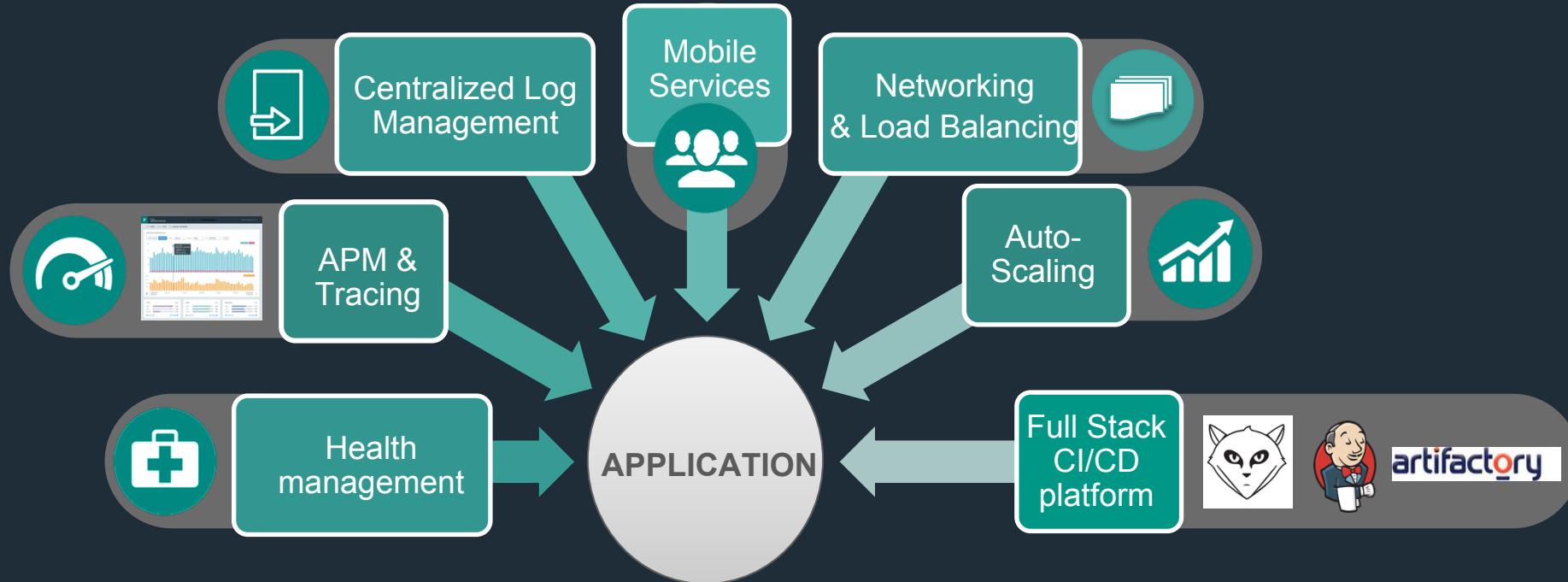


# Pivotal Cloud Foundry

## Architecture & Operations

April 2016

# Cloud Foundry: An Application-centric Platform



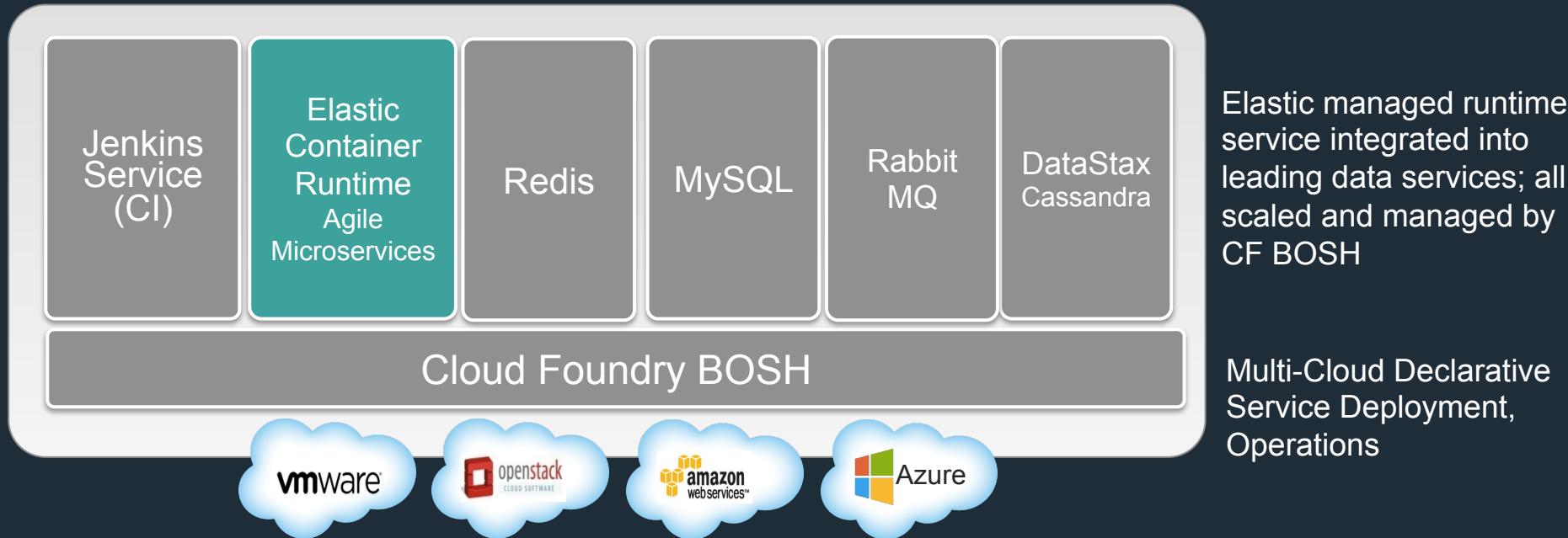
D E M O



CF

# The Whole Stack

# A Multi-Cloud 3<sup>rd</sup> Platform: Cloud Foundry



# Elastic Container Runtime

Technical Drill Down

# Pivotal Cloud Foundry

## Platform Access

Dynamic Router



## Elastic Container Runtime

Logging / Metrics

Application  
Access

Ops Manager

Service

Service

## BOSH - Automation Layer

VMware

openstack  
CLOUD SOFTWARE

amazon  
web services™

Azure

Pivotal™

# Pivotal Cloud Foundry Services

## Mobile



App Distribution



Push Notifications

## Security



Single Sign-on

## Data



Redis



DataStax Cassandra



MySQL



RabbitMQ



Data Flow



PivotalHD



Session state caching



GemFire

## CI/CD



Git Lab



Jenkins Enterprise

## Monitoring



App Dynamics



New Relic

## Cloud Native



Config Server



Service Directory



Circuit Breaker

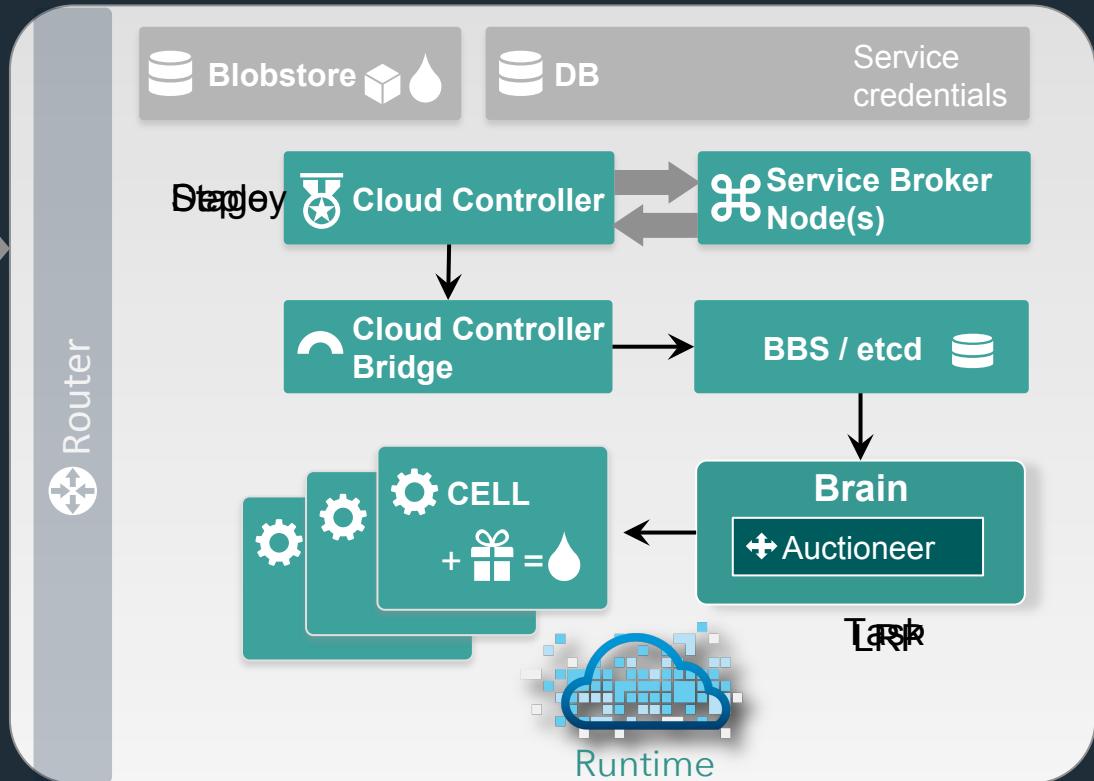
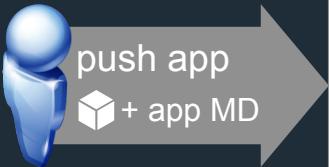
Powered by



