

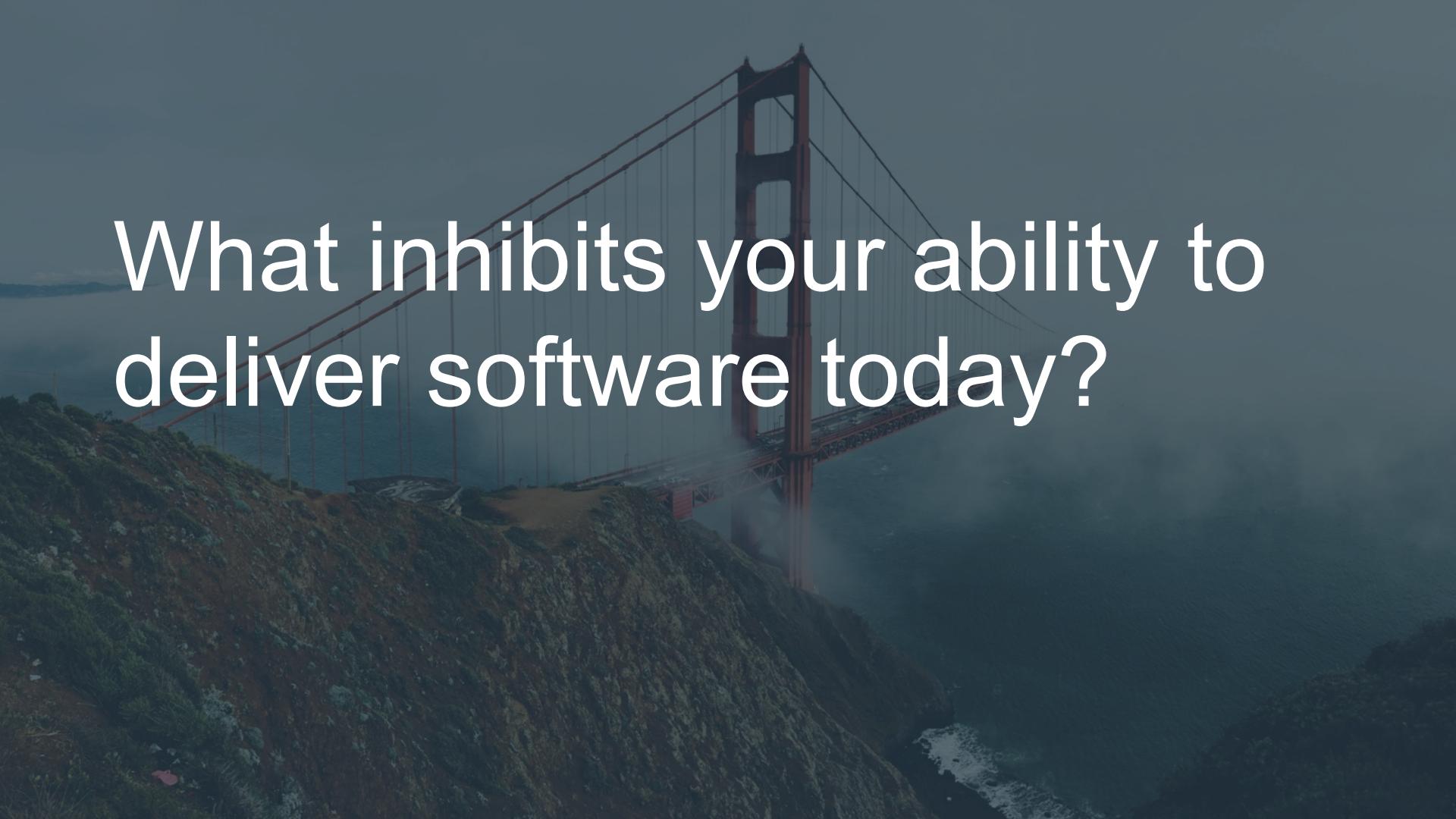


Pivotal
Cloud Foundry®

Cloud Native Workshop

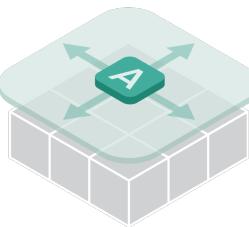
Brian Gregory, Steve Womack, Yo Mama

Pivotal®

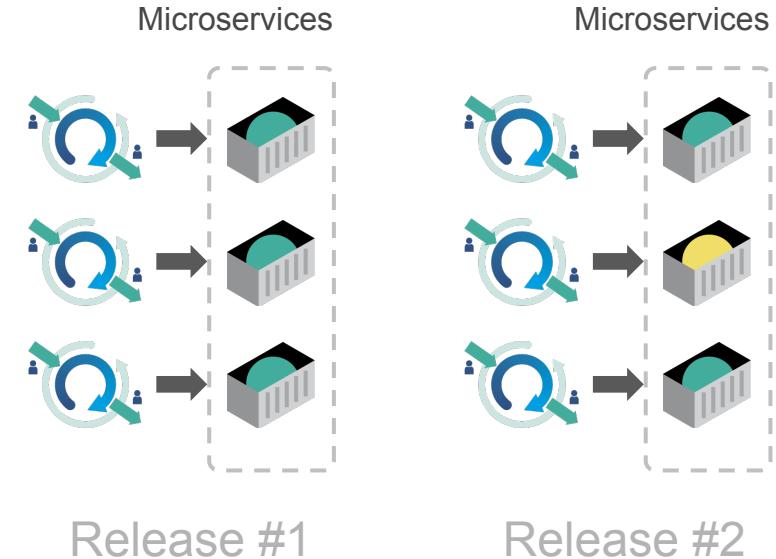
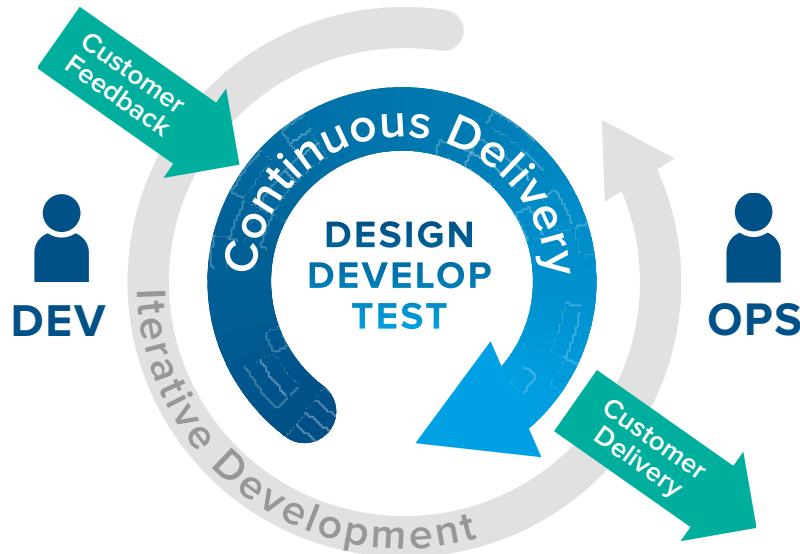
A dark, atmospheric photograph of the Golden Gate Bridge in San Francisco, California. The bridge's towers and cables are visible against a hazy sky. In the foreground, a steep, rocky hillside covered in greenery slopes down towards the ocean. The water is dark and choppy. The overall mood is somber and contemplative.

What inhibits your ability to
deliver software today?

