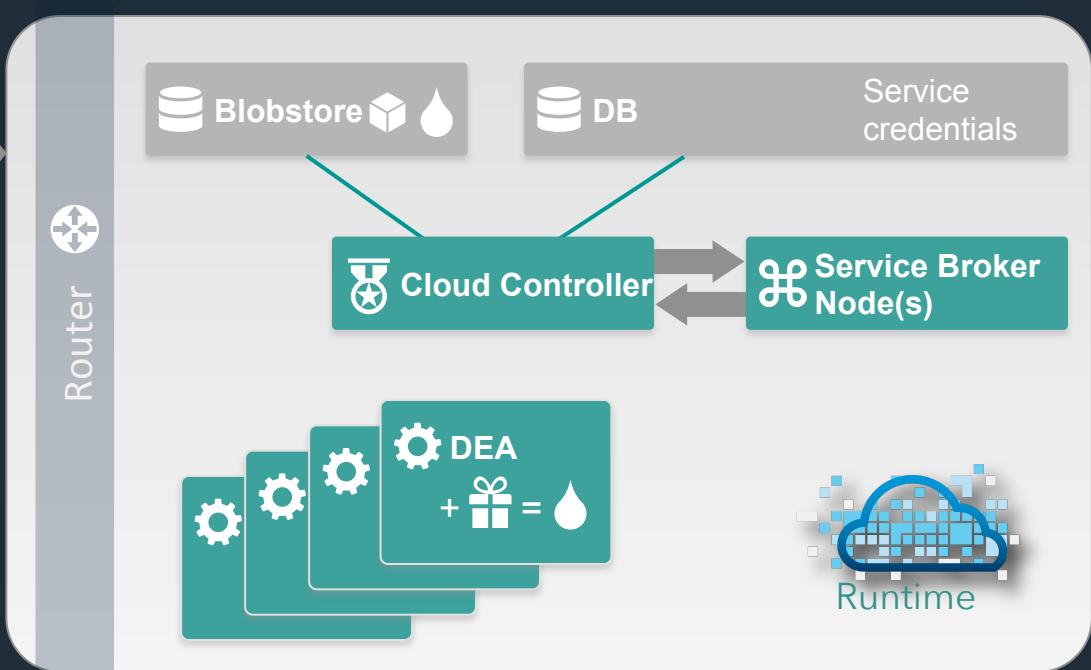
Write your own

Application Staging



Overview: Pushing an Application

- ① Upload app bits and metadata
- ② Create and bind services
- ③ Stage application
- ④ Deploy application
- ⑤ Manage application health



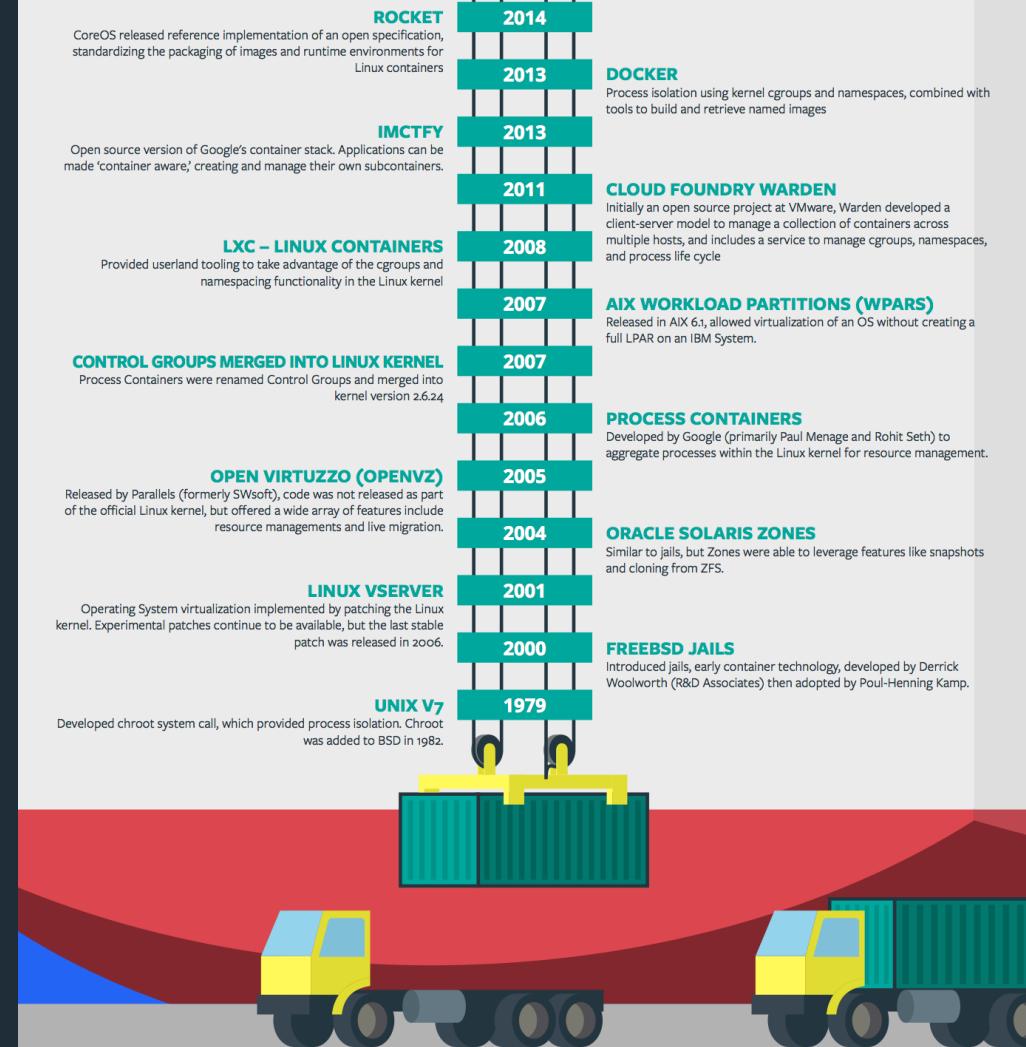


DEMO

CF

Containers - History

- Containers are not new
- CF has used containers since it's inception
- CF supports multiple container technologies as first class citizens including Docker, Warden, Garden and runC