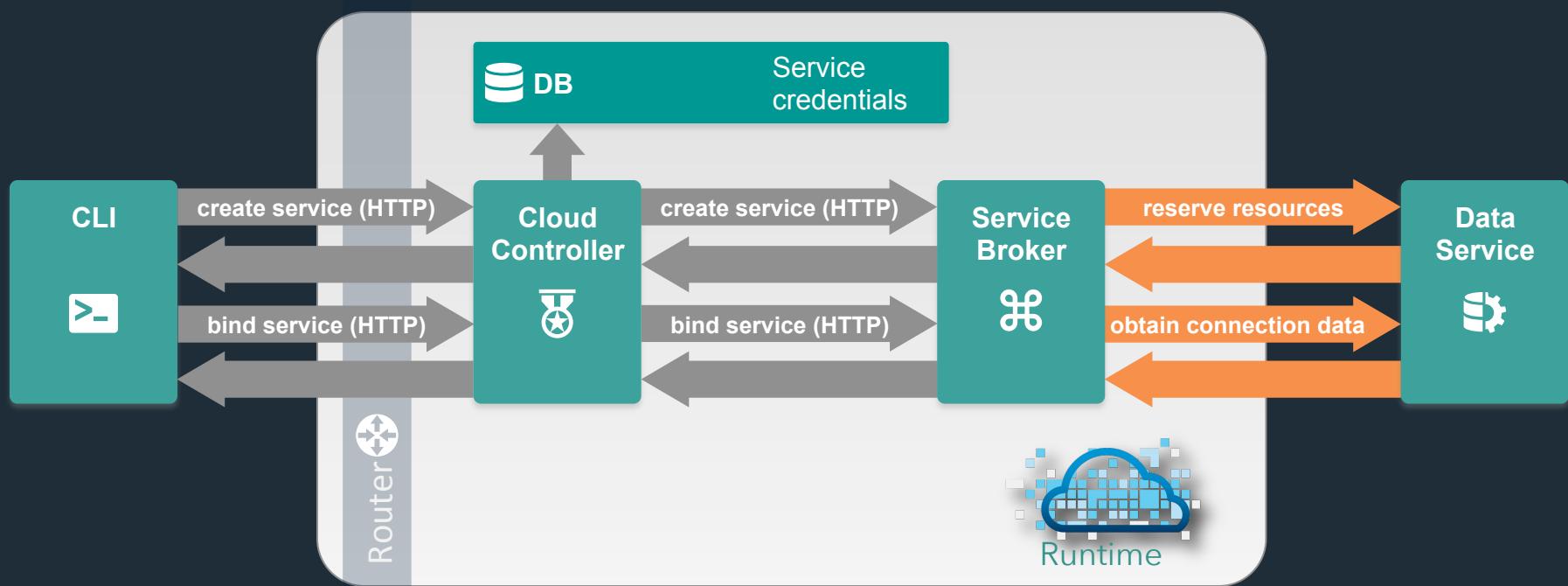
Pivotal™

# Overview: Pushing an Application

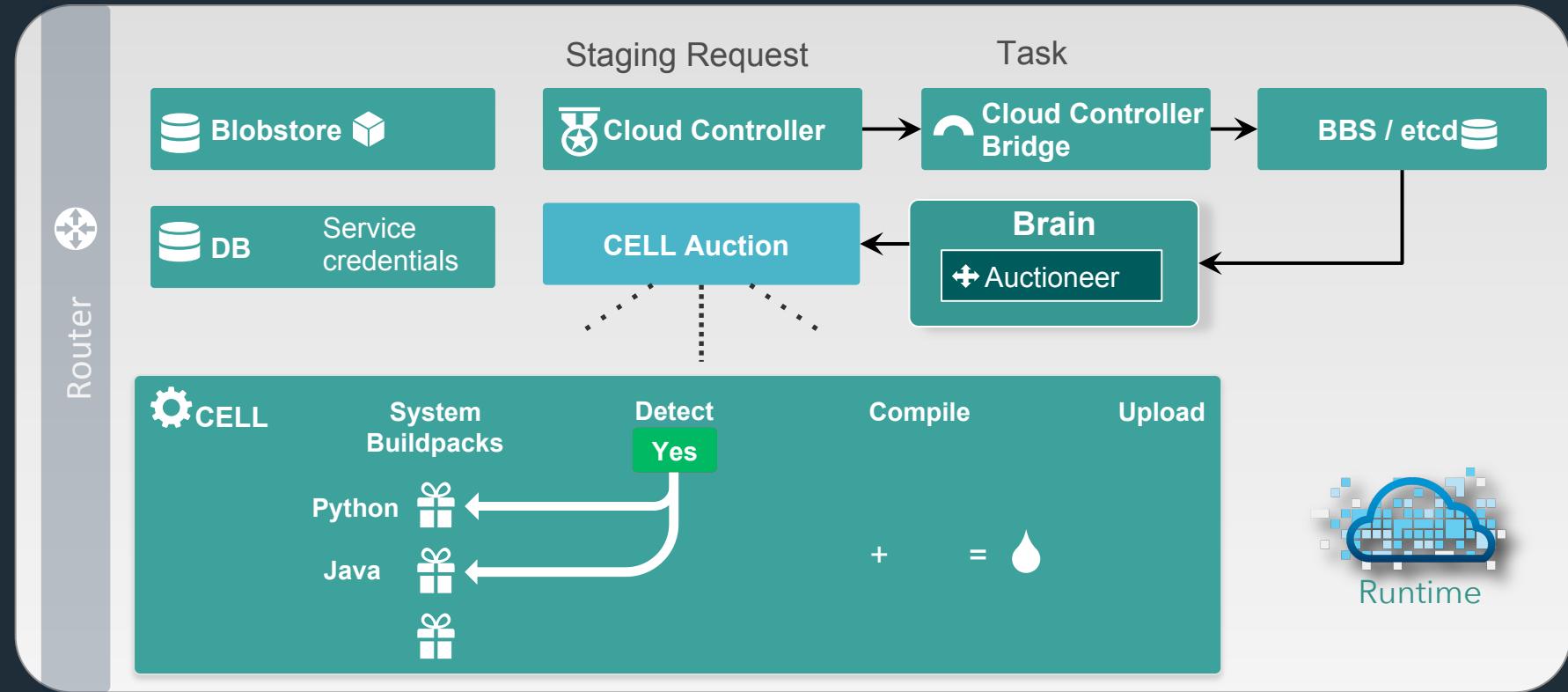
- ① Upload app bits and metadata
- ② Create and bind services
- ③ Stage application
- ④ Deploy application
- ⑤ Manage application health