Changing Model for Application Delivery

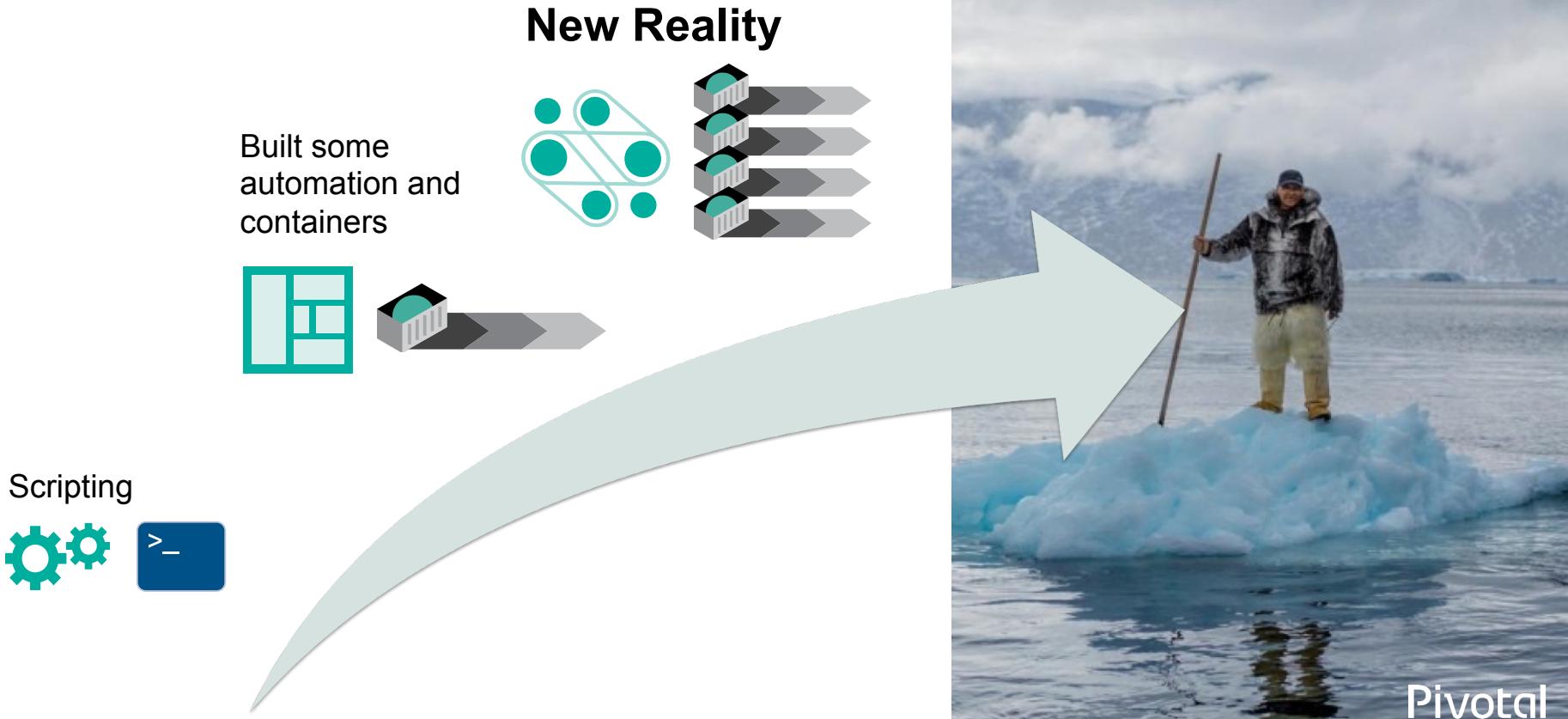
Architecture	Development	Abstraction Layer	Deployment	“Day 2” Ops
Monolithic App	Linear / Sequential	App Server on Machine	Sparingly at designated times	Many tools, ad hoc automation
				
Microservices / Composite app	Short cycles, test driven, iterative	App on “disposable” infrastructure	Ready for prod at any time	Manage services, not servers

Rise of the Cloud Natives



An idea in the morning can ship by evening

Typical Platform Evolution



Jez Humble, Joanne Molesky & Barry O'Reilly

LEAN ENTERPRISE

How High Performance
Organizations
Innovate at Scale

O'REILLY®

“High performing organizations
do not trade off agility
for safety.

In fact, high performance is
characterized by consistent
improvements in levels
of both agility and
safety.”



DEVELOPMENT

Multiple Languages



...

Microservices Support



Services Marketplace



OPERATIONS

App Deployment & Management



CI/CD Tools,
ID, Security

Availability



Health,
Metrics,
Patching

Visibility &
Administration



Apps &
Platform
Dashboards

Operating System



Container Orchestration



Cloud API



Google

AWS

Azure

VMW

Openstack



DEVELOPMENT

Multiple Languages



...

Microservices Support



Services Marketplace



OPERATIONS

App Deployment & Management



CI/CD Tools,
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VALUE LINE

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DEVELOPMENT

Multiple Languages



...

Microservices Support



Services Marketplace



User Provided



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App Deployment & Management



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Apps &
Platform
Dashboards

Operating System



Container Orchestration



Cloud API



Google

AWS

Azure

VMW

Openstack

Developer Self Service Provisioning

Flexibility with control



```
>cf
```

Push App



http://



more...

Push your app and it just works...no “snowflakes”, no waiting.

Complete Microservices Framework



Spring Boot



**Spring Cloud
Services**

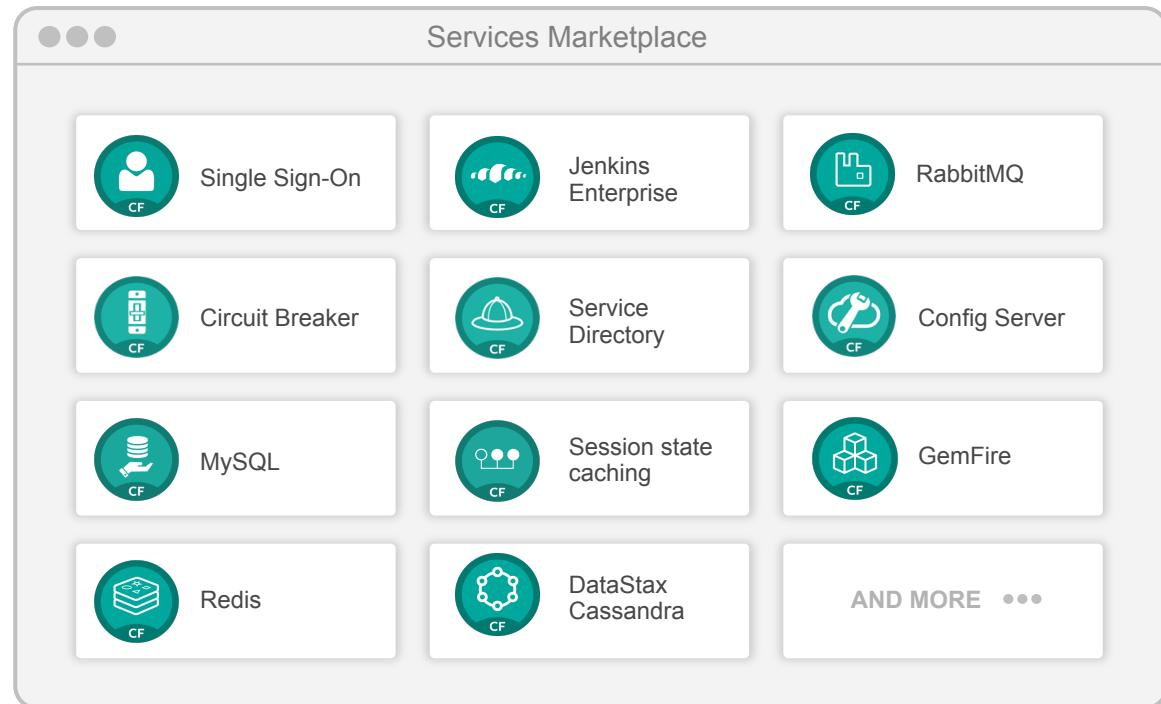


Pivotal **Cloud Foundry**®

Pivotal

Services prepackaged for simple consumption

- Easy accessibility through Marketplace
- Instant Provisioning and full lifecycle managed
- Bind to apps through easy to use interface
- Common access control and audit trails across services





DEVELOPMENT

Multiple Languages



...

