From Kubernetes to OpenShift

YOUR DIFFERENTIATION DEPENDS ON YOUR ABILITY TO DELIVER APPLICATIONS FASTER

Cloud-native Applications

AI & Machine Learning

Blockchain

Internet of Things

Innovation Culture

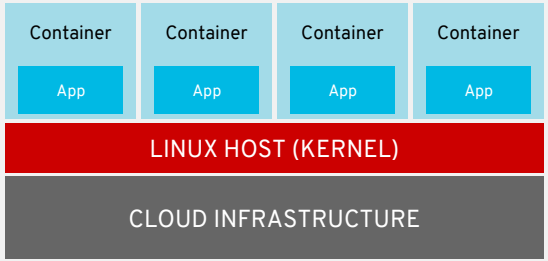
CONTAINERS, KUBERNETES, MICROSERVICES & DEVOPS ARE KEY INGREDIENTS

… so you want to do containers and Kubernetes?

WHAT ARE CONTAINERS?

CONTAINER BENEFITS FOR MULTIPLE TEAMS

CONTAINERS



Package all app dependencies
Integrated in Linux OS
Fully Open Source
Secure Isolation of Applications
Eliminates need for VM Hypervisor
Runs on Any Cloud Platform

DEVELOPERS

- CLOUD-NATIVE APPS
- SIMPLIFY PACKAGING
- SIMPLIFY TESTING

IT OPERATIONS

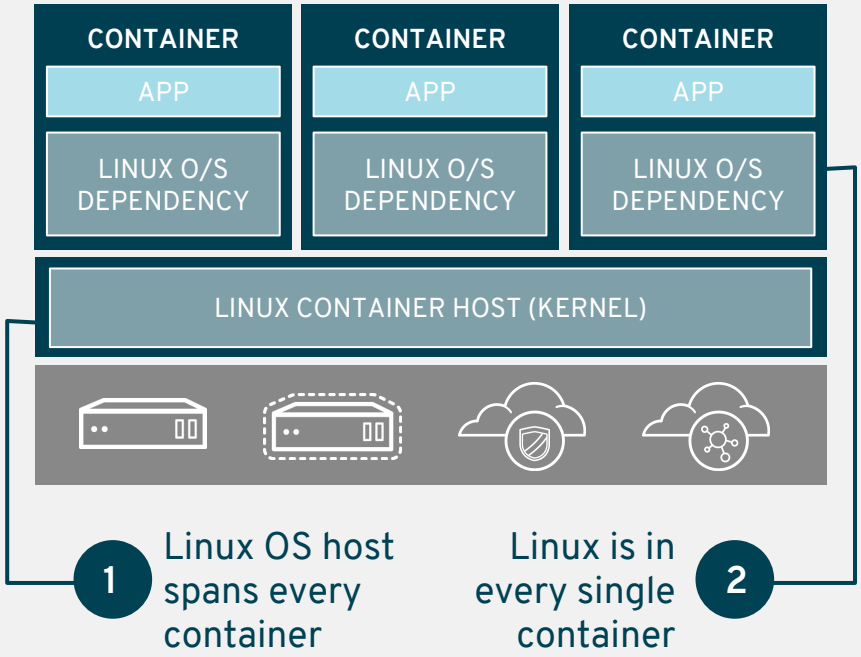
- CONSISTENT APP DEPLOYS
- AUTOMATED APP DEPLOYS
- IMPROVED APP PERFORMANCE
- MULTI-CLOUD CONSISTENCY

BUSINESS LEADERS

- ENABLE DEVOPS CULTURE
- ENABLE HYBRID CLOUD
- REDUCE VM LICENSING COSTS
- ACCELERATE APP-DEV CYCLES

CONTAINER INFRASTRUCTURE

WITH CONTAINERS, THE OS MATTERS MORE THAN EVER



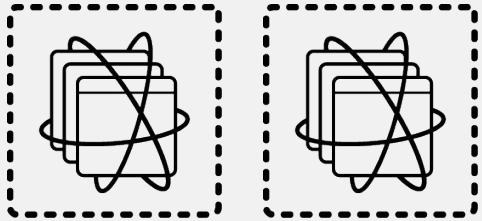
CONTAINERS ARE LINUX

Red Hat Enterprise Linux is a leader in paid Linux

70%

CY2016 paid Linux share

WHY DO CONTAINERS NEED KUBERNETES?