# Creating and Binding a Service

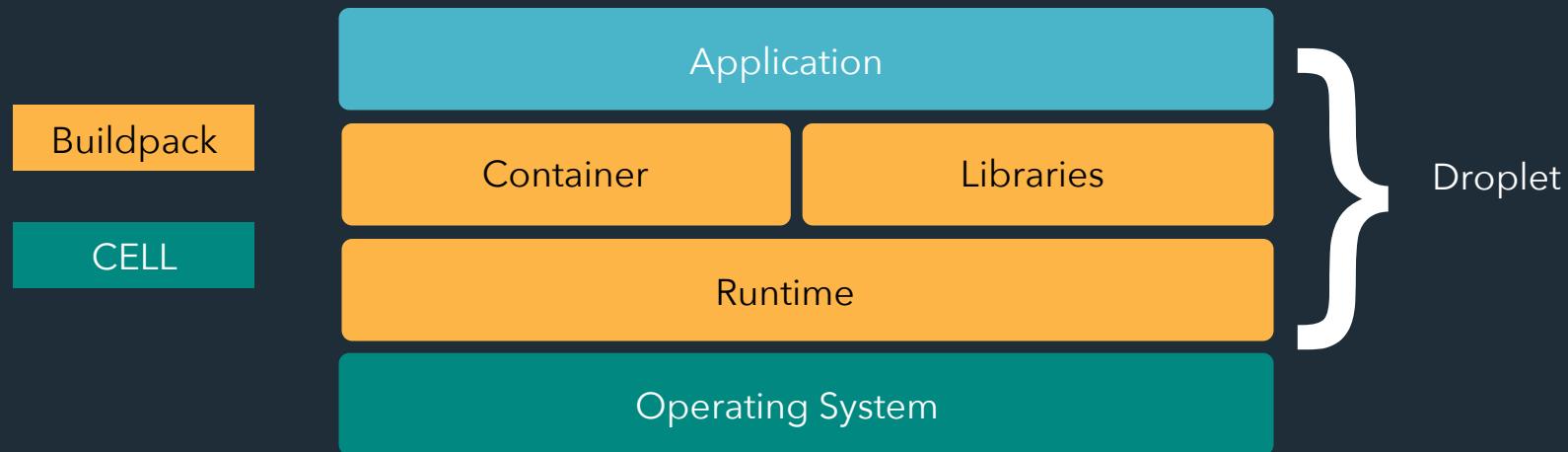


# Staging an Application



# Staging and Buildpacks

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



# Buildpack Flavors

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

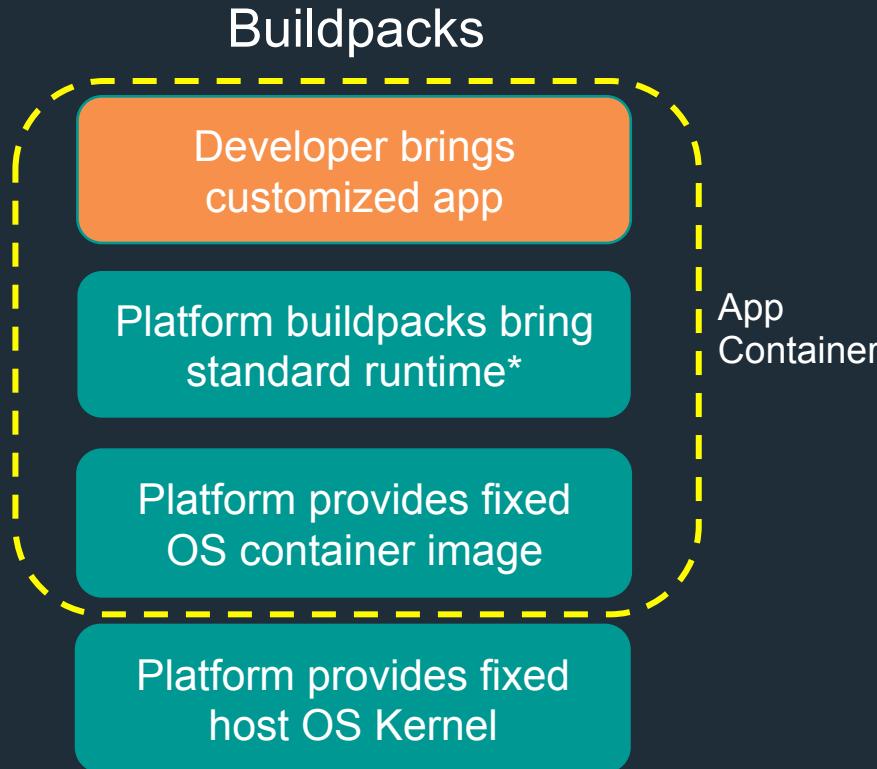
- Java
- Ruby
- Node.js
- Binary
- Go
- Python
- PHP
- Staticfile
- .NET
- TIBCO

## Java Buildpack

Numerous community buildpacks [[link](#)]