Microservices Support



Services Marketplace



OPERATIONS

App Deployment & Management



CI/CD Tools,
ID, Security

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Health,
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Operating System



Container Orchestration



Cloud API



Google

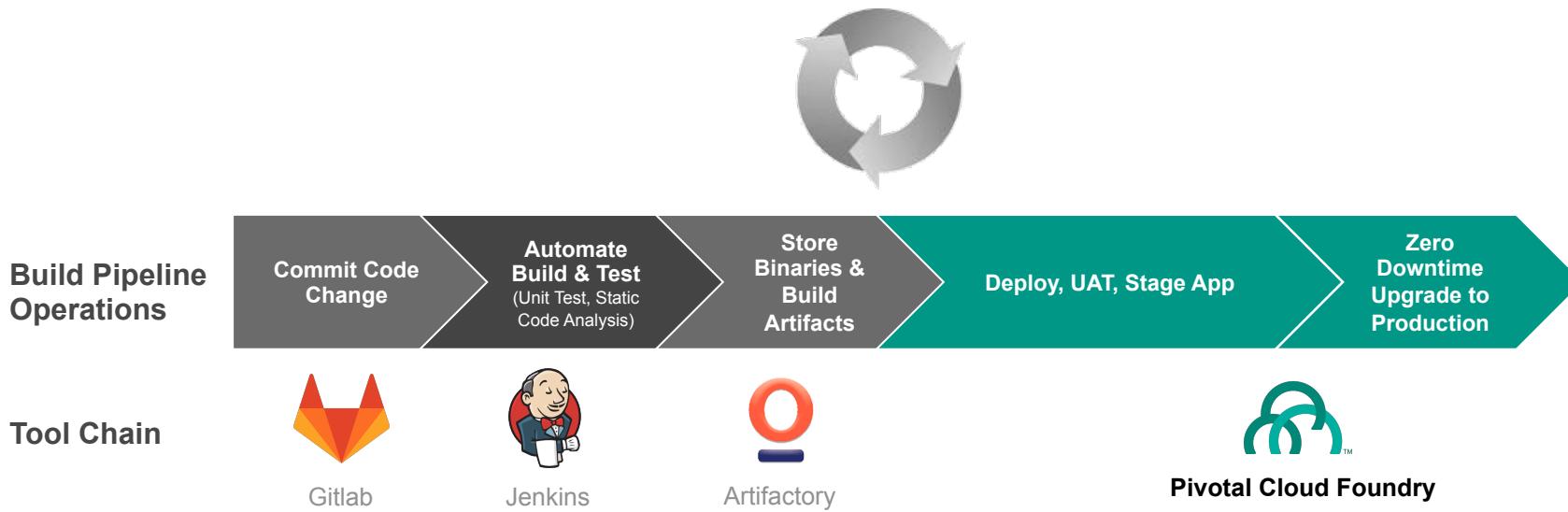
AWS

Azure

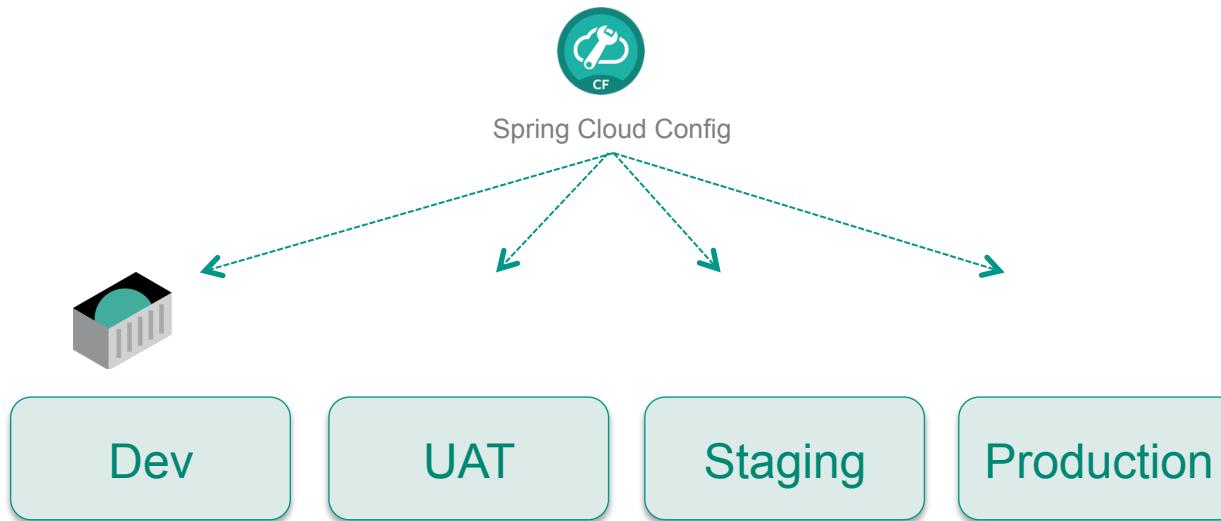
VMW

Openstack

Comprehensive application lifecycle management

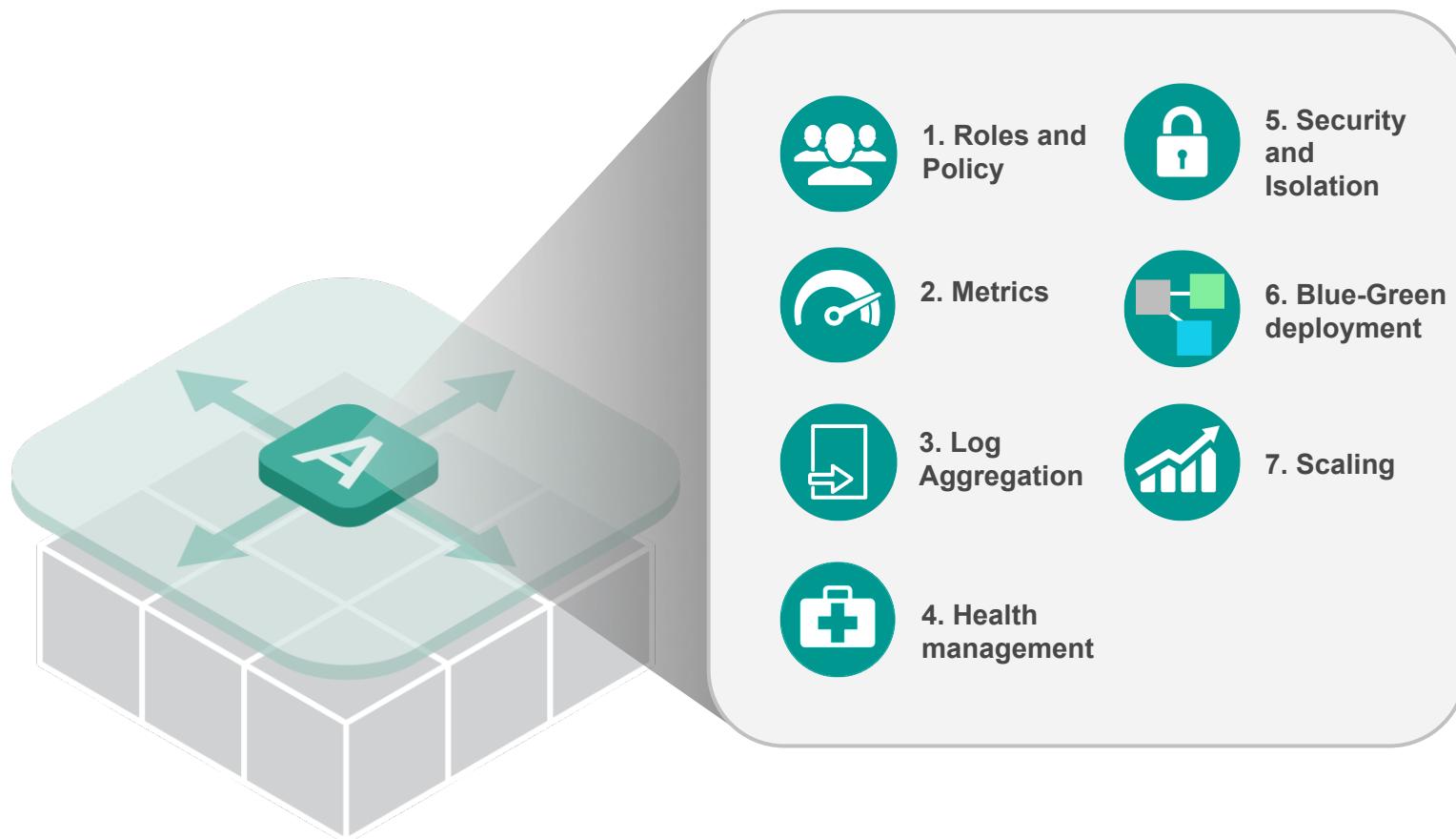


Accelerating the velocity of each iteration



- Dev, Test, Staging and Production on the same platform
- Bit for bit consistent environments
- Logical groupings of user access controls

Everything to Deploy and Manage the App



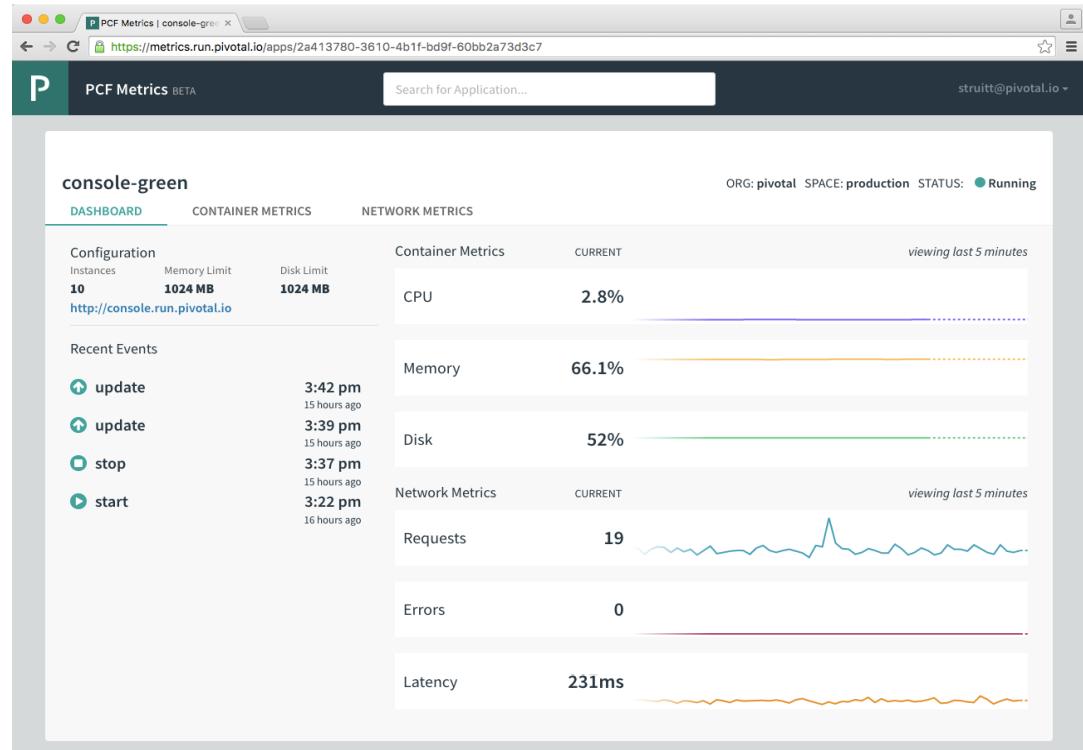
Improve Enterprise Security Culture

- Makes it easier to do the right things
- Prevents vulnerabilities due to
 - Leaked/misused credentials
 - Misconfigured/Unpatched software
 - Slow & rigid processes



Fast-feedback Monitoring Capabilities

- Integrated, near real-time view of key app, services & platform metrics
- Devs & Ops have shared understanding of system health / availability
- No embedded agent
- Simply select an app to watch streaming data



Comprehensive Visibility & Administration

PCF Ops Manager

The dashboard displays the following upgrade options:

- Ops Manager Director (v1.6.8.0)
- Pivotal Elastic Runtime (v1.6.13-build.1)
- Spring Cloud Services (v1.0.4)
- RabbitMQ (v1.5.4)
- MySQL for Pivotal Cloud Foundry (v1.7.2)

Available Products

- Ops Manager Director (No upgrades available)
- Pivotal Elastic Runtime (No upgrades available)
- RabbitMQ (No upgrades available)
- Spring Cloud Services (No upgrades available)
- MySQL for Pivotal Cloud Foundry (No upgrades available)

Import a Product

Download PCF compatible products at [Pivotal Network](#)

Operations Manager

Pivotal Apps Manager

The dashboard shows the following organization and space information:

- ORG**: system
- SPACES**:
 - app-usage-service
 - apps-manager
 - autoscaling
 - Marketplace
- SYSTEM**:
 - Accounting Report

system

QUOTA: 5 GB of 100 GB Limit

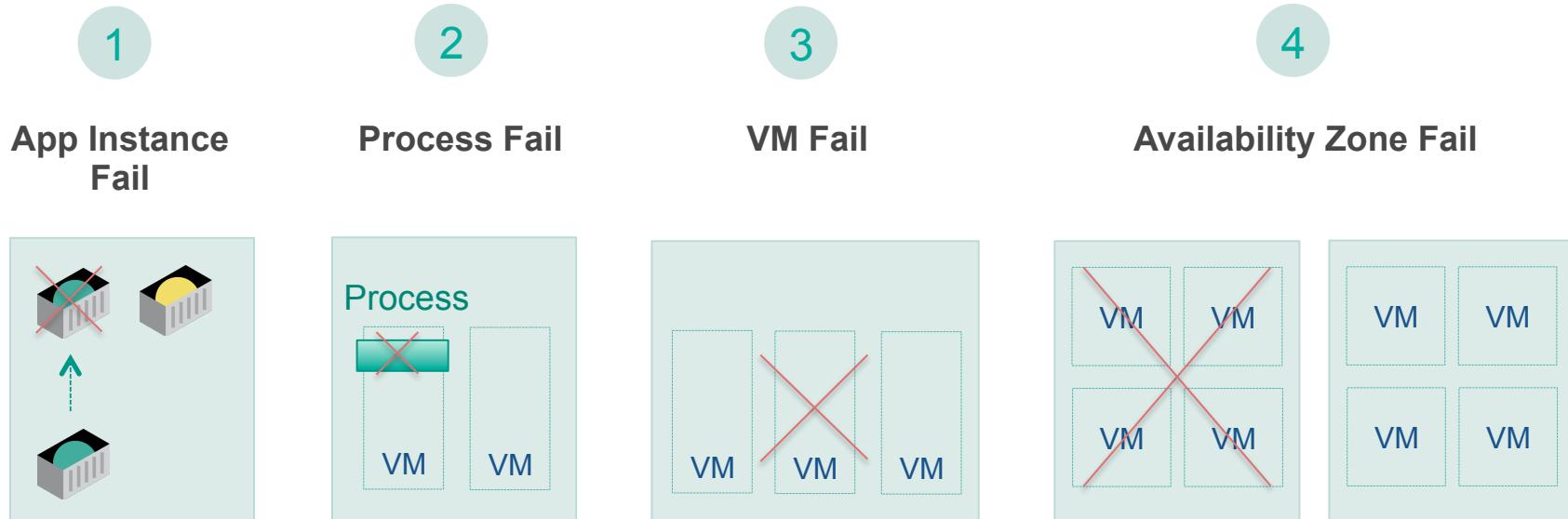
3 Spaces | 1 Domain | 3 Members

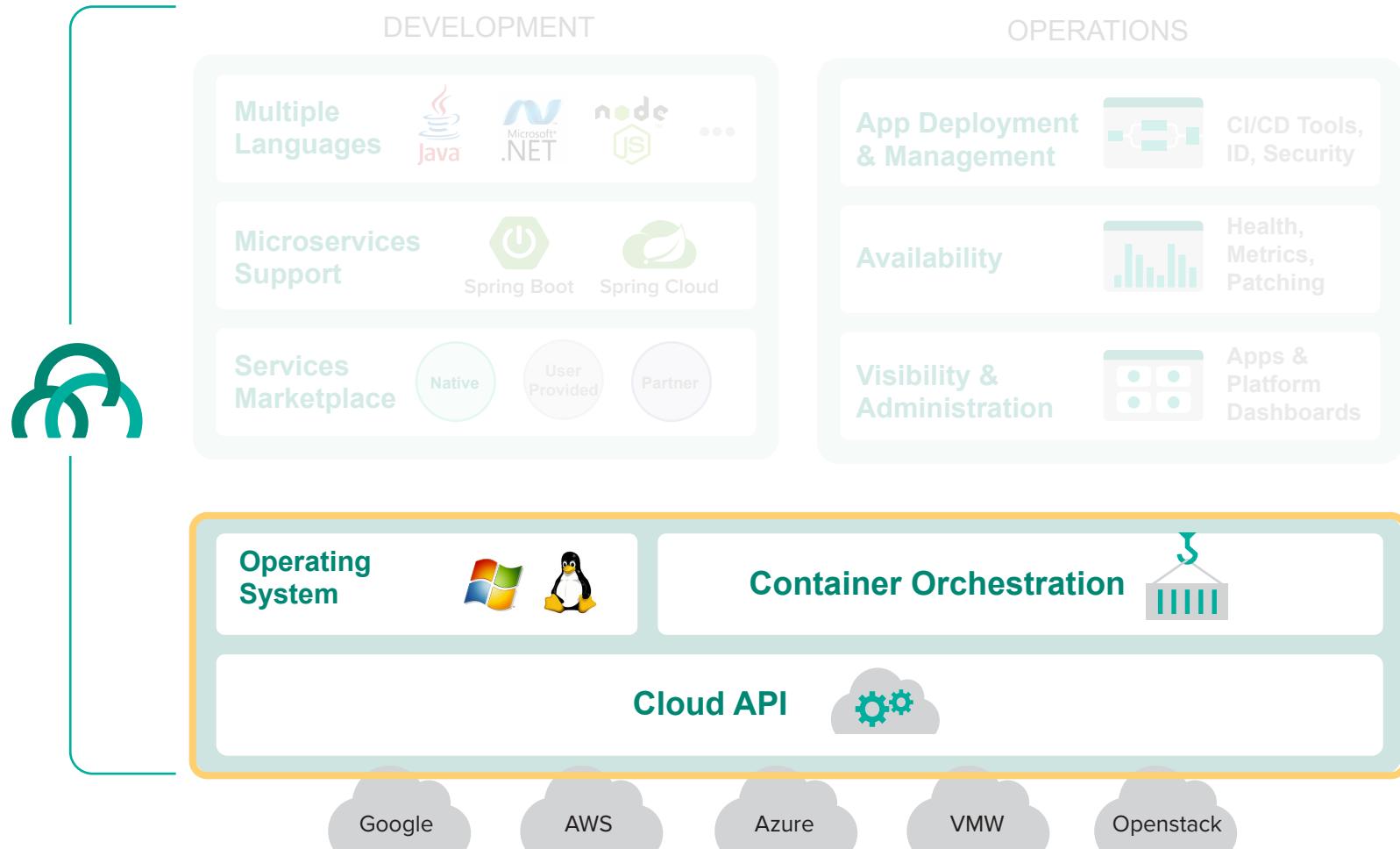
SPACE	APPs	SERVICES	Percentage
app-usage-service	3	0	3% of Org Quota
apps-manager	2	0	1% of Org Quota
autoscaling	1	0	1% of Org Quota

Docs
Support
Tools

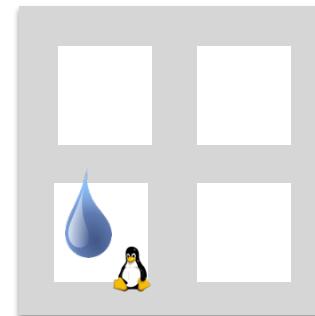
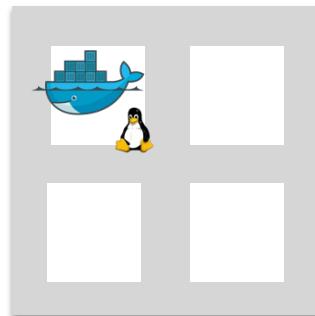
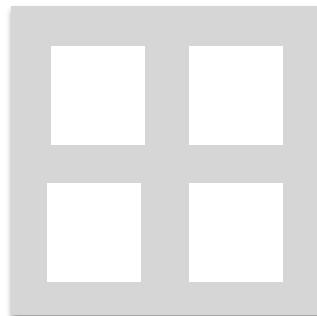
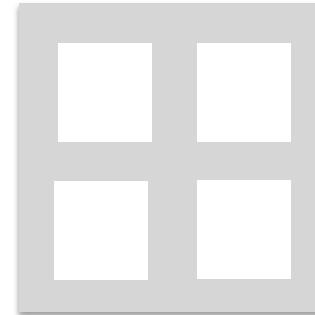
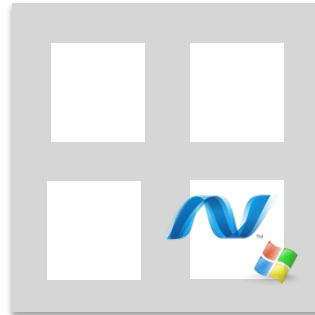
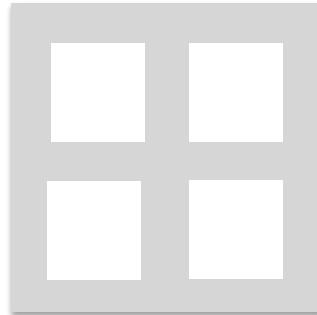
Applications Manager