CONTAINERIZED APPLICATIONS

kubernetes

MANAGE CONTAINERS SECURELY

MANAGE CONTAINERS AT SCALE

INTEGRATE IT OPERATIONS

ENABLE HYBRID CLOUD

KUBERNETES DONE RIGHT IS HARD

INSTALL

- Templating
- Validation
- OS Setup

DEPLOY

- Identity & Security Access
- App Monitoring & Alerts
- Storage & Persistence
- Egress, Ingress & Integration
- Host Container Images
- Build/Deploy Methodology

HARDEN

- Platform Monitoring & Alerts
- Metering & Chargeback
- Platform Security Hardening
- Image Hardening
- Security Certifications
- Network Policy
- Disaster Recovery
- Resource Segmentation

OPERATE

- OS Upgrade & Patch
- Platform Upgrade & Patch
- Image Upgrade & Patch
- App Upgrade & Patch
- Security Patches
- Continuous Security Scanning
- Multi-environment Rollout
- Enterprise Container Registry
- Cluster & App Elasticity
- Monitor, Alert, Remediate
- Log Aggregation

75%

of enterprise users identify complexity of implementation and operations as the top blocker to adoption

Source: The New Stack, The State of the Kubernetes Ecosystem, August 2017

RED HAT HAS BEEN A KUBERNETES LEADER SINCE DAY 1

K8S 1.0

K8S 1.0

K8S 1.6

K8S 1.8

K8S 1.9

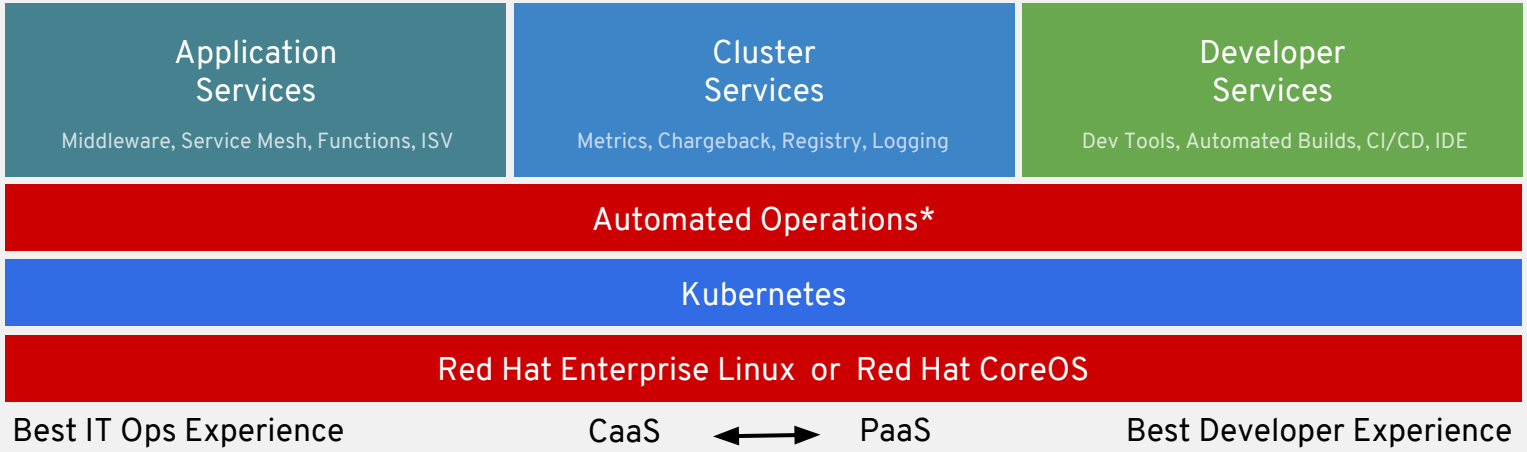
1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 .....

2015 2016 2017 2018

OPENSHIFT IS KUBERNETES
FOR THE ENTERPRISE

Security fixes
100s of defect and performance fixes
200+ validated integrations
Middleware integrations
(container images, storage, networking, cloud services, etc)
9 year enterprise lifecycle management
Certified Kubernetes

REFERENCE ARCHITECTURE
FOR ENTERPRISE KUBERNETES



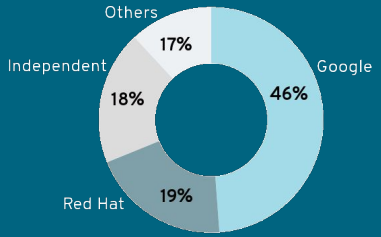
*coming soon

WHY IS RED HAT THE BEST CHOICE?