Write your own

# Customize the Container Experience



\* Devs may bring a custom buildpack

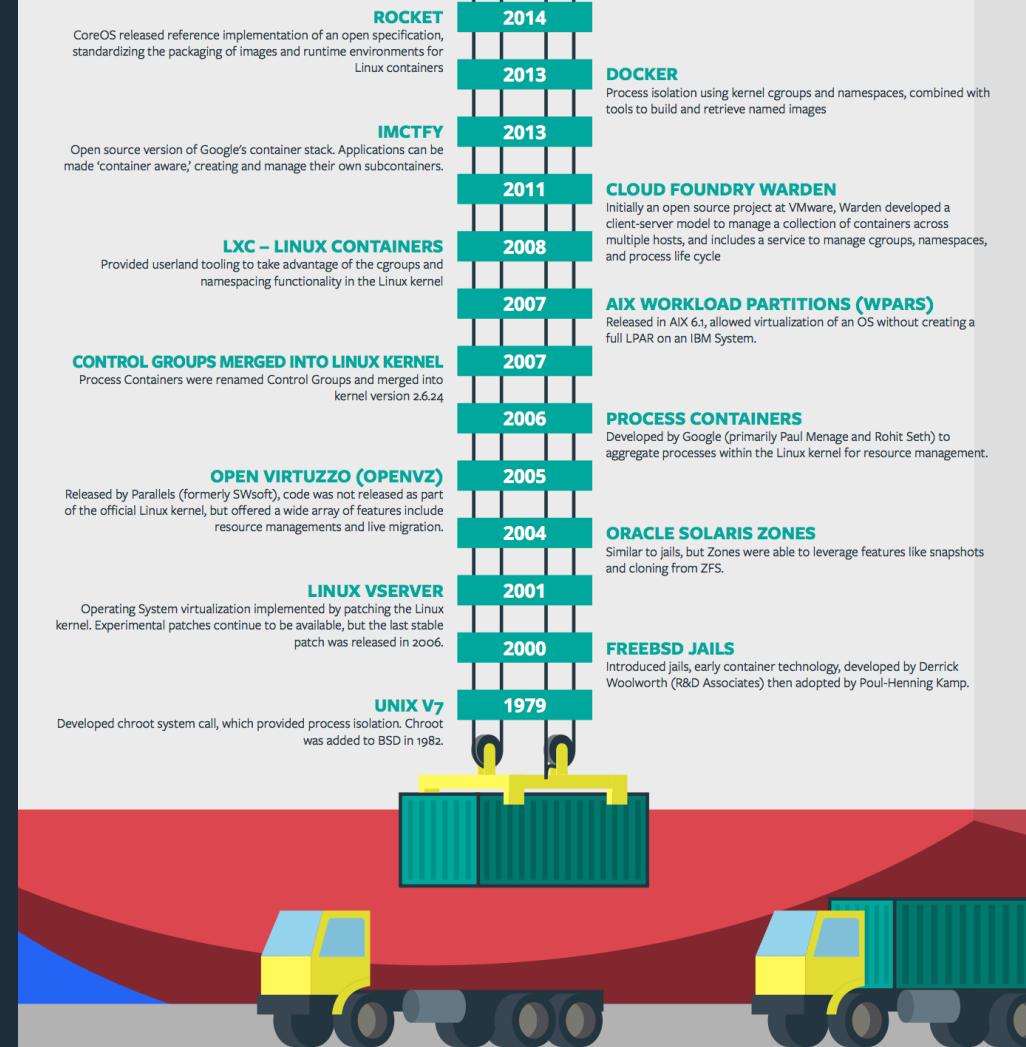


# DEMO

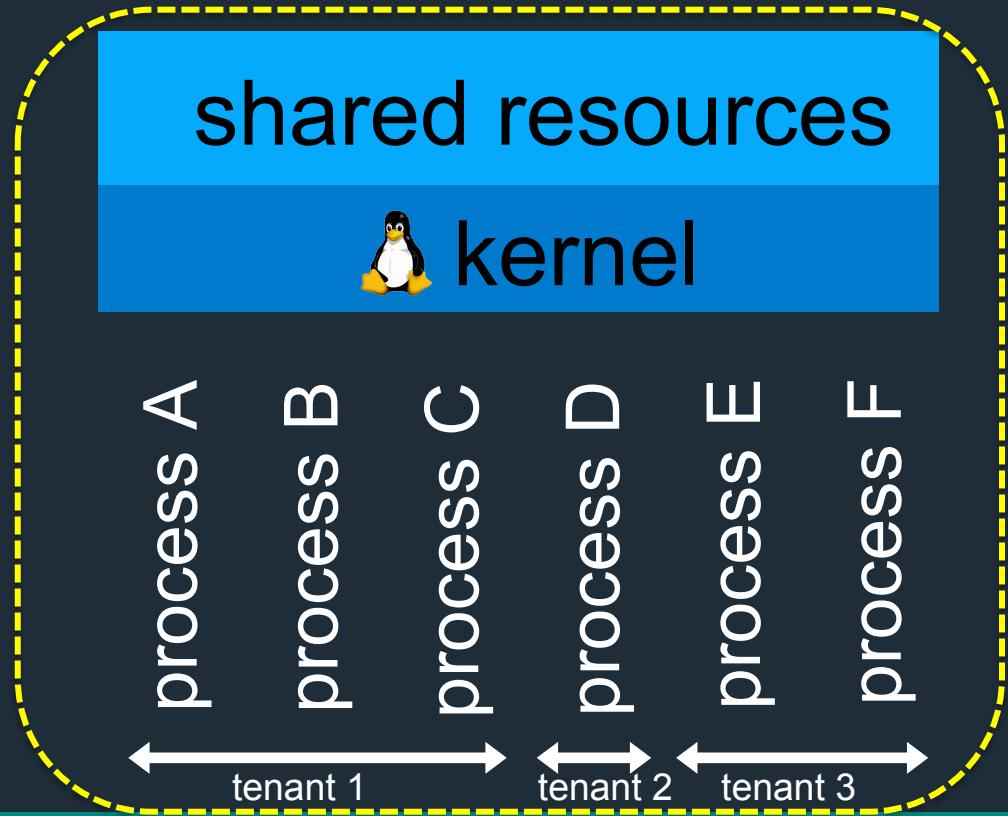
CF

# Containers - History

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



# Container Isolation

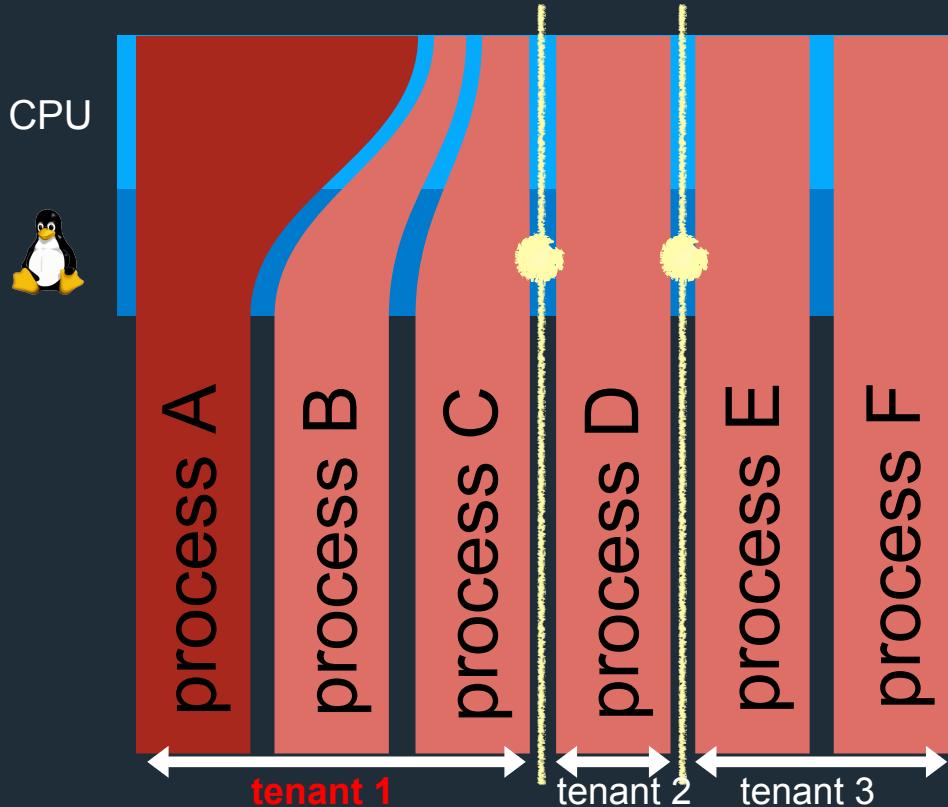


resource isolation

namespace isolation

Cell

# Container Isolation



resource isolation

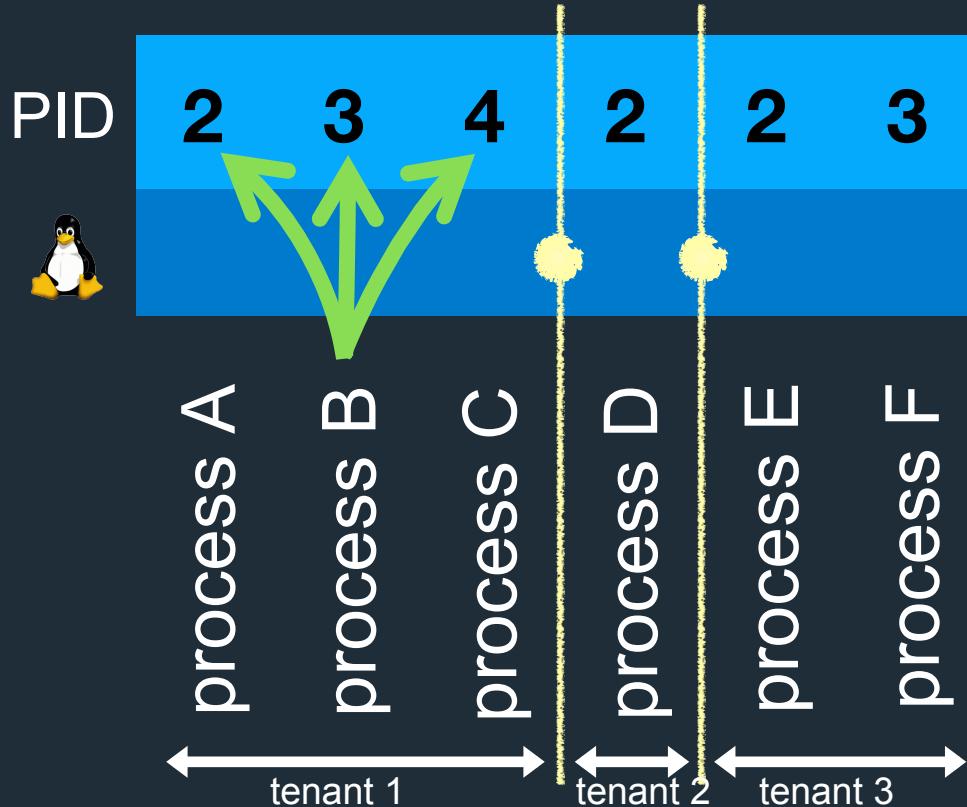
namespace isolation



cgroups

A Linux kernel feature that limits, accounts for, and isolates the resource usage of a collection of processes

# Container Isolation



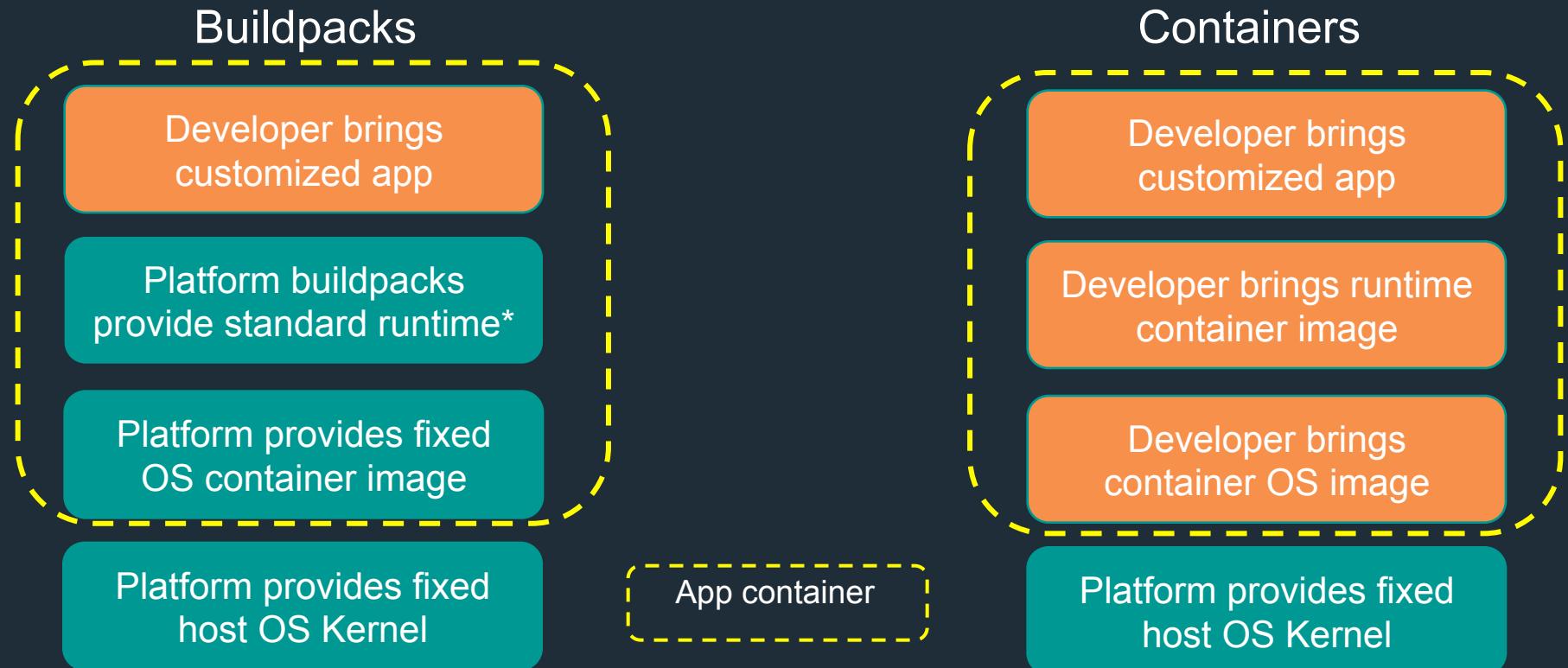
resource isolation

namespace isolation

## PID namespace

The PID namespace provides isolation for the allocation of process identifiers (PIDs), lists of processes and their details.