Container Isolation

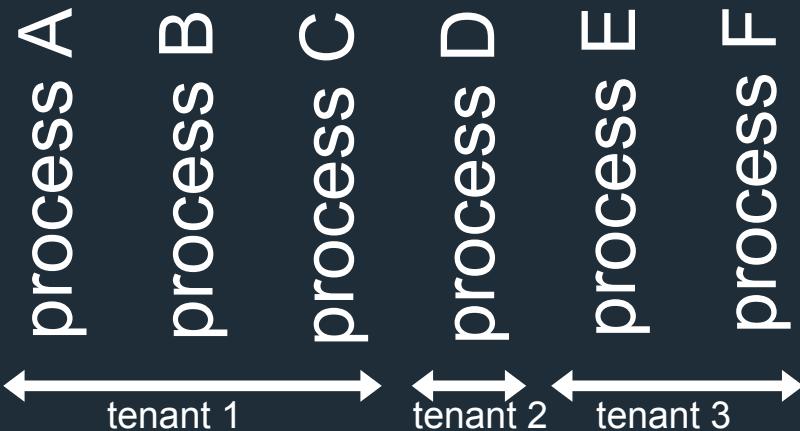
shared resources



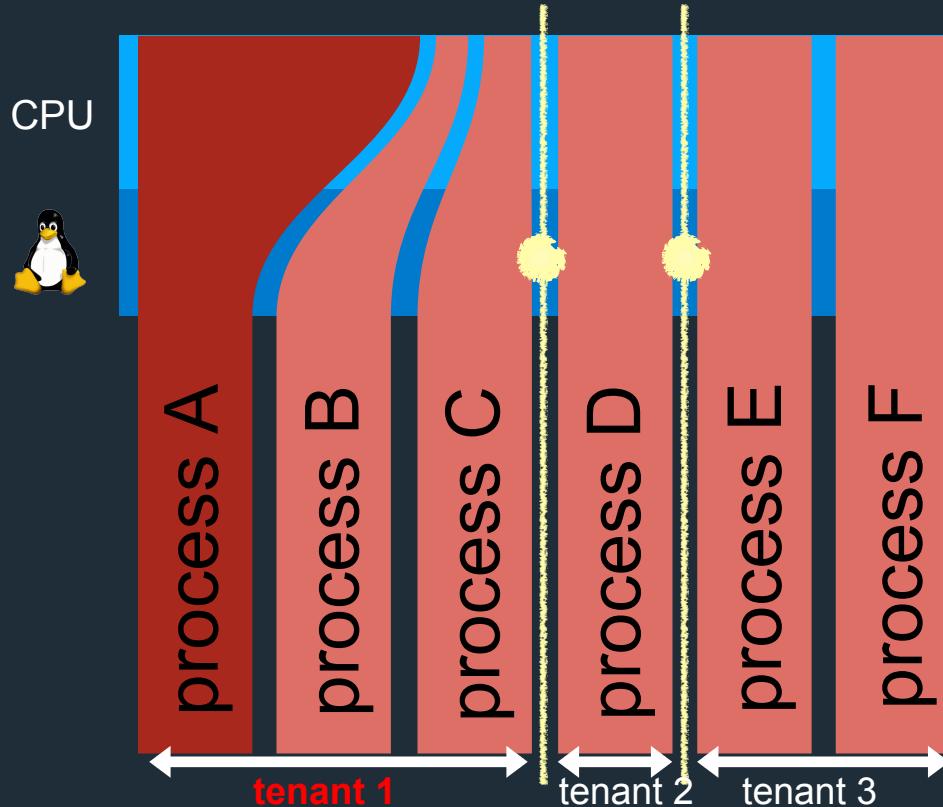
kernel

resource isolation

namespace isolation



Container Isolation

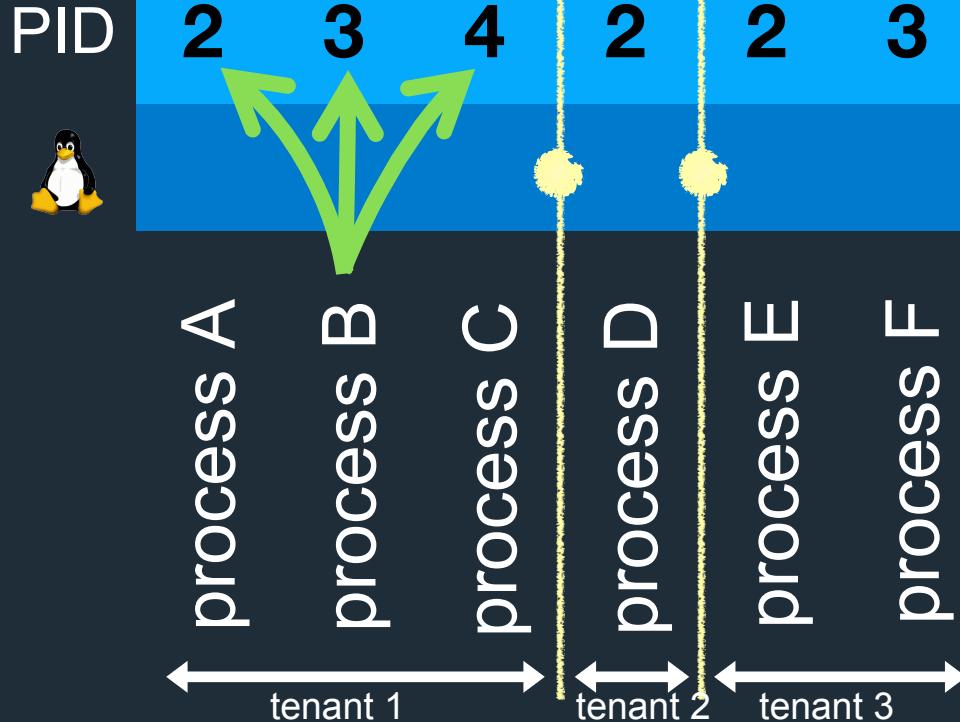


resource isolation

namespace isolation



Container Isolation

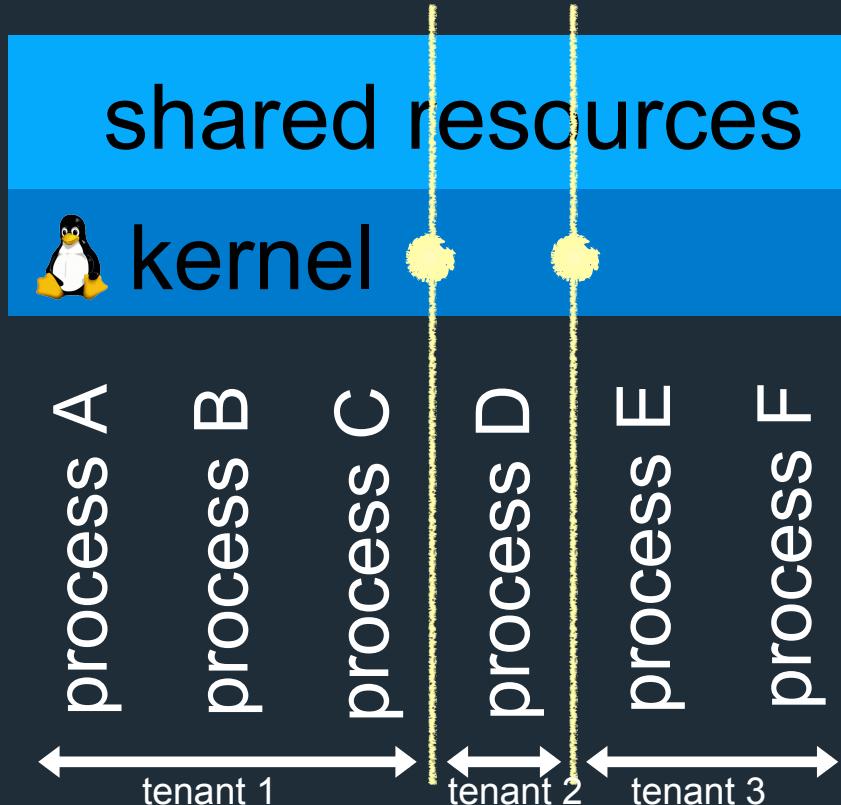


resource isolation

namespace isolation

 PID namespace

Container Isolation



resource isolation

namespace isolation

namespaces

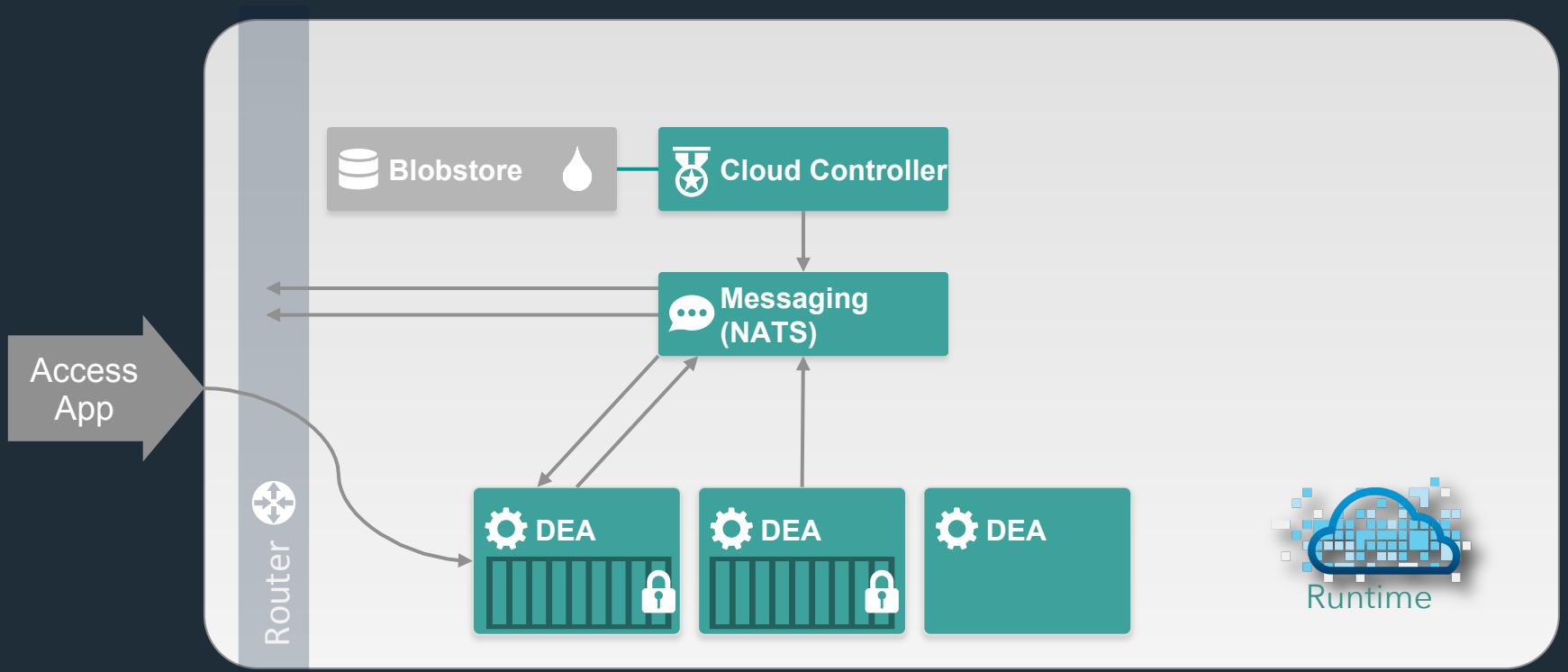
PID

Network

Mount

User

Application containers and scaling



Customize the container experience

Buildpack

Developer brings customized app

Buildpack brings standard runtime*

System stack brings fixed OS container image

System brings fixed host OS Kernel

Docker

Developer brings customized app

Developer brings runtime docker image