THE FOUR Cs

CODE

Kubernetes commits



Red Hat is a leading Kubernetes developer & contributor with Google[1].

We make container development easy, reliable, & more secure.

CUSTOMERS

Most reference customers running in production.

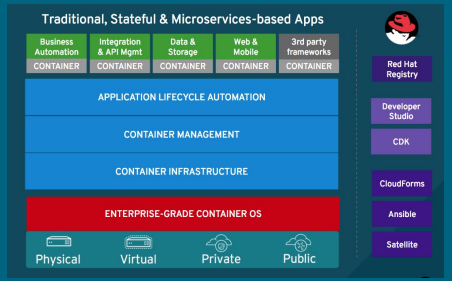
We have years of experience running OpenShift Online & OpenShift Dedicated services.

CLOUD

Strong partnerships with cloud providers, ISVs, CCSPs.

We have an extensive container catalog of certified partner images.

COMPREHENSIVE



Our comprehensive portfolio of container products and services includes developer tools, security, application services, storage, & management.

Source: [1] Stackalytics, *Contribution by Companies*. (Release: All, Project type: Kubernetes, Module: kubernetes, Metric: Commits) Retrieved: March 2, 2018.

IT Operations needs secure, efficient and controlled processes

Automated* provisioning
Automated installations
Automated security scanning
Automated upgrades
Automated backups

And it needs to integrate with what you already have.

*coming soon

A CONSISTENT CONTAINER APPLICATION PLATFORM

FROM YOUR DATACENTER TO THE CLOUD

RED HAT® OPENSHIFT

BARE METAL, VSPHERE, RHV, OPENSTACK, AWS, AZURE, GOOGLE

COMPREHENSIVE CONTAINER SECURITY

CONTROL
Application Security

- Container Content
- CI/CD Pipeline
- Container Registry
- Deployment Policies

DEFEND
Infrastructure

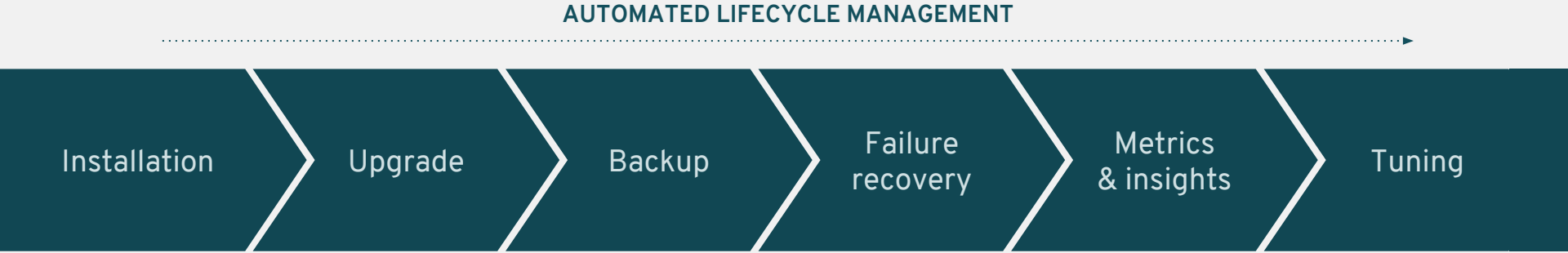
- Container Platform
- Container Host Multi-tenancy
- Network Isolation
- Storage
- Audit & Logging
- API Management

EXTEND

- Security Ecosystem

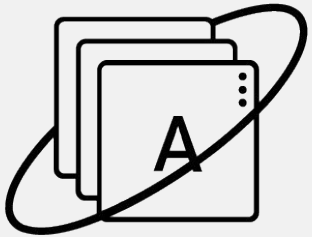
KUBERNETES OPERATOR FRAMEWORK

AN INNOVATIVE, MORE EFFICIENT WAY TO MANAGE CONTAINERIZED APPLICATIONS AT SCALE

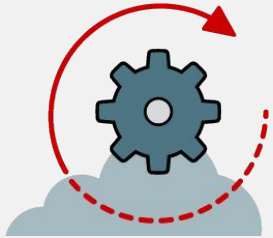


Operators codify operational knowledge and workflows to automate lifecycle management of containerized applications with Kubernetes