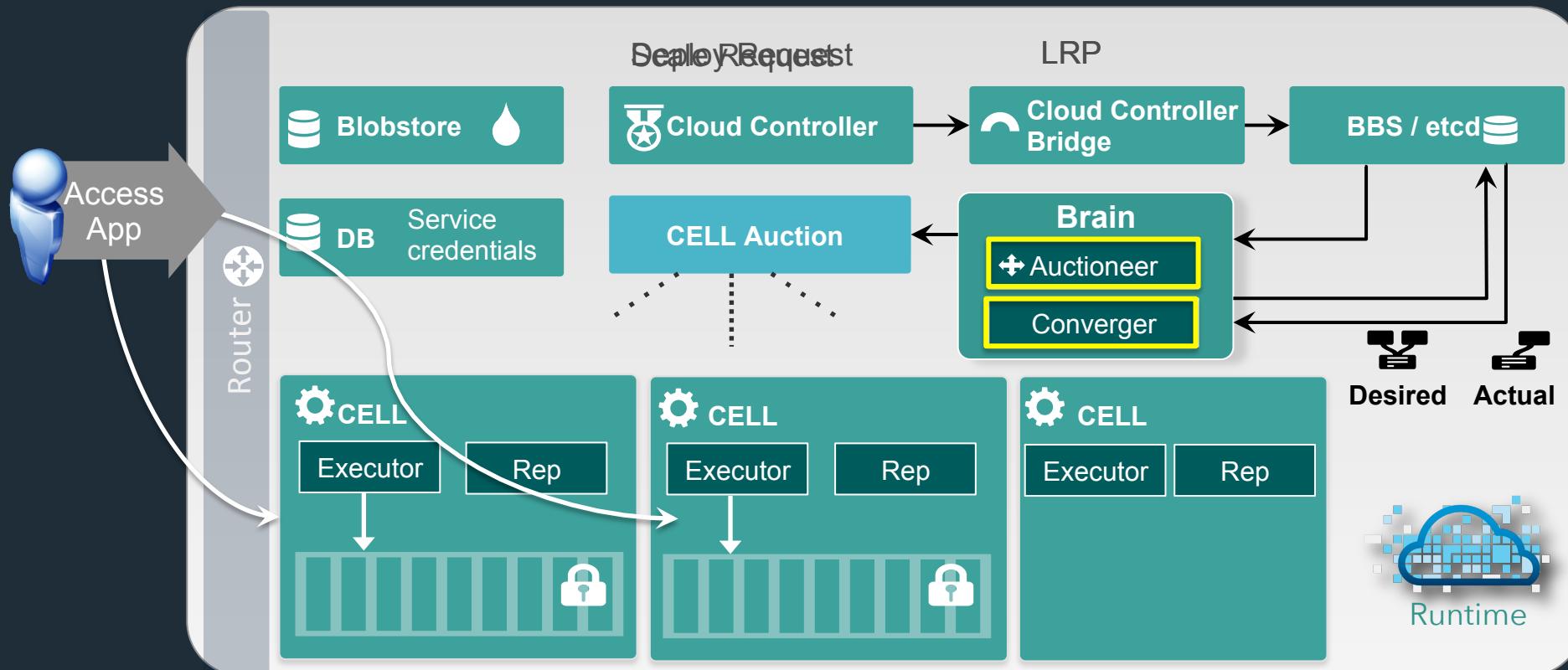
# Customize the Container Experience



\* Devs may bring a custom buildpack

Pivotal™

# Application Containers and Scaling



# Deploying Cloud Foundry

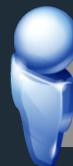
## Overview



# DEMO

CF

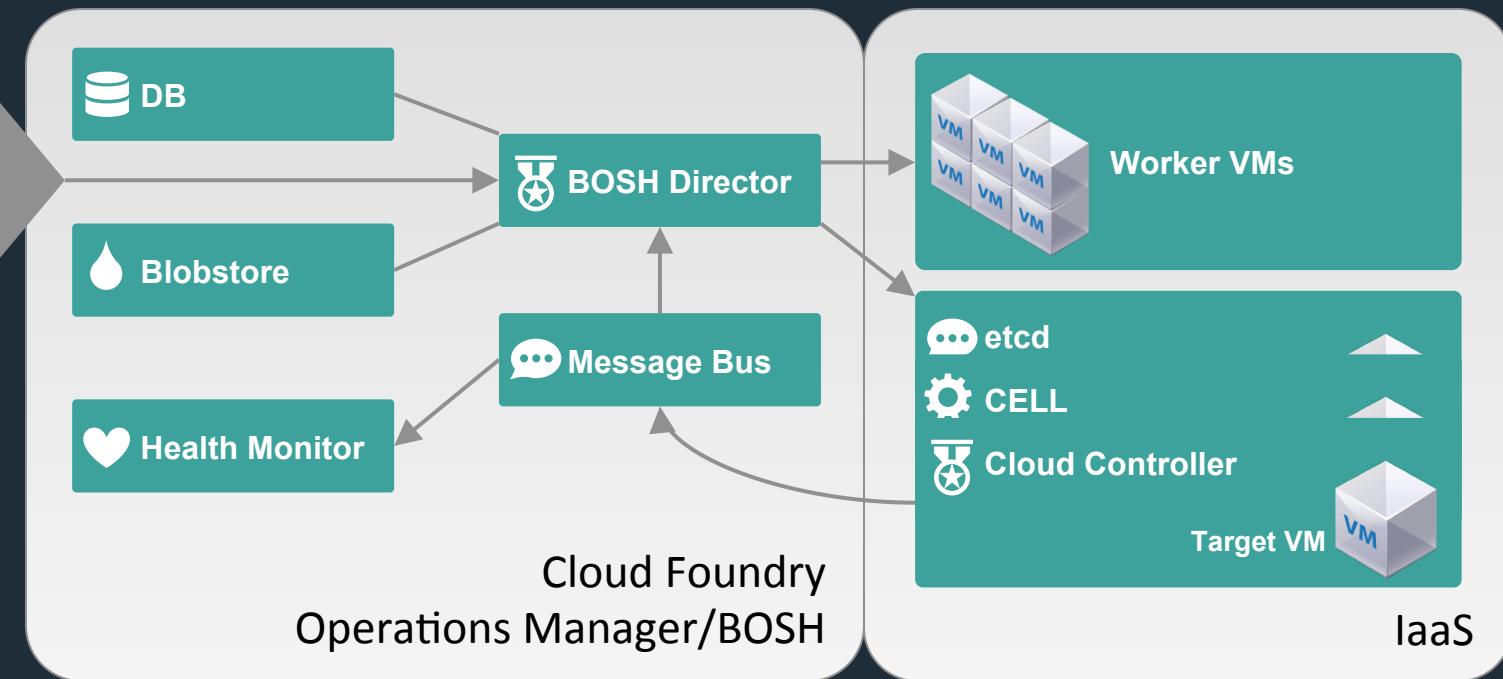
# Deploying the CF Runtime with Cloud Foundry BOSH



Deploy new  
CF Instance

## Deployment

- Packages
- Blobs
- Source
- Jobs
- Manifest



# Four Levels of HA

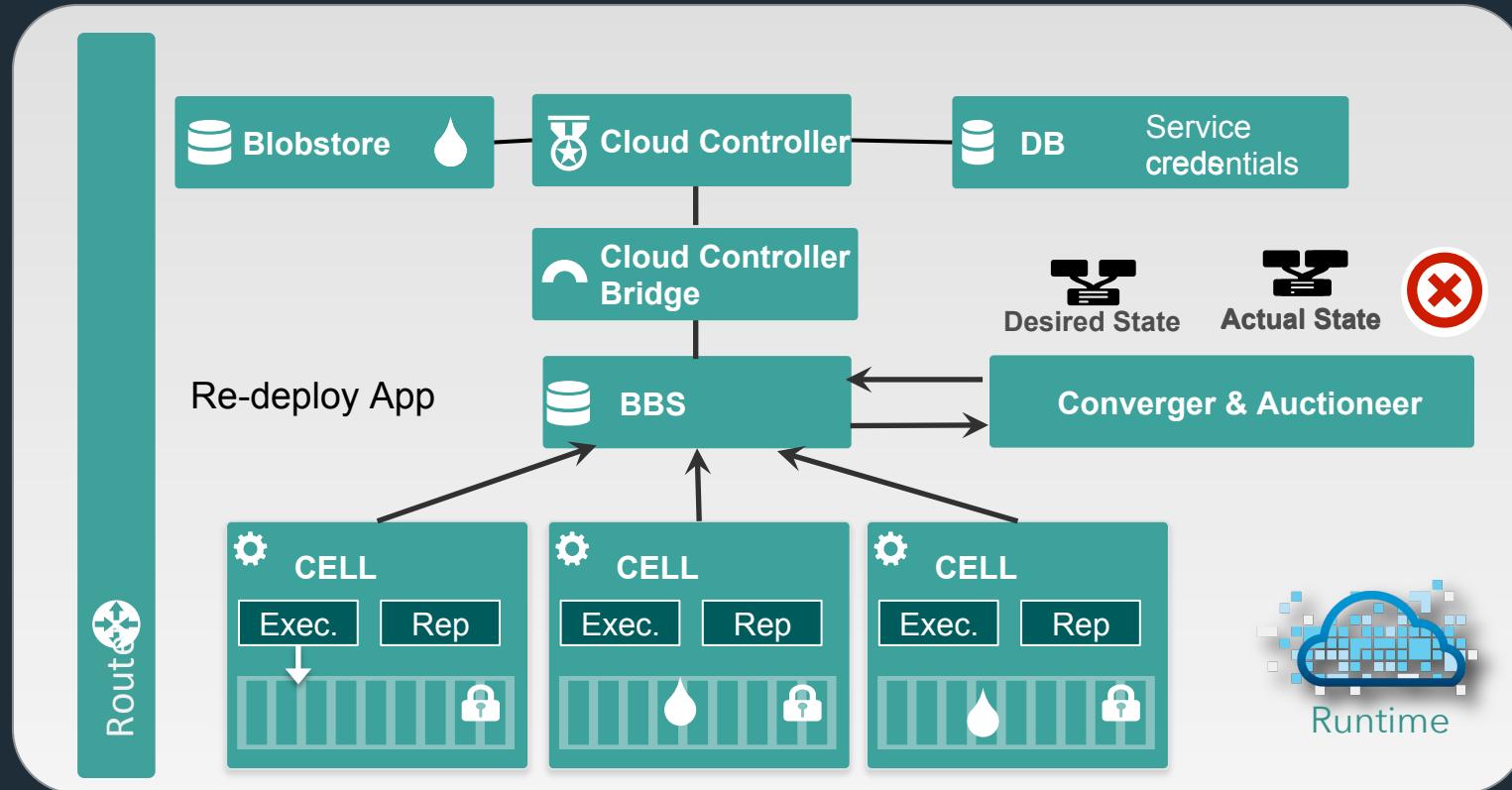
Built In!