Developer brings Docker OS image

System brings fixed host OS Kernel

App container

* Devs may bring a custom buildpack

Pivotal Cloud Foundry

Services

Pivotal™

Pivotal Cloud Foundry Services

Mobile



API
Gateway



Push
Notification



Data Sync



App
Distribution

Data



Redis



DataStax
Cassandra



MySQL



GemFire



Session
state
caching



PivotalHD



Neo4j



MongoDB

Other



RabbitMQ



Jenkins
Enterprise



Spring XD



Single Sign-
on

Spring Cloud



Config
Server

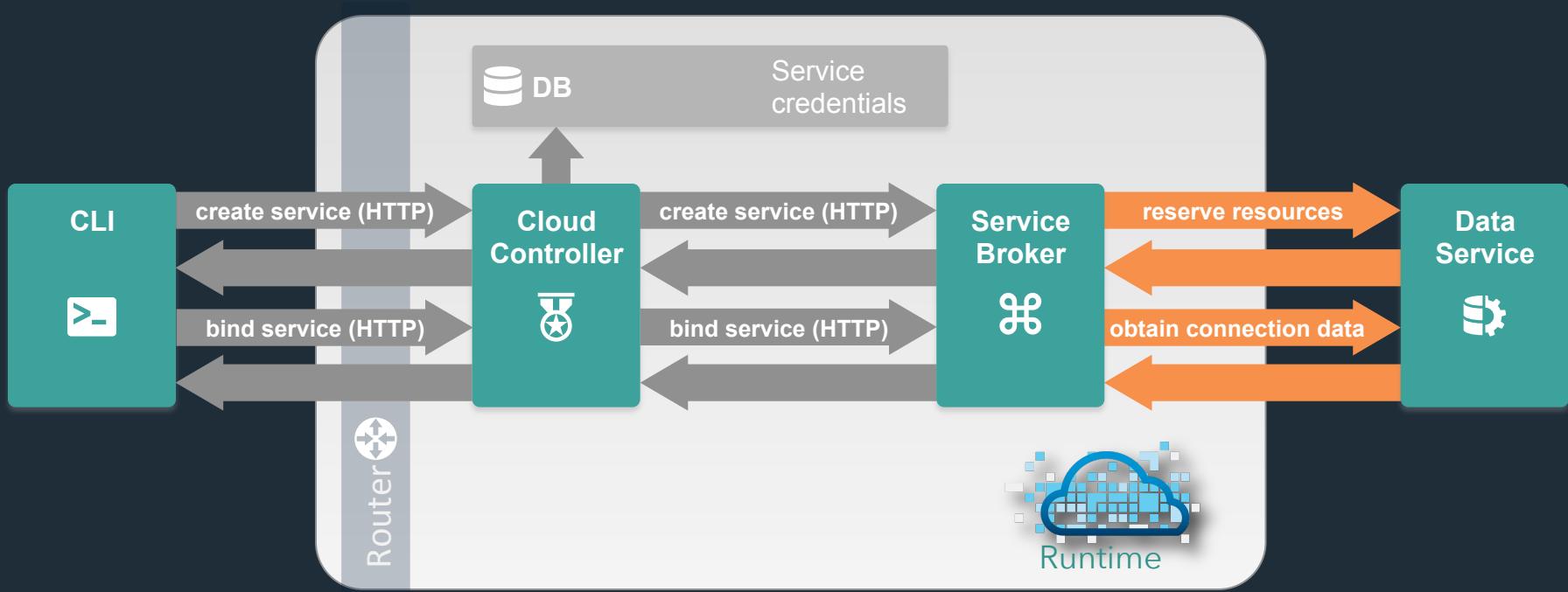


Service
Directory

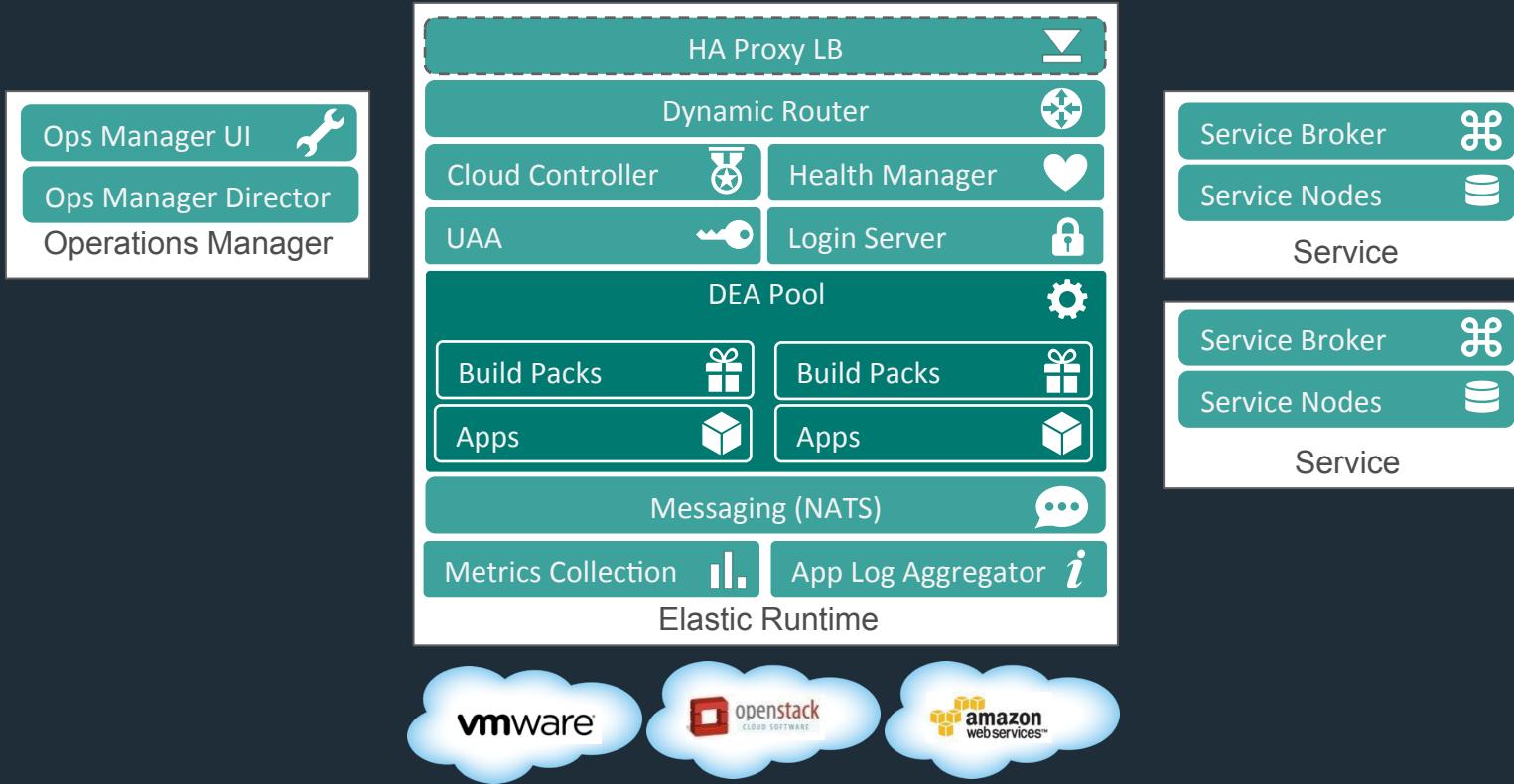


Circuit
Breaker

Creating and Binding a Service



Pivotal CF Architecture - Recap



Pivotal Cloud Foundry

Operations

Pivotal CF operations



Developer



Operator



Deploy to dev





Deploy to dev



Install runtime and
container



Install services (db,
messaging, hadoop, ...)