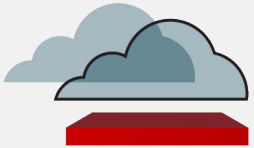
THE EASE OF THE CLOUD EVERYWHERE



YOUR APPLICATION
Kubernetes-native apps and services



AUTOMATED LIKE THE CLOUD
Automatic updates, patching, recovery, and tuning



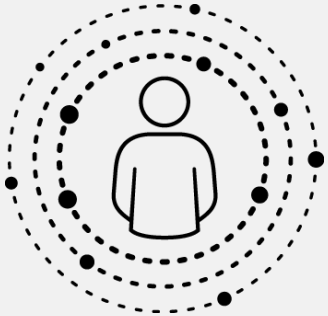
BUT RUNS EVERYWHERE
Build once, deploy on any Kubernetes cluster, Public cloud or on-prem

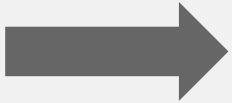
THE EASE OF THE CLOUD EVERYWHERE WITH KUBERNETES OPERATORS

OPERATOR

- encode human operational knowledge
- **automatically patch, upgrade, recover, and tune apps and services**
- Kubernetes-native
- Purpose-built for a specific application or service

ENCODING AND AUTOMATING OPS KNOWLEDGE WITH OPERATORS





WITHOUT OPERATORS
REACTIVE

- Continually checks for anomalies
- Alert humans for response
- Requires manual change to fix

WITH OPERATORS
PROACTIVE

- Continually adjusts to optimal state
- Automatically acts in milliseconds

KUBERNETES OPERATORS IN PREVIEW IN OCP 3.11

APPLICATION OPERATORS
DEVELOPER PREVIEW

etcd

AMQ Streams

mongoDB

dynatrace

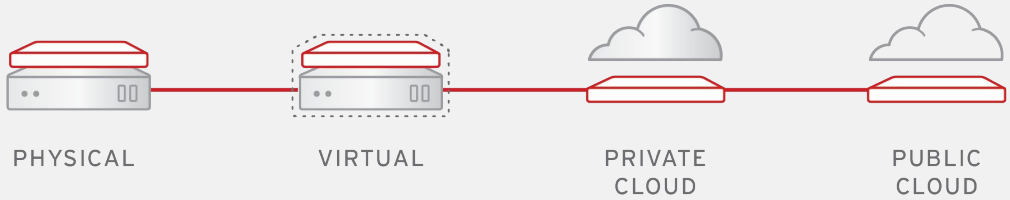
Couchbase

OPERATOR LIFECYCLE MANAGER (OLM)
TECHNOLOGY PREVIEW

Install, manage, and upgrade Operators and their dependencies

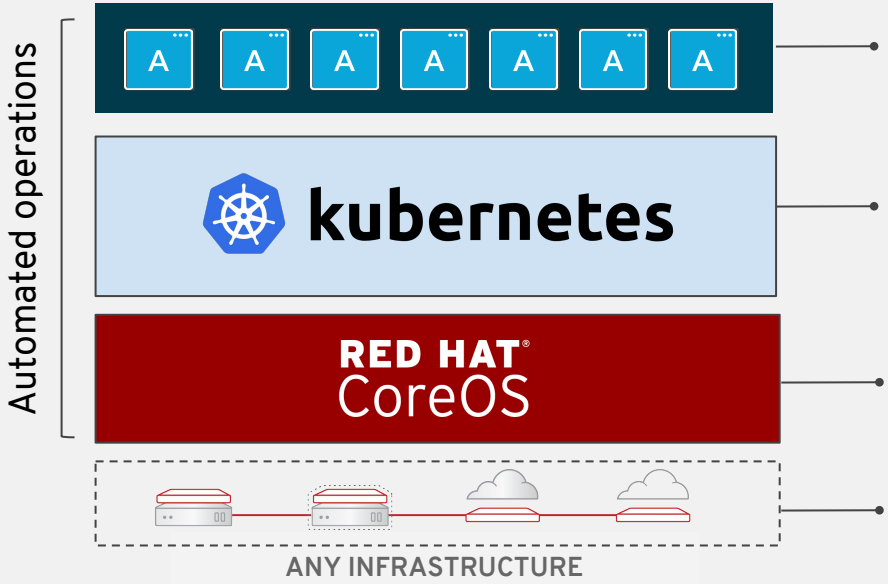
RED HAT OPENSHIFT

Portable application services across any infrastructure



A SMARTER KUBERNETES PLATFORM

Automated installation, patching, and updates from the OS on up*



APPLICATIONS AND SERVICES
ISV Operators
Custom Operators (built w/Operator SDK)