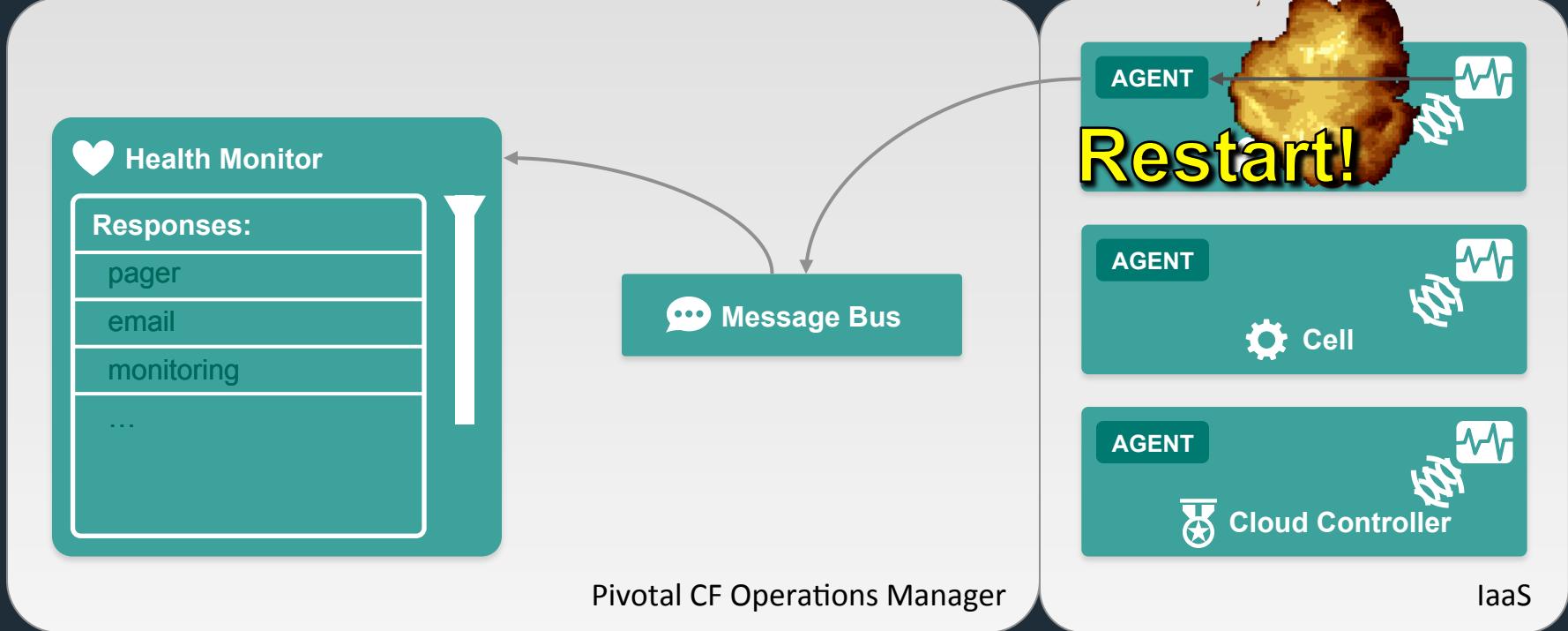
# DEMO

CF

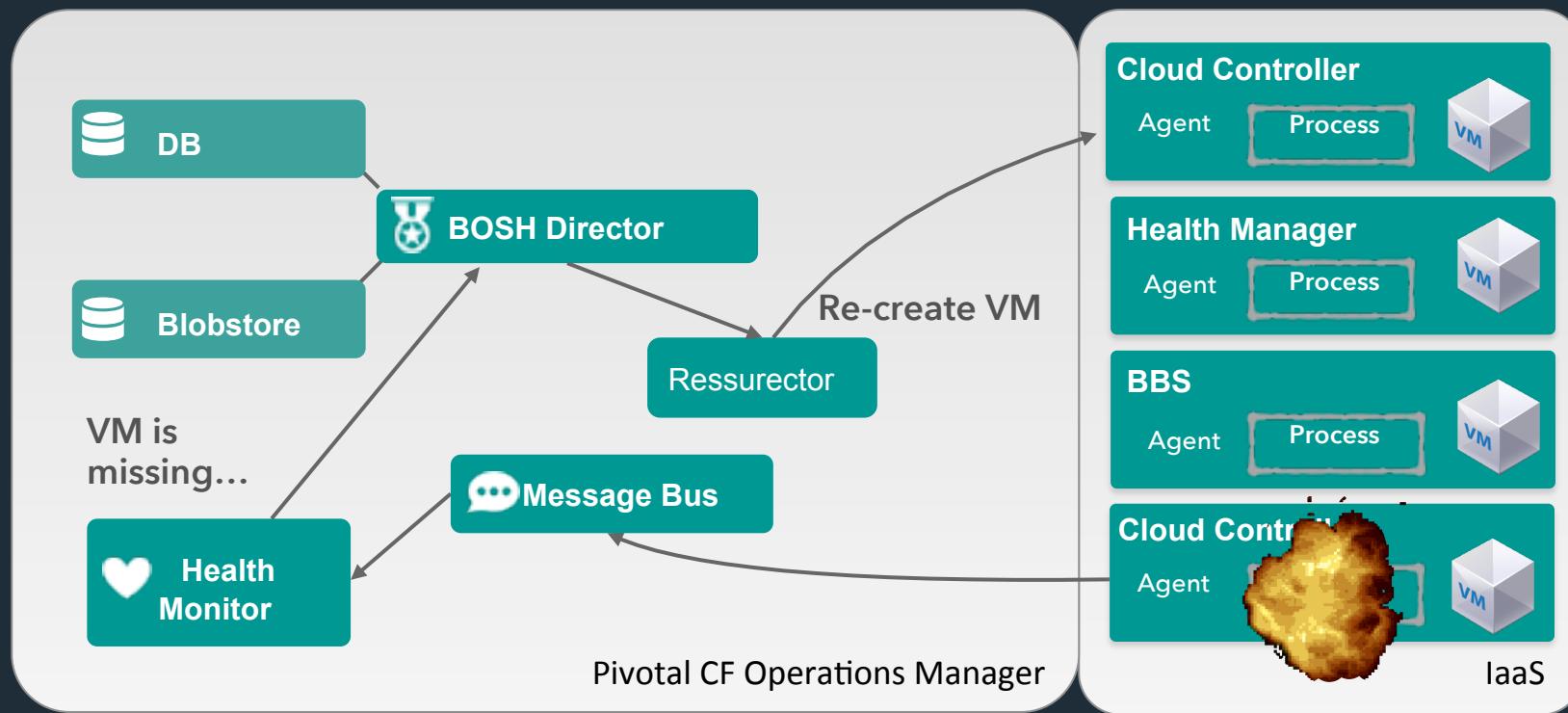
# Application Instance HA



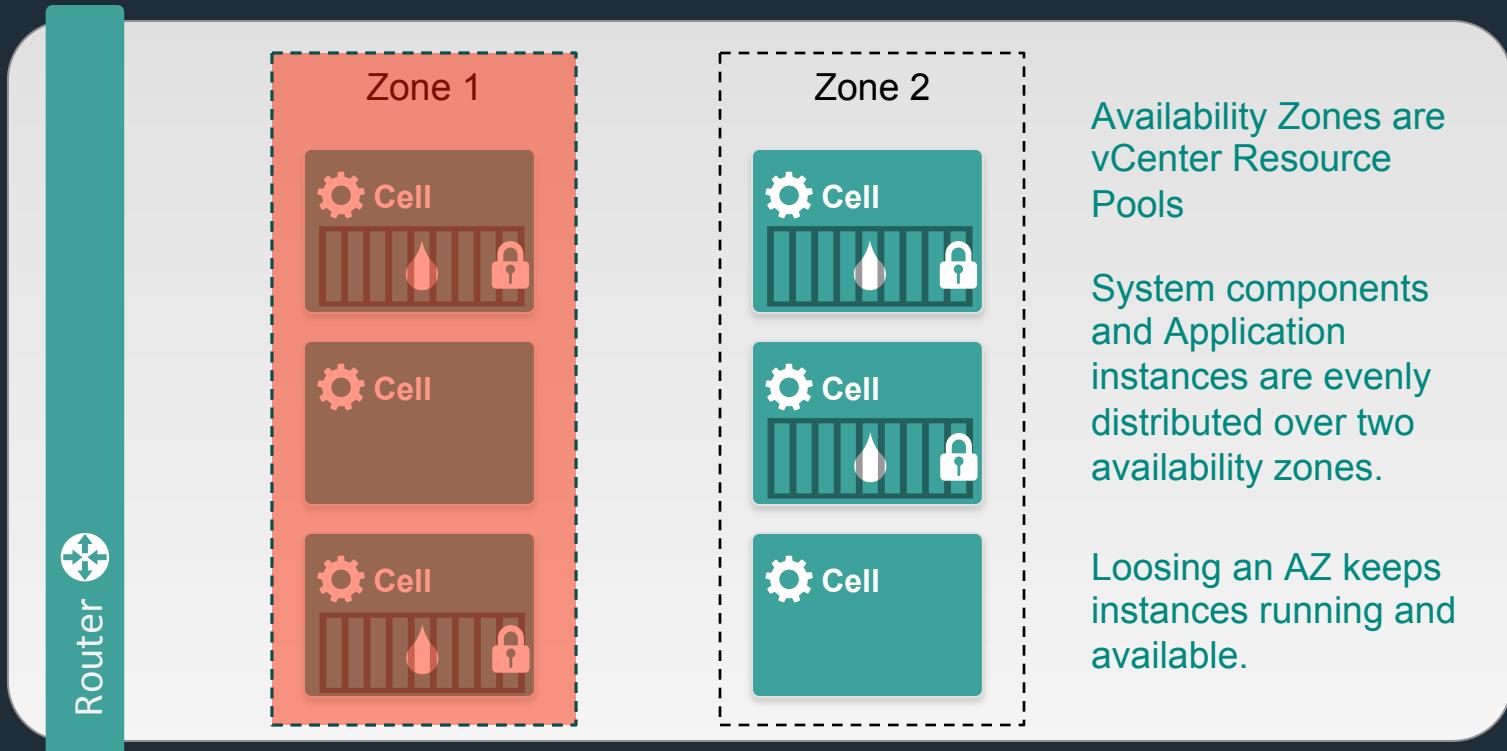
# Platform Process HA



# Platform Virtual Machine HA



# Availability Zone HA



# Platform Monitoring

## Overview



# DEMO

CF

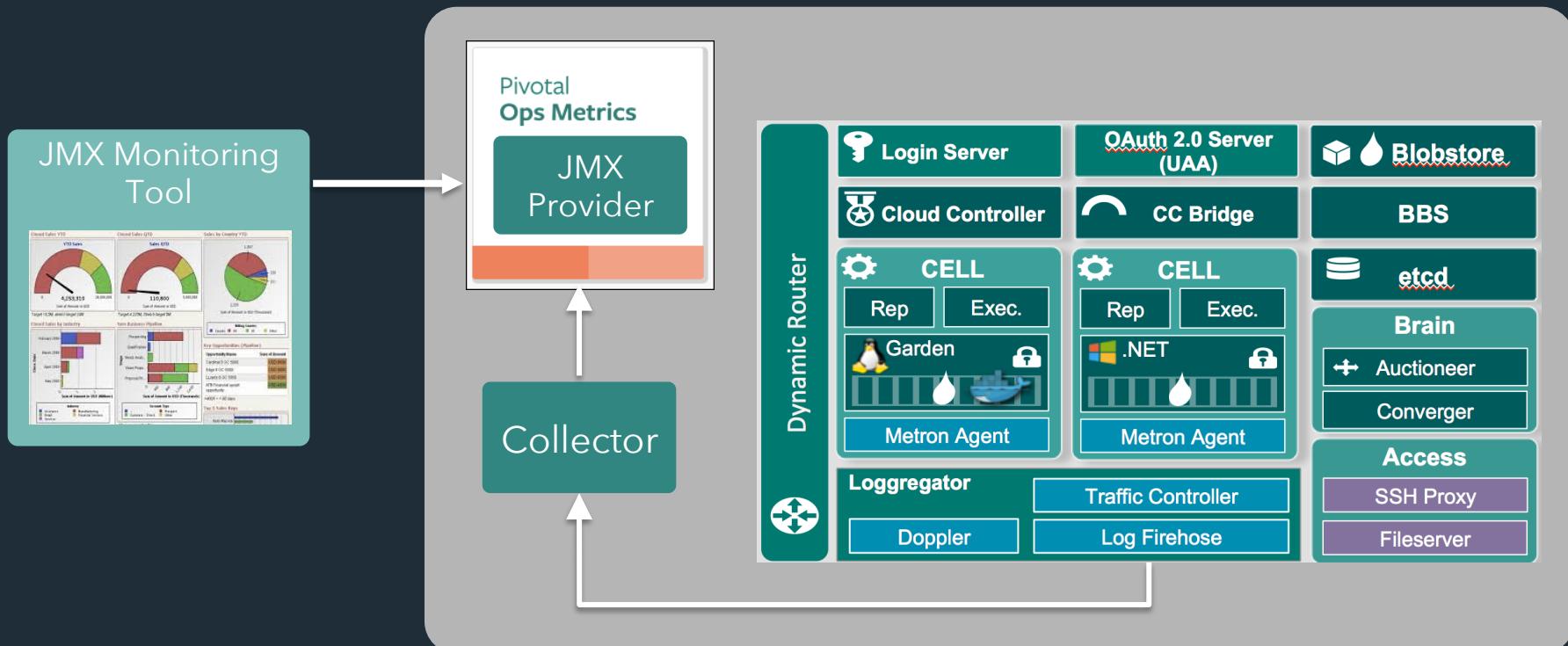
# Platform Monitoring

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

- Cells
- Cloud Controllers
- Routers
- Health Managers
- BBS, UAA, Login Server, ...



# Platform Monitoring



## MONITOR

## EXPLORE

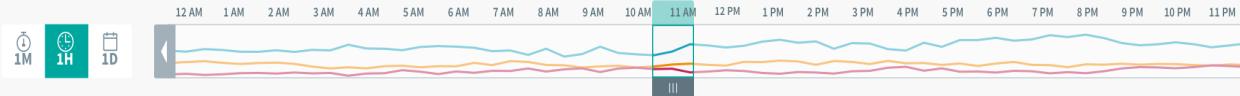
 Container Network Logs

## Lorem Ipsum Dolor App

ORG: Pivotal SPACE: Labs STATUS: Running

## TIMEFRAME

Container

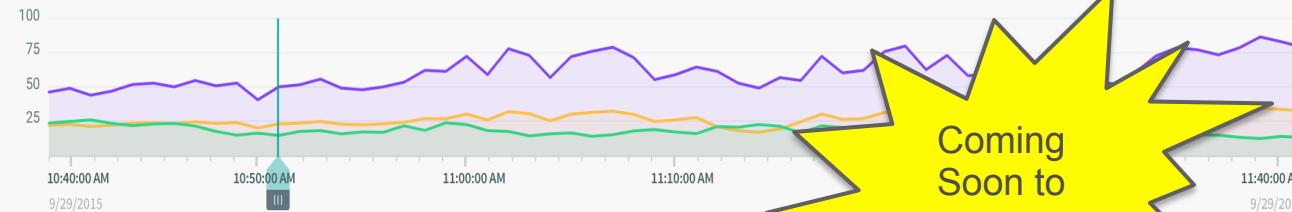


## METRICS

## Container

percent usage/minute

- CPU
- MEMORY
- DISK



## LOGS

Sources: Apps, Health

Apply

```
▶ Tue Nov 03 2015 10:50:49.123 GMT-0800 (PST) [RTR] OUT console.run.pivotal.io - [03/11/2015:18:28:49 +0000] "GET /api/apps/f136eb5a-9d8d-41be-9571-578d95feeb0a/env_vars HTTP/1.1" 200 0 4 "https://console.run.pivotal.io/organizations/99345203-f06a-4e1e-8f04-f05060d881d8/spaces/99345203-f06a-4e1e-8f04-f05060d881d8/spaces/51ff-2bd4-4b70-155c-04cc-65-aaef2dcf5e/announcements/fff9c6b2-040d-41bc-9571-578d95feeb0a#liveload" "Max(11.15.0.0) (Windows NT 6.3; Win32; Trident/7.0+ rv:11.0) like Gecko"
```

```
Tue Nov 03 2015 10:50:50.202 GMT-0800 (PST) [APP] OUT /home/vcap/app/vendor/bundle/ruby/2.0.0/gems/actionpack-4.1.11/lib/action_dispatch/journey/router.rb:73:in `block in call'
```