Setup load-balancing, SSL
termination and dynamic
routing



Setup / config High
Availability



Setup APM

Setup log streaming



Pivotal™



Deploy to dev



App Deployed



Install runtime and container



Setup databases (db, mongo, hadoop, ...)



Setup load-balancing, SSL termination and dynamic routing



Setup / config
Availability



Setup APM

Setup log streaming



Pivotal™

Restart server

Create service

Deploy to dev

Scale Platform

Update app



Blue-green deployment

Upgrade app

Deploy to Test

Change JDK
Redeploy

Scale up

Bind service

Deploy to QA

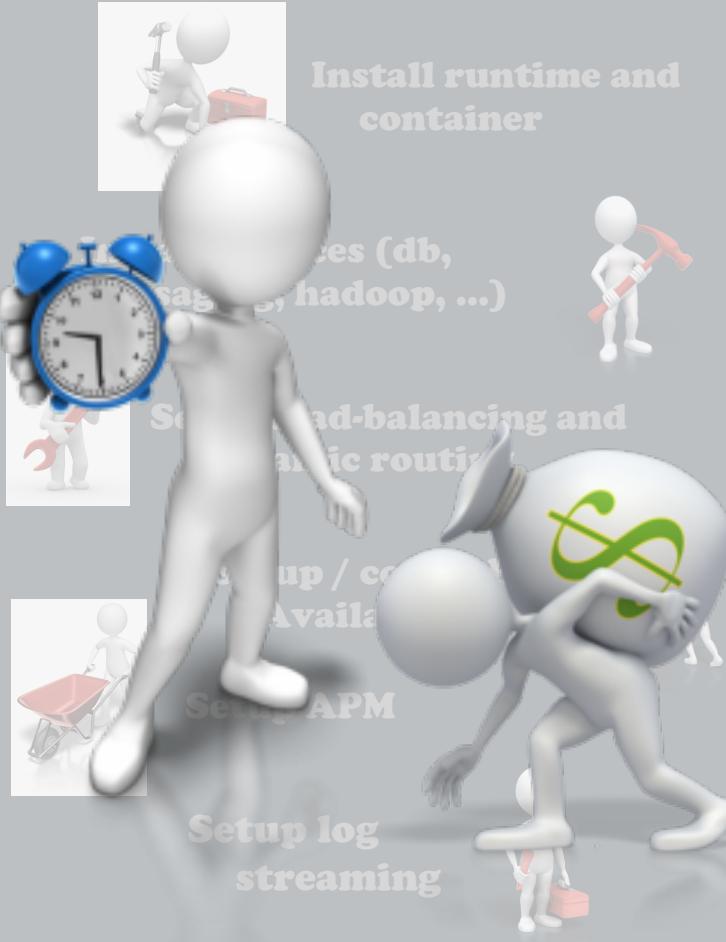
Update app server

Unbind service
Change route

Promote to production
Escalate memory
Check logs

Scale down

Delete App



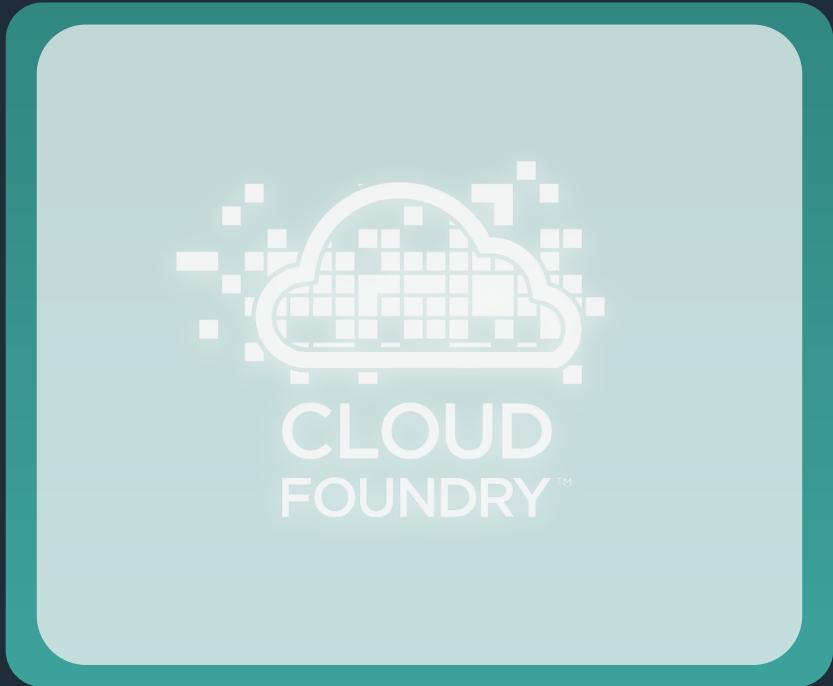


Pivotal™

The Pivotal CF way



Deploy to dev



The Pivotal CF way



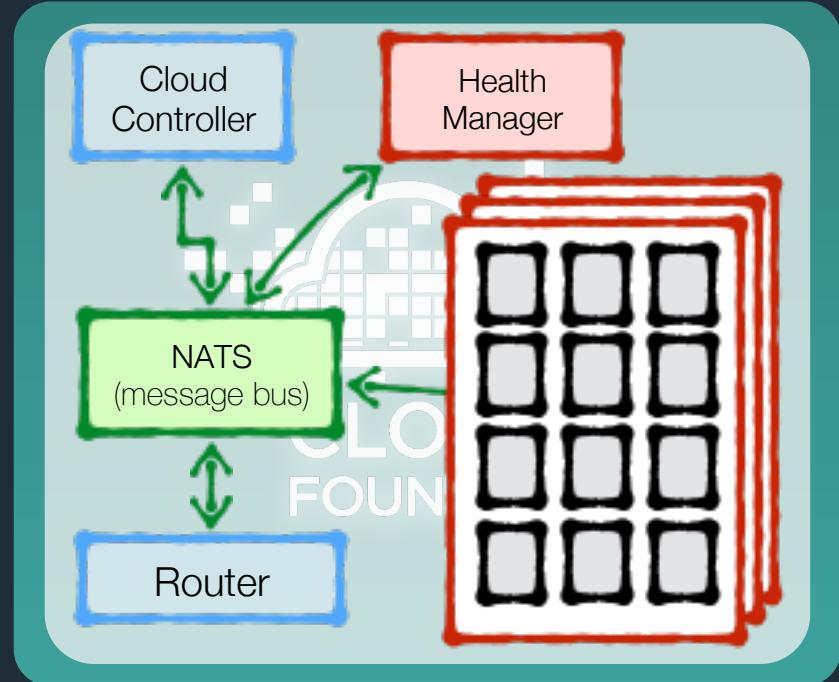
Deploy to dev



>cf push



App Deployed

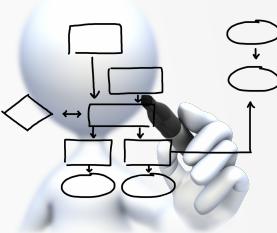


The operator in the PaaS era





Operator Concerns



Manage users
and quotas



Plan capacity



Install the
platform



Setup High
Availability



Handle upgrades
and updates



Monitor the
platform



Install the platform



Target multiple clouds



Handle live upgrades and updates

Pivotal Ops Manager

Pivotal CF

CLOUD FOUNDRY™

IaaS

amazon web services

Setup High Availability

Install and manage services

Scale and plan capacity

The central teal box contains the Pivotal CF logo, which includes the text "Pivotal CF" at the top, "CLOUD FOUNDRY™" in the center, and seven circular icons below representing different services: "CF" with a network icon, "CF" with a dolphin icon, "CF" with a leaf icon, "CF" with a smiling face icon, "CF" with a starburst icon, "HD" with a "H" icon, and "CF" with a cloud icon.

The bottom row shows IaaS providers: amazon web services, Microsoft Azure, Google Cloud Platform, and OpenShift.