PLATFORM AND CLUSTER MANAGEMENT
Automated updates for Kubernetes, monitoring, security, registry and more

LINUX HOST
Atomic, over-the-air updates for Red Hat CoreOS

ACROSS HYBRID / MULTI CLOUD DEPLOYMENTS

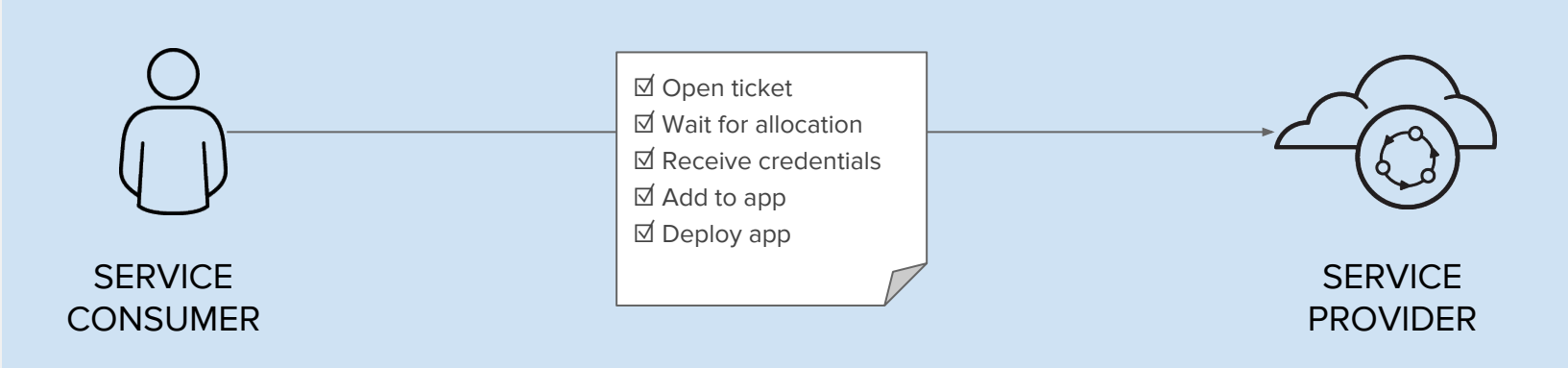
***coming soon**

THE INDUSTRY IS ALIGNING BEHIND THE KUBERNETES OPERATOR FRAMEWORK

60+ Certified ISV Operators in Red Hat Early Access Program

SERVICE BROKER

WHY A SERVICE BROKER?