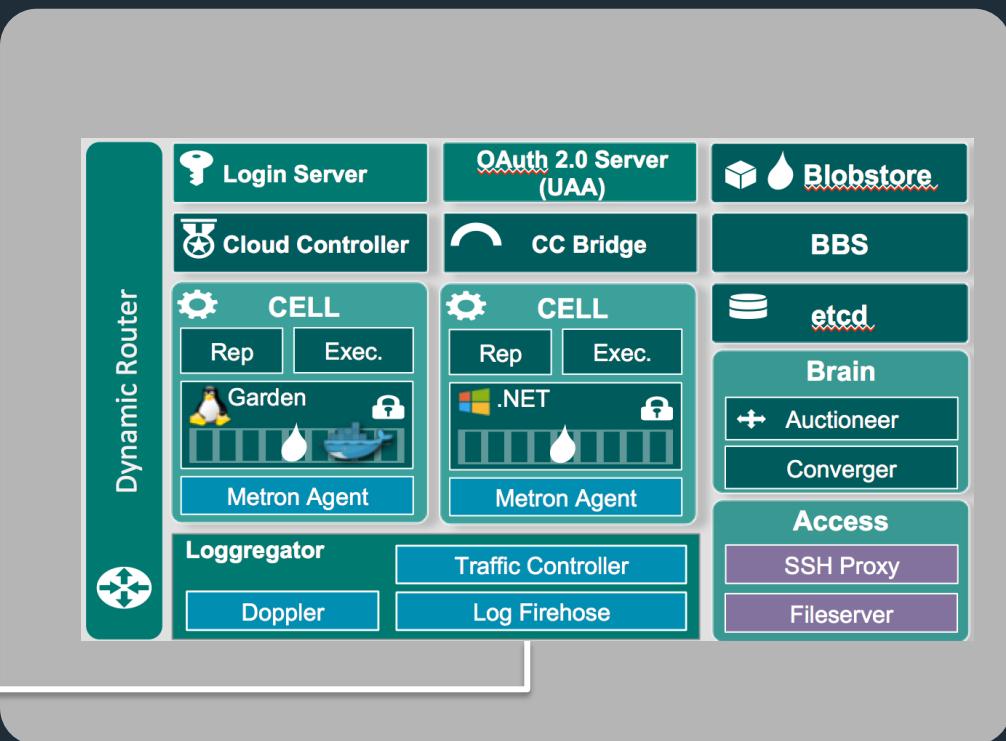
```
Tue Nov 03 2015 10:50:50.820 GMT-0800 (PST) [APP] ERROR /home/vcap/app/vendor/bundle/ruby/2.0.0/gems/newrelic_rpm-3.10.0.279/lib/new_relic/agent/instrumentation/middleware_tracing.rb:67:in `call'
```

```
Tue Nov 03 2015 10:50:51.151 GMT-0800 (PST) [HEALTH] OUT /home/vcap/app/vendor/bundle/ruby/2.0.0/gems/actionpack-4.1.11/lib/action_controller/metal/instrumentation.rb:32:in `block in process_action'
```

# Platform Monitoring

The screenshot shows the Splunk search interface. The search bar at the top contains the query "exception". Below the search bar, a results table displays 177 matching events from 08:41:08 to 08:41:24 on Wednesday, May 1, 2013. The table includes columns for index, offset, host, type, source, and \_source. A red box highlights the search bar and the results table. An arrow points from the "exception" search term in the search bar to the "exception" entry in the Pivotal Cloud Foundry diagram.

index	offset	host	type	source	_source
1	08:41:13 08:40:48	00000000 PolicyService 0 com.lim.wps.policy.services.PolicyService.getPolicyException	com.lim.wps.policy.services.PolicyService.getPolicyException	com.lim.wps.policy.services.PolicyService.getPolicyException	[REDACTED]
2	08:41:13 08:40:37	00000000 PolicyService 0 com.lim.wps.policy.services.PolicyService.getPolicyException	com.lim.wps.policy.services.PolicyService.getPolicyException	com.lim.wps.policy.services.PolicyService.getPolicyException	[REDACTED]
3	08:41:13 08:40:28	00000000 PolicyService 0 com.lim.wps.policy.services.PolicyService.getPolicyException	com.lim.wps.policy.services.PolicyService.getPolicyException	com.lim.wps.policy.services.PolicyService.getPolicyException	[REDACTED]
4	08:41:13 08:40:14	00000000 PolicyService 0 com.lim.wps.policy.services.PolicyService.getPolicyException	com.lim.wps.policy.services.PolicyService.getPolicyException	com.lim.wps.policy.services.PolicyService.getPolicyException	[REDACTED]



# Multi-tenancy

Overview

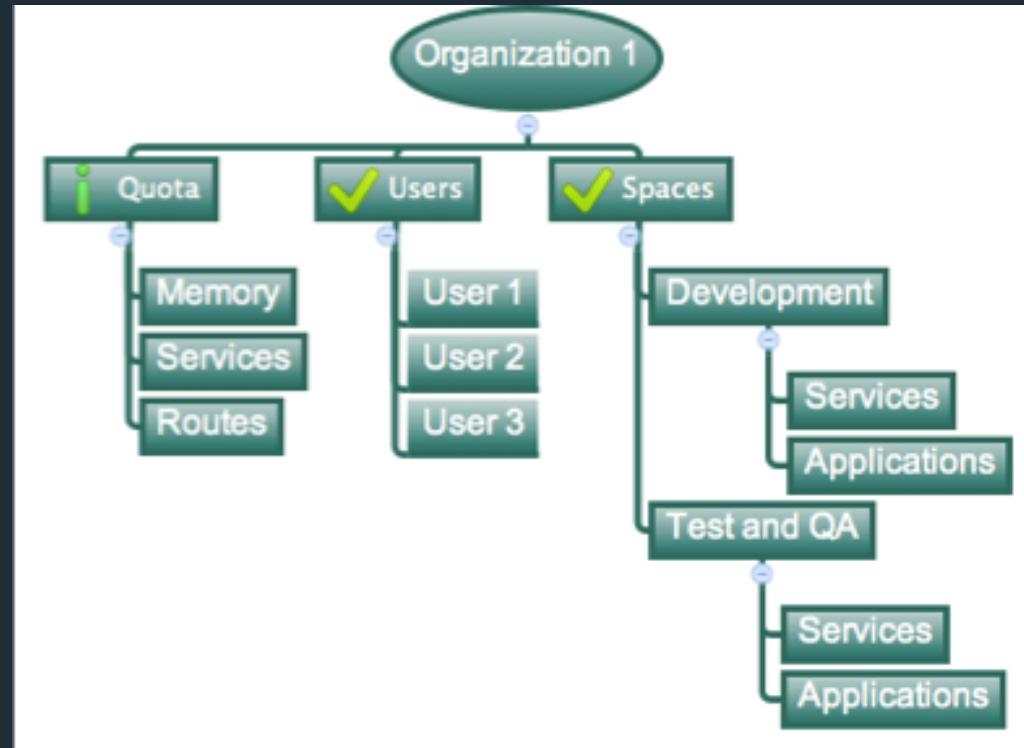
# Organizations

Logical division within a Pivotal CF Installation / Foundation.

Each organization has its own users and assigned quota

User permissions / roles are specified per space within an organization

Sub-divided into Spaces

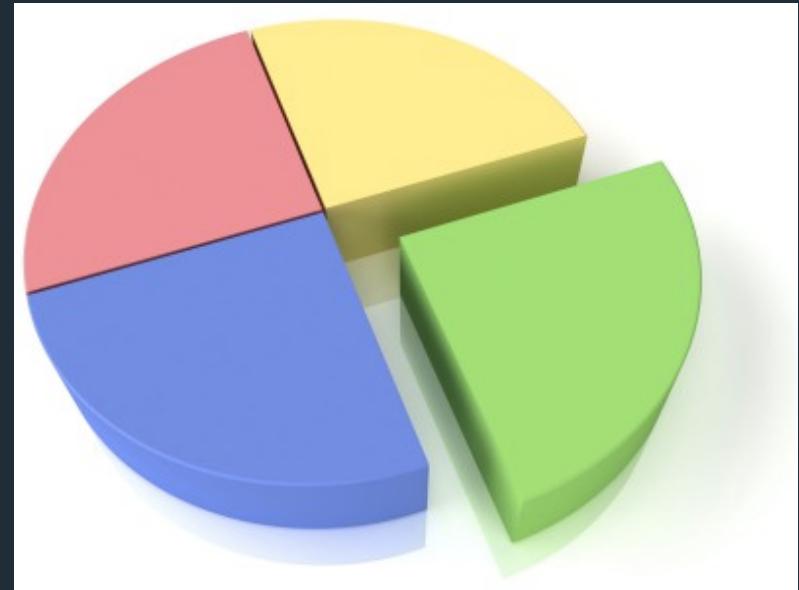


# Quotas & Plans

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

Spaces can be assigned quotas





# DEMO

CF

# Capabilities of Pivotal Cloud Foundry

Automatic App Server & OS Configuration with Buildpacks (“just push your app”)



Application Containerization & Cluster Scheduling



Application Network Security Groups



Application to Services Binding and Access



App Health, Load Balancing, Rapid Scaling, Availability Zones



Policy, Identity and Roles Management



Native & Extended Data, Mobile and Platform Services



IaaS Provisioning, Scaling & Configuration

Logging as a service, Application metrics & performance, Metric based scaling



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

vmware

openstack  
CLOUD SOFTWARE

amazon  
web services™

Azure

Pivotal™

# Pivotal

BUILT FOR THE SPEED OF BUSINESS