Setup High Availability



Install and manage services



Scale and plan capacity

Pivotal™

Click to install

No downtime updates

Explore install logs

Click to scale the platform

Built-in High Availability

Built-in Platform Monitoring

Integrated services

The image shows the Pivotal Ops Manager interface. At the top is a large teal box with a white 'P' icon and the text "Pivotal Ops Manager". Below this is a grid of service cards. The first row contains three cards: "Pivotal Elastic Runtime", "MySQL for Pivotal CF", and "App Autoscaling for Pivotal CF". The second row contains three cards: "Pivotal Ops Metrics", "Pivotal RabbitMQ for Pivotal CF", and "Riak CS for Pivotal CF". The third row contains three cards: "Pivotal Redis", "MongoDB for Pivotal CF", and "CloudBees Jenkins Enterprise". The fourth row contains three cards: "Cassandra for Pivotal CF", "Pivotal HD for Pivotal CF", and "Neo4j for Pivotal CF". The fifth row contains three cards: "ElasticSearch for Pivotal CF", "Mobile Services for Pivotal CF", and "Pivotal Spring Insight". At the bottom, there are two teal buttons labeled "BOSH Director" and "BOSH Agent". Below these buttons is a grey bar labeled "IaaS" with icons for Amazon Web Services, Google Compute Engine, Microsoft Azure, and OpenShift.

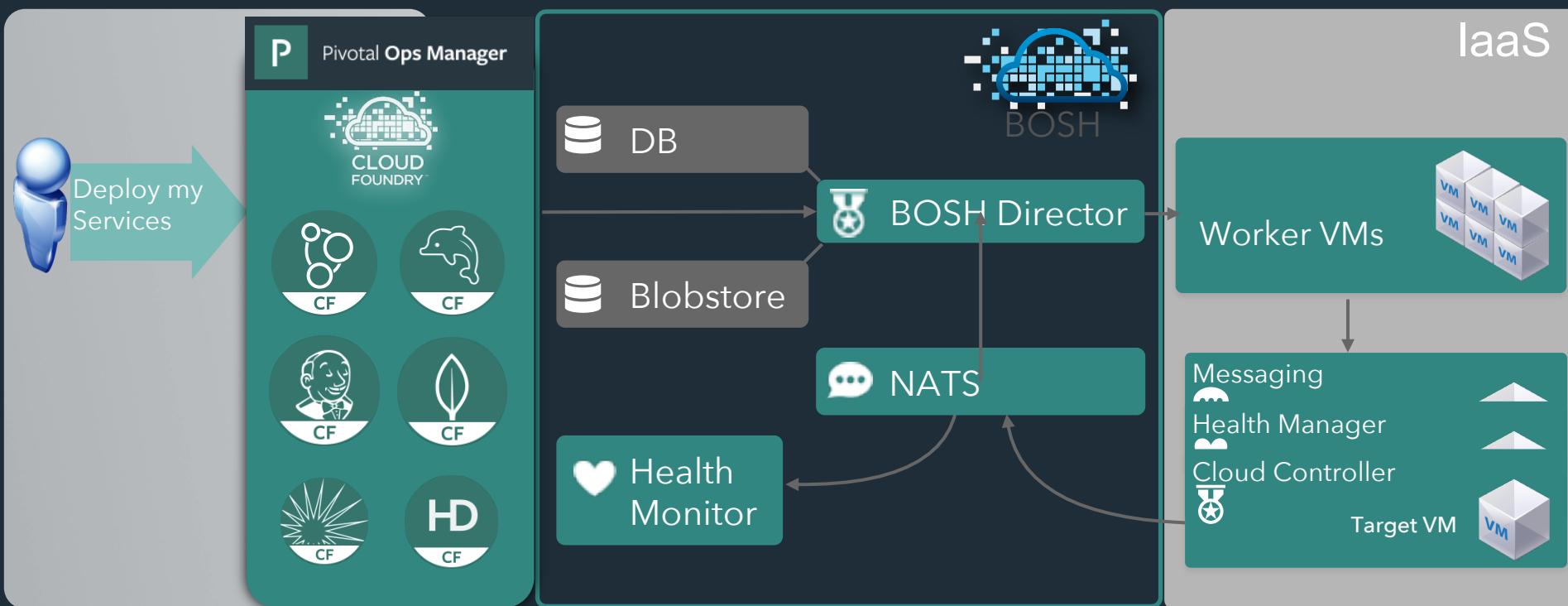
- Pivotal Elastic Runtime
- MySQL for Pivotal CF
- App Autoscaling for Pivotal CF
- Pivotal Ops Metrics
- Pivotal RabbitMQ for Pivotal CF
- Riak CS for Pivotal CF
- Pivotal Redis
- MongoDB for Pivotal CF
- CloudBees Jenkins Enterprise
- Cassandra for Pivotal CF
- Pivotal HD for Pivotal CF
- Neo4j for Pivotal CF
- ElasticSearch for Pivotal CF
- Mobile Services for Pivotal CF
- Pivotal Spring Insight

IaaS

BOSH Director BOSH Agent

Amazon web services

Ops Manager + BOSH

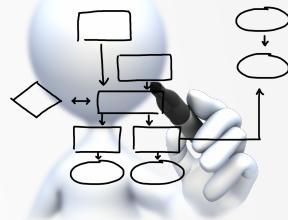




Operator Concerns



Plan capacity



Manage users
and quotas



Install the
platform



Setup High
Availability

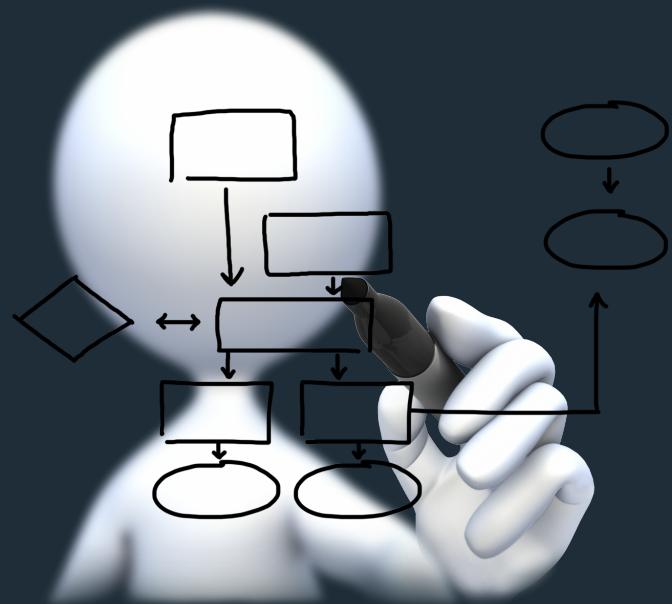
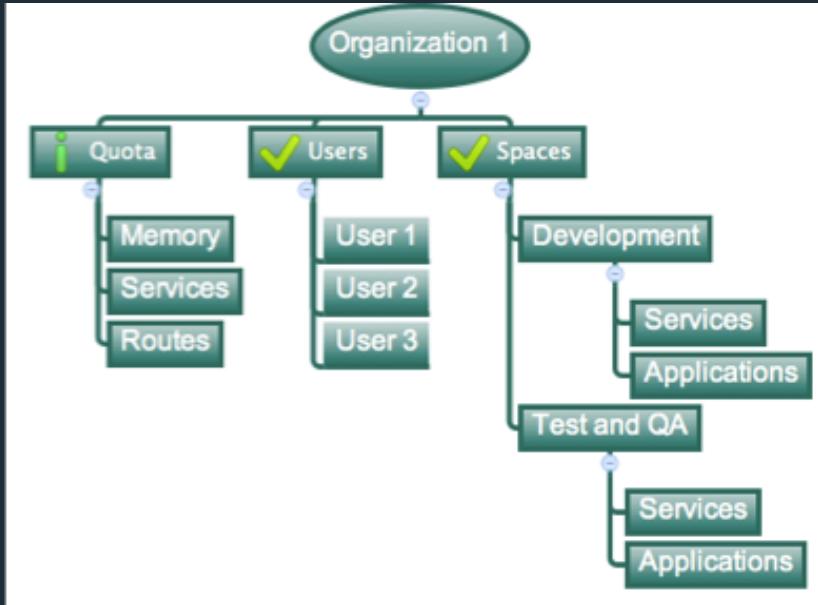