4 Levels of High Availability

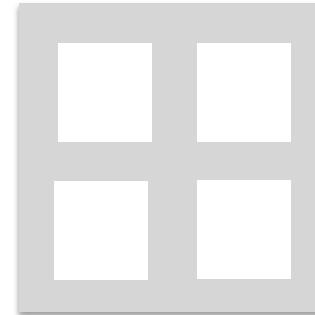
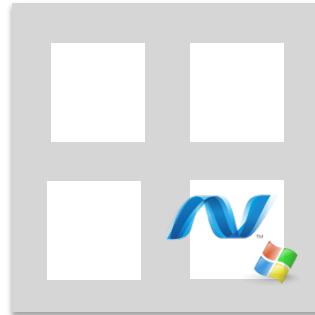
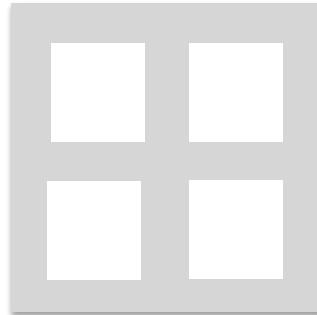




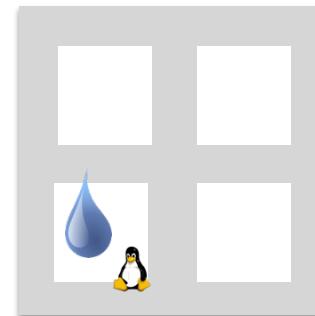
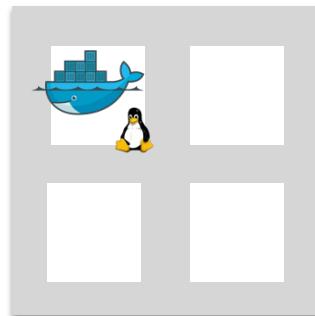
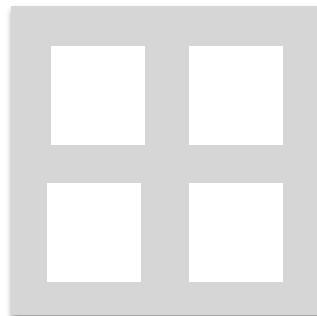
Container Scheduler Handles Workloads



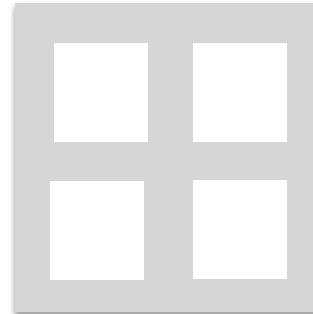
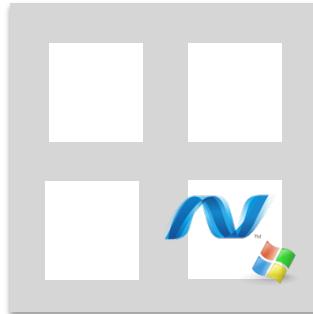
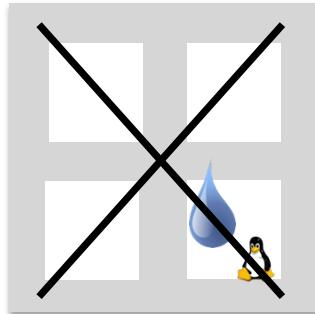
Container Scheduler Handles Workloads



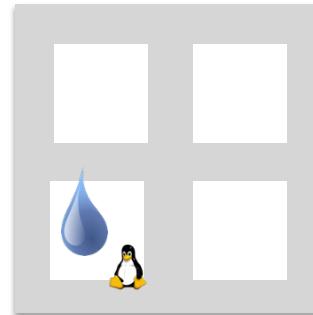
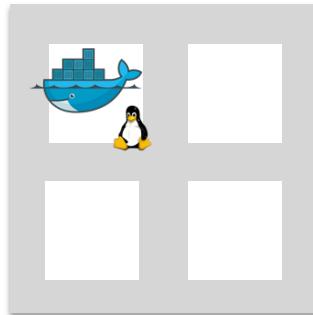
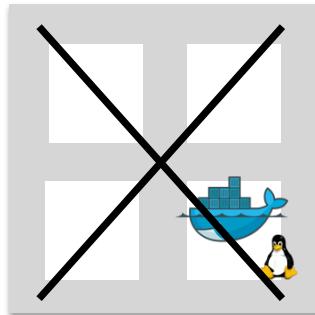
**Dynamic load
balancing**