Handle upgrades
and updates



Monitor the
platform

Orgs, Spaces, Users and Quotas



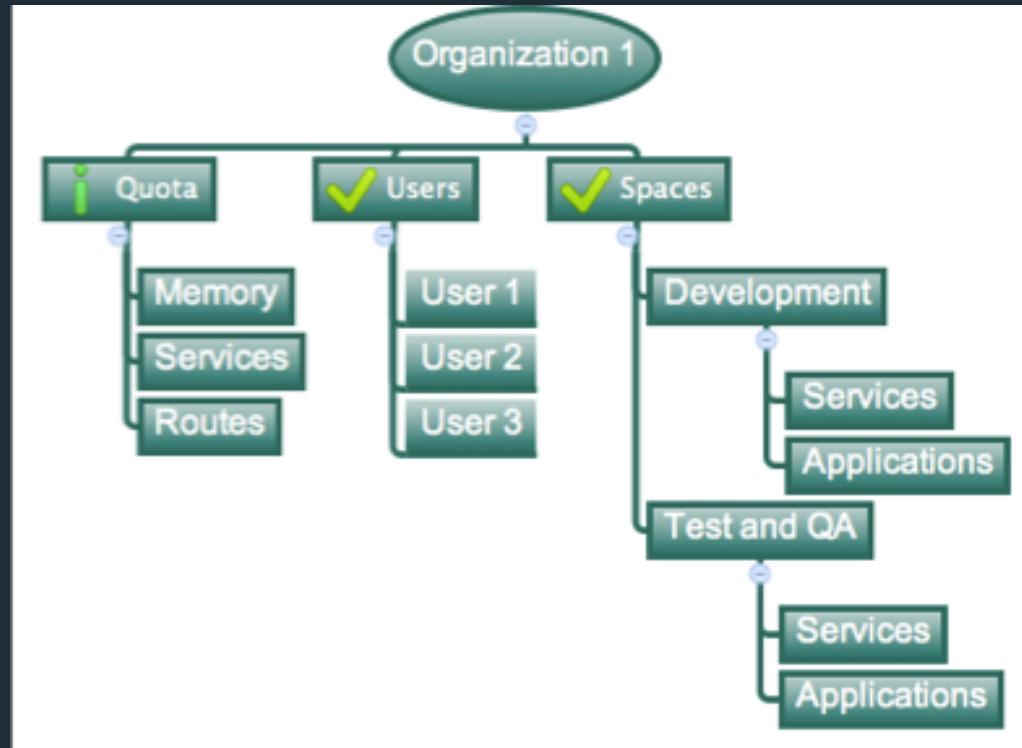
Organizations

Logical division within a Pivotal CF install / Foundation.

Each organization has its own users and assigned quota

User permissions / roles are specified per space within an organization

Sub-divided into Spaces

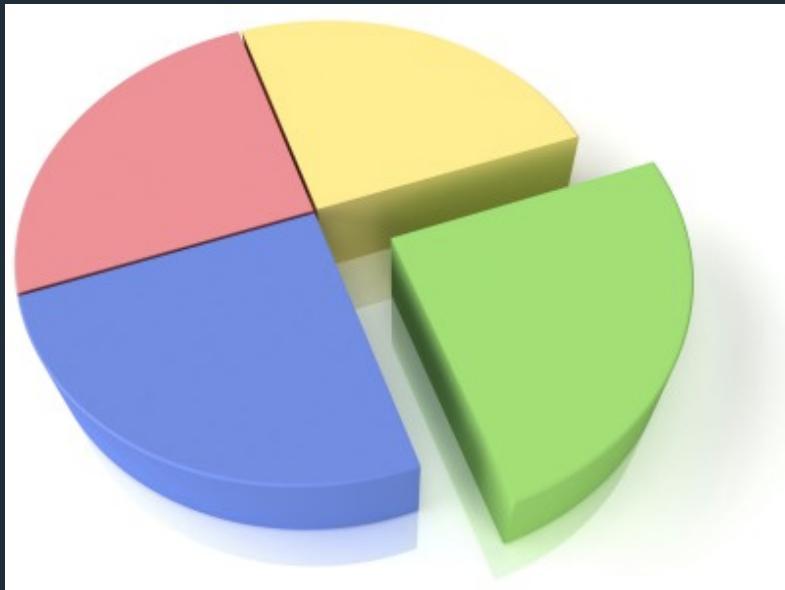


Quotas and Plans

Different quota limits (e.g. “small”, “enterprise”, “default”, “runaway”) can be assigned per Organization

Quota defines

- Total Memory
- Total # of Services
- Total # of Routes



Spaces

Logical sub-division within an organization

Users authorized at an organization level can have different roles per space

Services and Applications are created / specified per Space

Same Service can have different meanings per space





Operator Concerns



Plan capacity



Install the platform



Setup High Availability



Manage users and quotas



Handle upgrades and updates



Monitor the platform

Platform Monitoring



- How do I know when to scale DEAs?
- How many requests each Router is servicing?
- What is the current load of my Cloud Controllers?

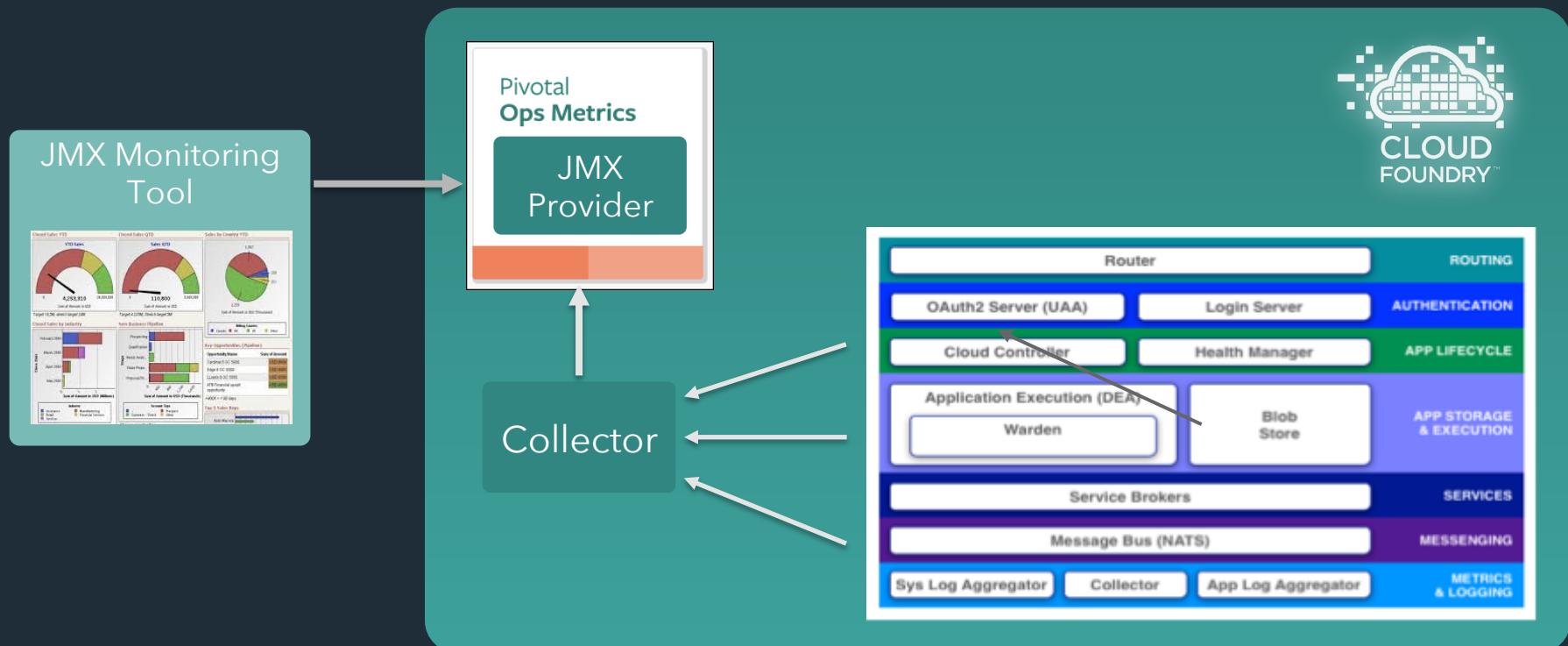
Platform Monitoring

Pivotal Ops Metrics provides a single JMX interface to access metrics for each Pivotal CF component

- DEAs
- Cloud Controllers
- Routers
- Health Managers
- NATS, UAA, Login Server, ...



Platform Monitoring





Operator Concerns



Plan capacity



Install the platform



Setup High Availability



Manage users and quotas



Handle upgrades and updates



Monitor the platform

4 Layers of built-in High Availability

Application Instance

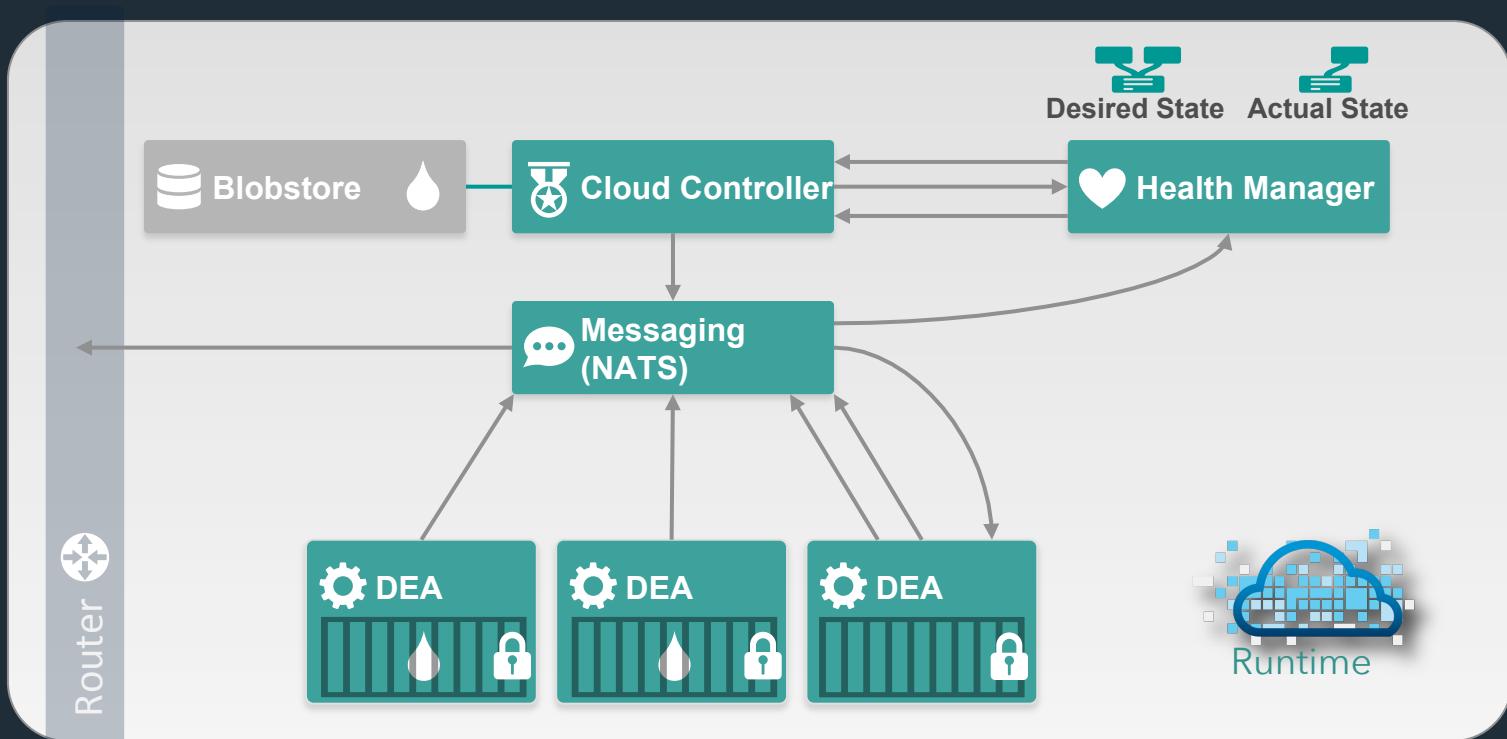
Platform Processes

Platform VMs

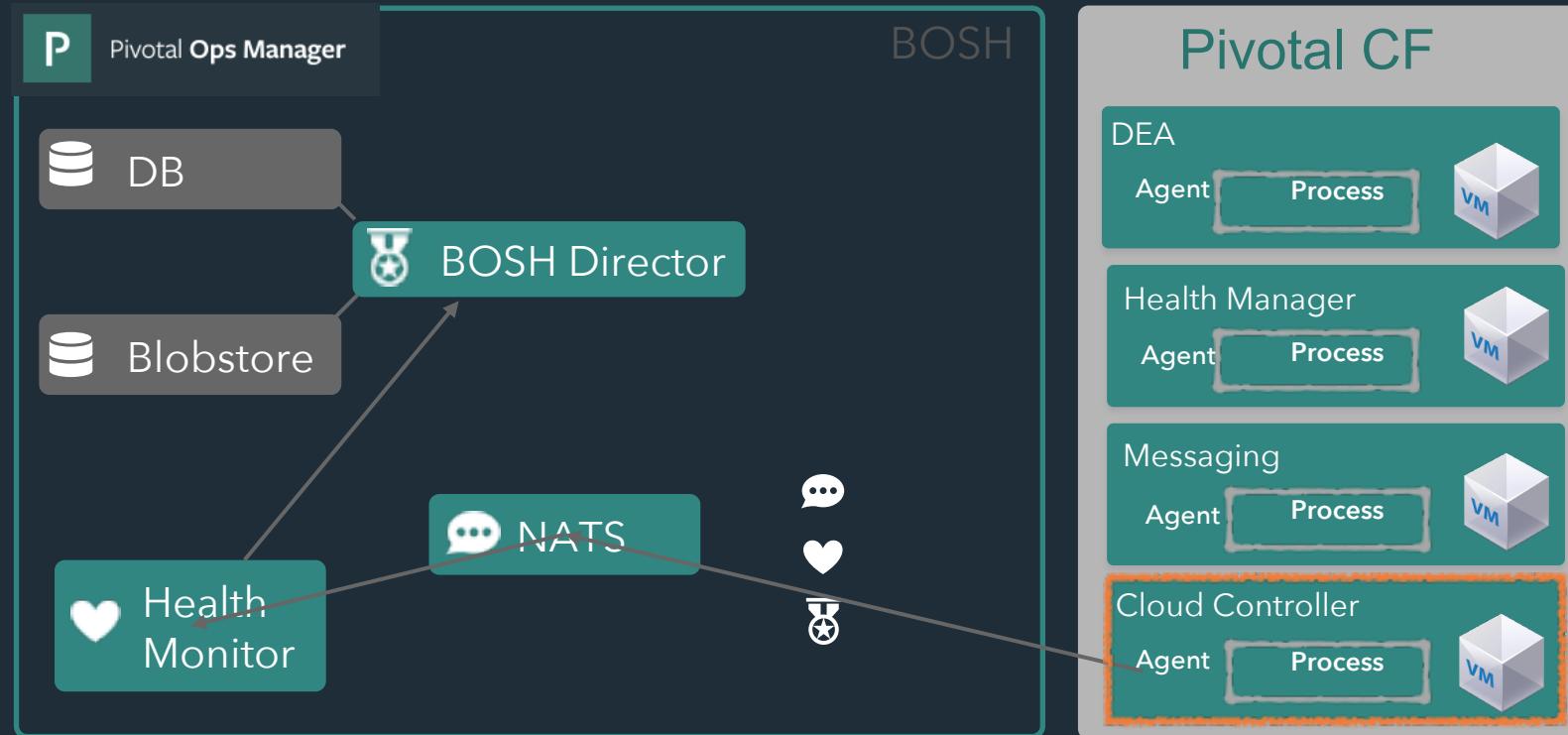
Availability Zones



App Instance HA



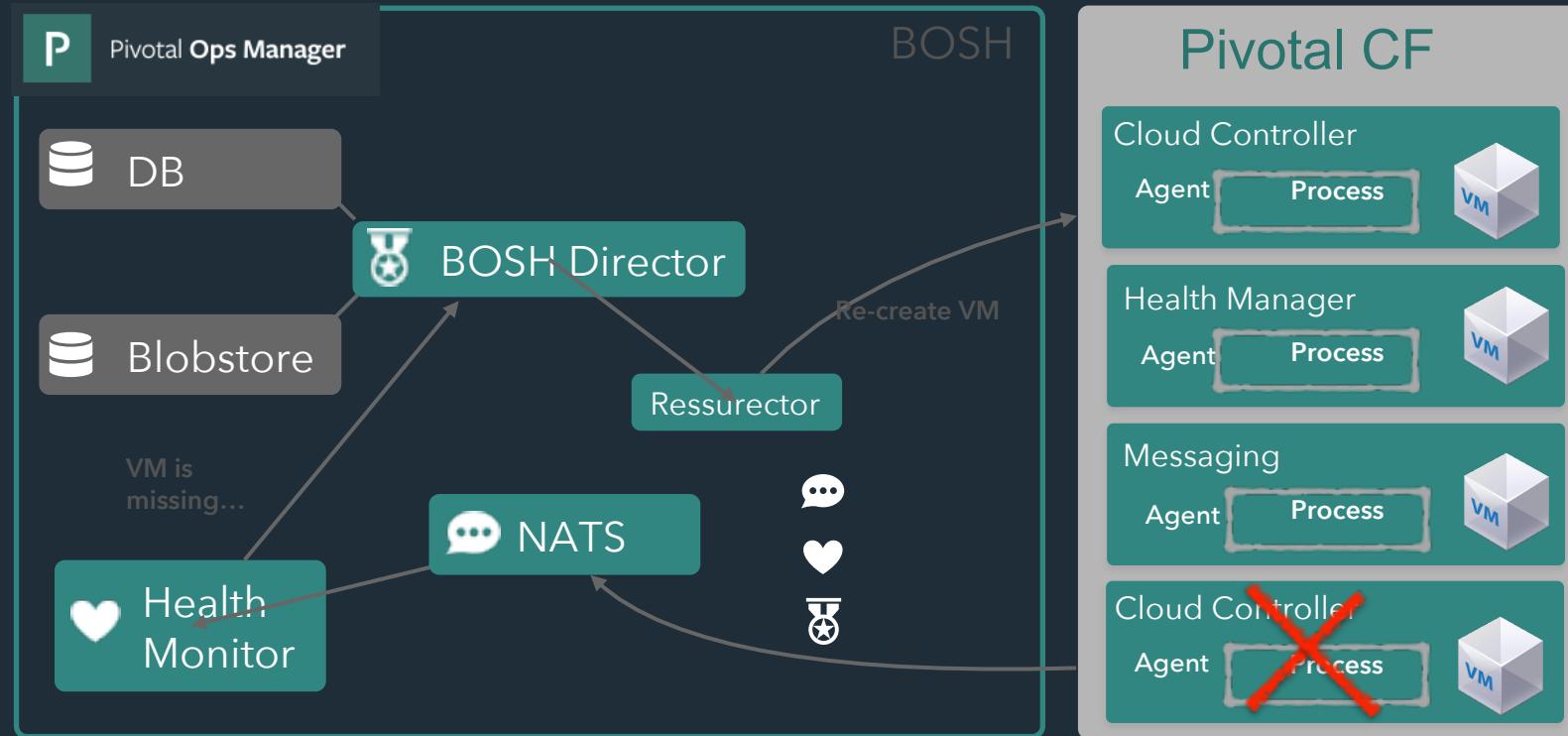
Platform Processes HA



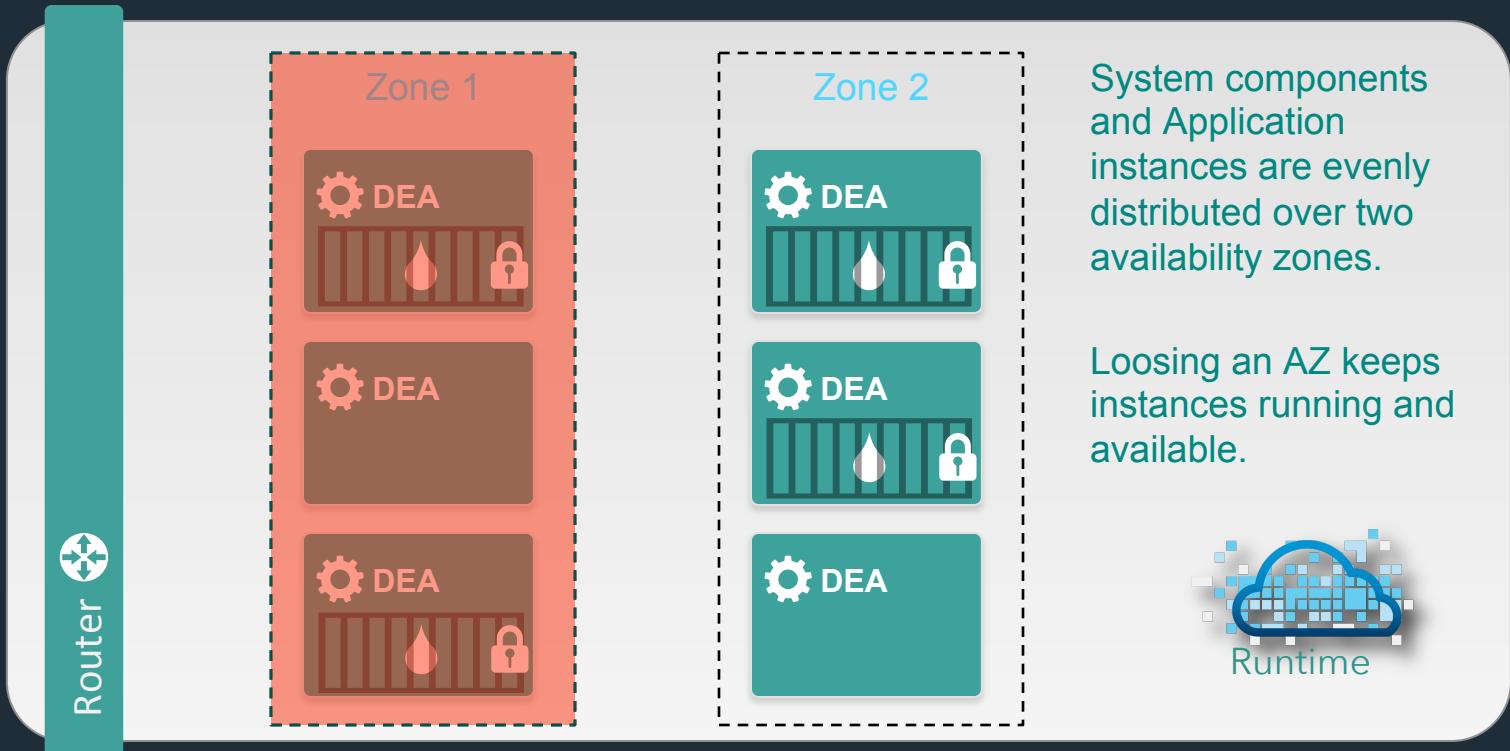
Platform Processes HA



Platform VMs HA

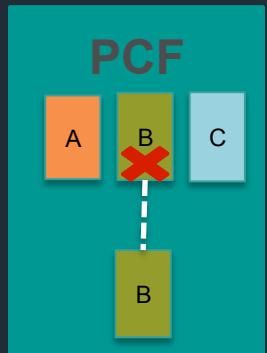


Availability Zones

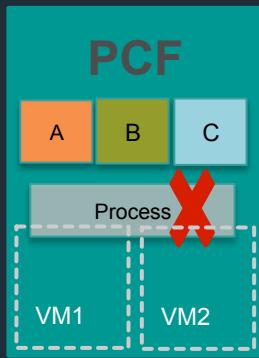


How Pivotal CF enables four layers of HA

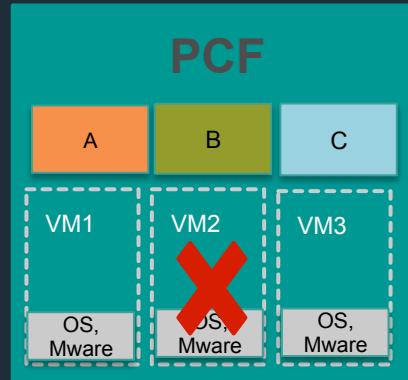
1.



2.



3.



4.



If an **app fails**, PCF reboots app in a new container.

App Fail

If a **process fails**, PCF restarts the process

Process Fail

If an **OS or network failure occurs** PCF kills the VM and reboots the host in a new Virtual machine.

VM Fail

If a **datacenter rack fails**, PCF ensures applications stay running in multiple availability zones

Rack Fail



Operator Concerns



Plan capacity



Install the platform



Setup High Availability



Manage users and quotas



Handle upgrades and updates



Monitor the platform

Pivotal

A NEW PLATFORM FOR A NEW ERA