Container Scheduler Handles Workloads

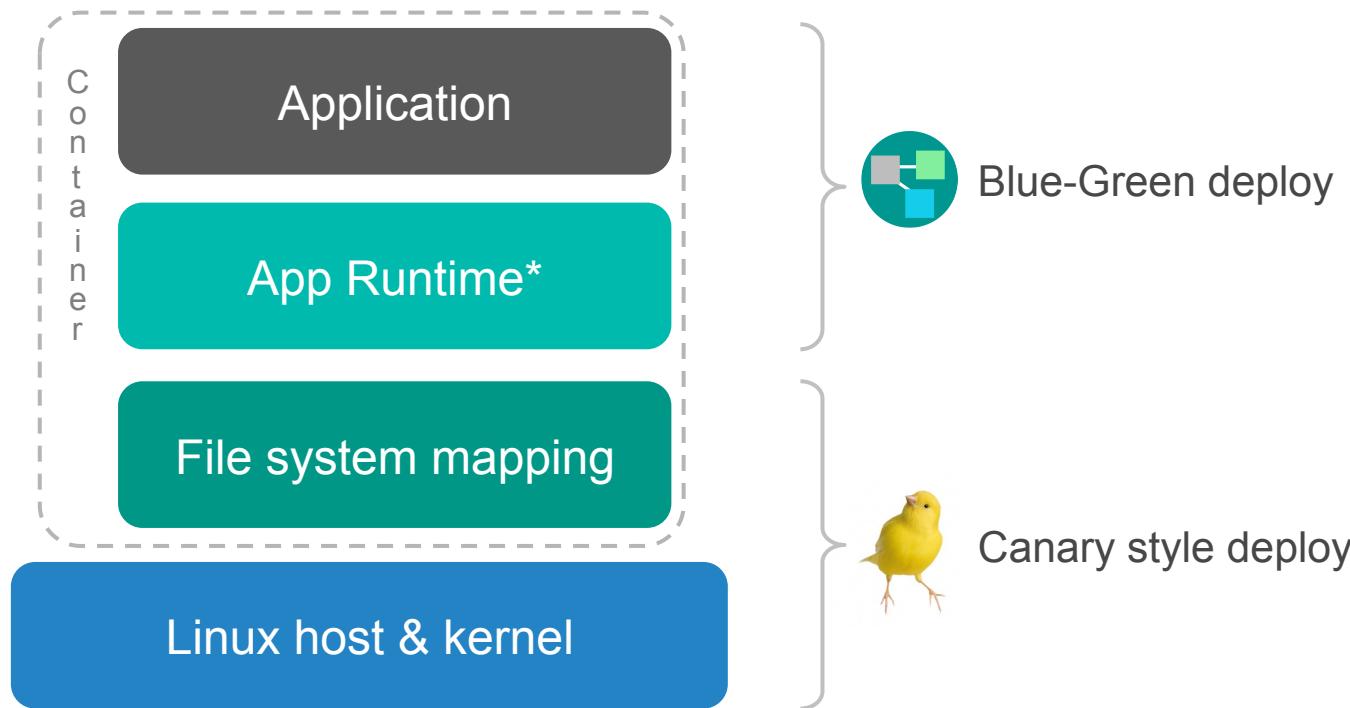


Dynamic load balancing



Remediation and rebalance of workloads

Each Layer Upgradable with No Downtime



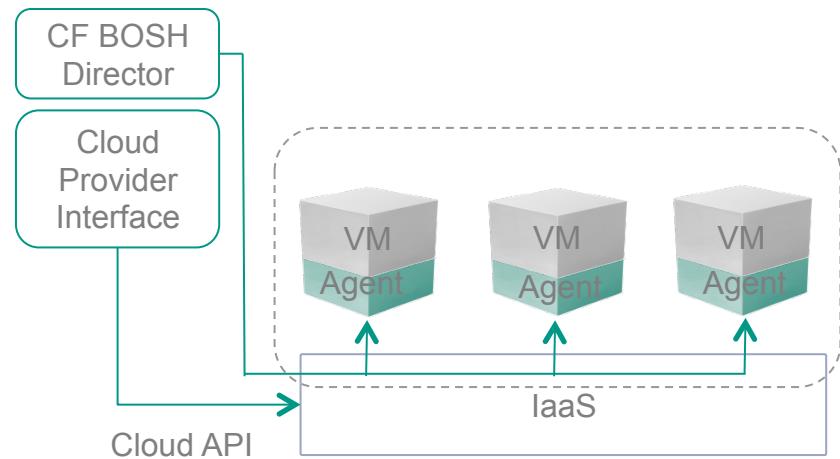
* e.g. Embedded webserver, app configurations, JRE, agents for services packaged as buildpacks

Patch With Rolling Deploys



“Cloud is about how computing is done, not where”

Paul Maritz , Founding CEO



Multi-cloud Advantage:
Cloud agnostic view of app & platform operations

Write App Once, Deploy Anywhere

Customer Managed



Google

Pivotal Managed



- 25K Containers
- Just 4 Operators

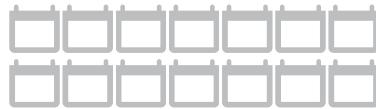
Faster Time to Market at Less Cost



BEFORE
Originally Allocated



12 Software Engineers



14 Months

AFTER
Actually Required



6 Software Engineers



6 Months



“Without Cloud Foundry underlying what we are doing, a lot of things we have been able to do in the last year would not have been possible.”

“By working with Pivotal, our clients now look at us as **industry-leading technology experts** and much more of a technologically innovative company.”

Worldwide, Cross-Vertical Customer Adoption

Internet of Things



Telco / ISP



Insurance



Financial Services



Retail / Transport



High Tech / Industrial



Media / Services



Government



Education





Pivotal[®]

Transforming How The World Builds Software

APPENDIX - 2

DIY Cloud Native Platform Reference Architecture

Infrastructure				Visualization & Reporting				Release Management			
Capability	Description	Solution	Icon	Capability	Description	Solution	Icon	Capability	Description	Priority	Icon
Multi-Region Deployment	Deployment across multiple, disparate geographies; i.e. east and west coasts	AWS us-east-1 AWS us-west-2		Metrics Collection	Collection of time series metrics for alerting and reporting	Sensu		Security / Account Abstraction & Portal Access	Single unified access to all CSP accounts	Custom	
Multi-AZ Deployment	Deployment across multiple datacenters within a geography; i.e.	AWS AZs		Metrics Storage	Storage of time series metrics for alerting and reporting	Graphite		Security / RBAC Abstraction	Role-based access by product team to CSP accounts	Custom	
Network Circuits / VPN	Dedicated network connectivity between CSP and Datacenters	AWS DirectConnect		Dashboards	Single view of disparate operational health and metrics	Grafana		Execution of Orchestration Templates	Automated provisioning of stacks based off of orchestration templates	Custom	
Private Networks / SDN	Implementation of dedicated, private RFC 1918 subnets within CSP	AWS VPC		Logging	Aggregated collection and visualization of log data	ELK		Versioning and Bundling of Deployment Artifacts (Chef, CFN, Binaries)	Bundling and versioning of all "full-stack" deployment artifacts.	Custom	
Routing & Segmentation of Private Networks	Routing and integration of traffic between multiple private networks	AWS VPC		Financial Reporting	Detailed financial reporting by product and team	Netflix ICE		Application Deployment Abstraction of CSP	Parameterized deployment for applications to deploy consistently across multiple cloud providers	Custom	
Firewall / Segmentation	Automated provisioning and configuration of firewall rules	AWS VPC & Sec. Groups		Alerts	Routing of events and notifications by on-call schedule	Pager Duty		Automated Blue-Green Traffic Switching	Automated shifting of traffic from one application release to another in a full-stack model	Custom	
DNS	DNS switching capability to bridge external/public DNS and internal DNS	AWS Route 53 BIND DNS		Continuous Delivery				Service Catalog of Approved Versions of Deployment Artifacts	Catalog of tested and approved production deployment artifacts	Custom	
Outbound Network Traffic	Ability for compute instances to initiate network connections to the Internet	iptables		CI Orchestration	Continuous build, test, and integration of application and infrastructure code	Jenkins		Deployment Policy Enforcement (Network, Capacity, etc...)	Enforcement of placement of application stacks based on policy: compliance, capacity, etc...	Custom	
Configuration Management (Run-Time)	Configuration management of compute instances in production runtime	Chef		Infrastructure Orchestration	Orchestrated provisioning and configuration of stack-specific infra.	Cloud Formation Terraform	 	DNS Provisioning	Automated provisioning of DNS records for application components and stacks	Custom	
Artifact Repository (Binaries)	Repository of successfully tested application binaries	Artifactory		Configuration Management (Image Build)	Continuous build, test, and integration of cloud instance images by application component	Packer					
Service Discovery	Ability for services to register themselves, discover each other, & integrate autonomously	Consul		Artifact Repository (Infracode)	Repository of successfully tested infrastructure code.	Chef Supermarket					
Container Format	Standardized format for packaging and delivery of Linux containers	Docker		Security				Middleware			
Container Scheduler	Automated scheduling, deployment, and recovery of Linux containers	Kubernetes and/or ECS		Capability	Description	Solution	Icon	HTTP Proxy	Reverse proxy and routing to backend micro services and applications	Nginx	
Data Platform											
Capability	Description	Solution	Icon	Capability	Description	Solution	Icon	Java Container	Standard container for running Spring-based Java applications	Tomcat	
Geo-Replicated Messaging	High-throughput, distributed messaging platform replicated across AZs/Regions	Kafka		Network Security Monitoring	Automated monitoring and alerting of internal and external network for malicious traffic	BRO		Object Cache	In-memory object cache	Memcached	
Geo-Replicated NoSQL	Distributed NoSQL key/value store replicated across AZs/Regions	Cassandra		Secrets Management	Automated creation, management, and expiration of security "secrets"	Vault		Document Store	High performance No-SQL document store	MongoDB	
Data Search and Analytics	Search, analysis, and visualization of data in real time			Vulnerability Audit	Proactive scanning for threats and vulnerabilities	Tenable		Messaging	Traditional asynchronous messaging	RabbitMQ	
				Incident Response	Collection of forensic data in the event of a security event or compromise	Google Rapid Response					
				CSP Management Console Audit	Automated security auditing of CSP admin console	Evident.io					

Same Reference Arch with Cloud Foundry

Infrastructure			Visualization & Reporting			Release Management		
Capability	Description	Solution	Capability	Description	Solution	Capability	Description	Priority
Multi-Region Deployment	Deployment across multiple, disparate geographies; i.e. east and west coasts	Pivotal Ops Manager 	Metrics Collection	Collection of time series metrics for alerting and reporting	Pivotal Ops Metrics 	Security / Account Abstraction & Portal Access	Single unified access to all CSP accounts	Elastic Runtime Apps Manager 
Multi-AZ Deployment	Deployment across multiple datacenters within a geography; i.e.	Pivotal Ops Manager 	Metrics Storage	Storage of time series metrics for alerting and reporting	Pivotal Ops Metrics 	Security / RBAC Abstraction	Role-based access by product team to CSP accounts	Elastic Runtime & OpsManager 
Network Circuits / VPN	Dedicated network connectivity between CSP and Datacenters	AWS DirectConnect 	Dashboards	Single view of disparate operational health and metrics	Pivotal PCF Metrix 	Execution of Orchestration	Automated provisioning of stacks based off of orchestration templates	Elastic Runtime and BOSH 
Private Networks / SDN	Implementation of dedicated, private RFC 1918 subnets within CSP	Pivotal Ops Manager 	Logging	Aggregated collection and visualization of log data	Pivotal PCF Metrix 	Versioning and Bundling of Deployment Artifacts 	Bundling and versioning of all "full-stack" deployment artifacts.	Elastic Runtime and BOSH 
Routing & Segmentation of Private Networks	Routing and integration of traffic between multiple private networks	Pivotal Ops Manager 	Financial Reporting	Detailed financial reporting by product and team	Netflix ICE 	Application Deployment Abstraction of CSP	Parameterized deployment for applications to deploy consistently across multiple cloud providers	Elastic Runtime and BOSH 
Firewall / Segmentation	Automated provisioning and configuration of firewall rules	Application Security Groups 	Alerts	Routing of events and notifications by on-call schedule	Pager Duty 	Automated Blue-Green Traffic Switching	Automated shifting of traffic from one application release to another in a full-stack model	Elastic Runtime (go)Router Routes 
DNS	DNS switching capability to bridge external/public DNS and internal DNS	Elastic Runtime (go)Router 	Continuous Delivery			Service Catalog of Approved Versions of Deployment Artifacts	Catalog of tested and approved production deployment artifacts	Elastic Runtime & Marketplace 
Outbound Network Traffic	Ability for compute instances to initiate network connections to the Internet	Elastic Runtime (go)Router 	CI Orchestration	Continuous build, test, and integration of application and infrastructure code	Jenkins Enterprise for PCF 	Deployment Policy Enforcement (Network, Capacity, etc...)	Enforcement of placement of application stacks based on policy: compliance, capacity, etc...	Elastic Runtime Apps Manager & Diego Scheduler 
Configuration Management (Run-Time)	Configuration management of compute instances in production runtime	Elastic Runtime Stemcells & Build Packs 	Infrastructure Orchestration	Orchestrated provisioning and configuration of stack-specific infra.	Elastic Runtime Buildpacks 	DNS Provisioning	Automated provisioning of DNS records for application components and stacks	Elastic Runtime (go)Router Routes 
Artifact Repository (Binaries)	Repository of successfully tested application binaries	Artifactory for PCF 	Configuration Management (Image Build)	Continuous build, test, and integration of cloud instance images and containers by application component	Stem Cells & Elastic Runtime Buildpacks 	Security		
Service Discovery	Ability for services to register themselves, discover each other, & integrate autonomously	Spring Cloud Services: Eureka 	Artifact Repository (Infracode)	Repository of successfully tested infrastructure code.	Elastic Runtime Blobstore 	HTTP Proxy	Reverse proxy and routing to backend micro services	Elastic Runtime (go)Router 
Container Format	Standardized format for packaging and delivery of Linux containers	Elastic Runtime Garden 	Middleware			Java Container	Standard container for running Spring-based Java applications	Tomcat (tcServer) 
Container Scheduler	Automated scheduling, deployment, and recovery of Linux containers	Elastic Runtime Diego 	Network Security Monitoring	Automated monitoring and alerting of internal and external network for malicious traffic	BRO 	Object Cache	In-memory object cache	Memcached for PCF 
Data Platform			Secrets Management	Automated creation, management, and expiration of security "secrets"	Vault 	Document Store	High performance No-SQL document store	MongoDB for PCF 
Capability			Vulnerability Audit	Proactive scanning for threats and vulnerabilities	Tenable 	Messaging	Traditional asynchronous messaging	RabbitMQ for PCF 
Geo-Replicated Messaging	High-throughput, distributed messaging platform replicated across AZs/Regions	Kafka for PCF 	Incident Response	Collection of forensic data in the event of a security event or compromise	Google Rapid Response 			
Geo-Replicated NoSQL	Distributed NoSQL key/value store replicated across AZs/Regions	Cassandra for PCF 	CSP Management Console Audit	Automated security auditing of CSP admin console	Evident.io 			
Data Search and Analytics	Search, analysis, and visualization of data in real time	Elasticsearch for PCF 						

Cloud Foundry Foundation

An Open Industry Standard

PLATINUM



GOLD



SILVER



Customer Value

Traditional way of enabling SSO	Federated Identity provider	PCF SSO
<ul style="list-style-type: none">SSO agent install & configConfigure the app to use the agent	<ul style="list-style-type: none">Separate console for managing app specific config	<ul style="list-style-type: none">Configure identity providerBind SSO service instance
<ul style="list-style-type: none">Repeat per app, per environment	<ul style="list-style-type: none">Repeat per app, per environment	<ul style="list-style-type: none">One time set up of a provider
<ul style="list-style-type: none">Tickets for standing agent	<ul style="list-style-type: none">Tickets for standing up Federation config	<ul style="list-style-type: none">Choose provider, bind app

Customer Value

Traditional way of enabling SSO	Federated Identity provider	PCF SSO
Reduce complexity		<ul style="list-style-type: none">Configure identity providerBind SSO service instance
Improve re-use/Automation/Time		<ul style="list-style-type: none">One time set up of a provider
Enable Developer Self service		<ul style="list-style-type: none">Choose provider, bind app