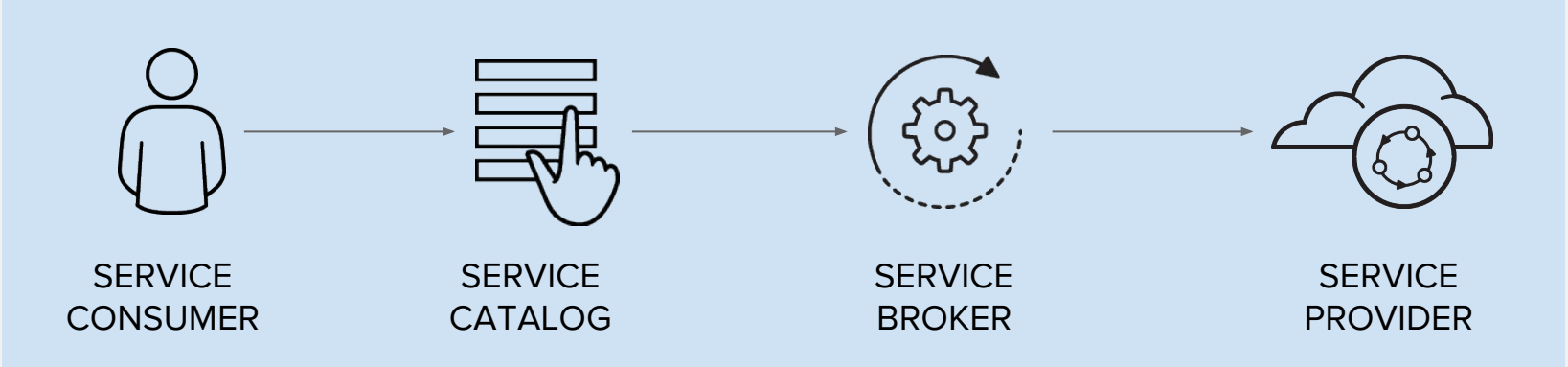
Manual, Time-consuming and Inconsistent

OPEN SERVICE BROKER API™

A multi-vendor project to standardize how services are consumed on cloud-native platforms across service providers

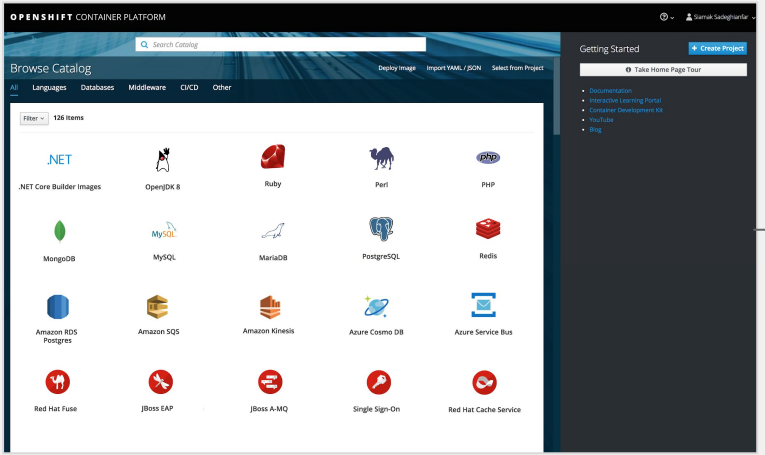
FUJITSU Pivotal IBM redhat. Google SAP®

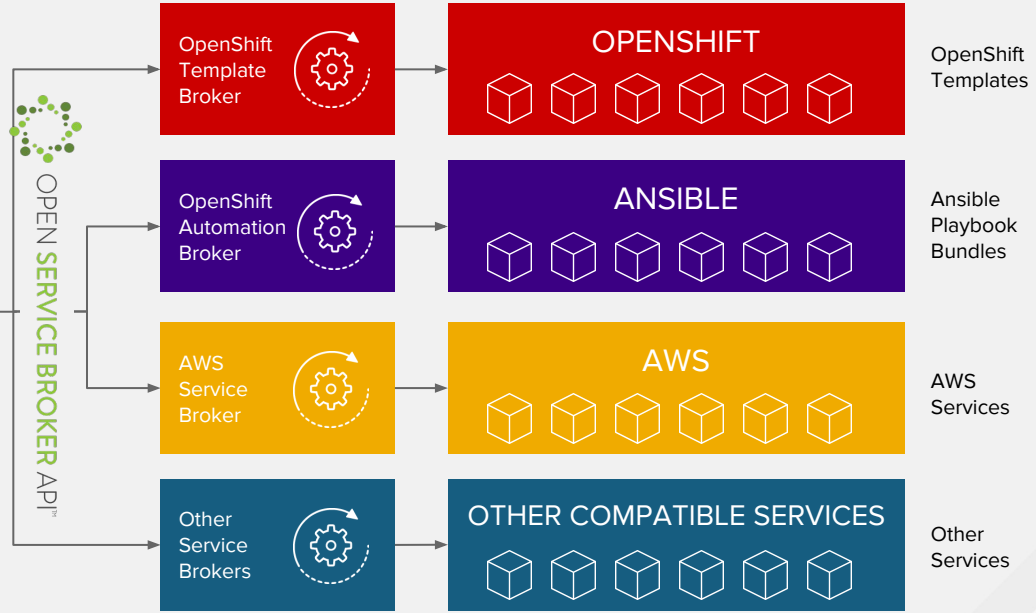
WHAT IS A SERVICE BROKER?



Automated, Standard and Consistent

OPENSHIFT SERVICE CATALOG





OPENSHIFT SERVICE CATALOG

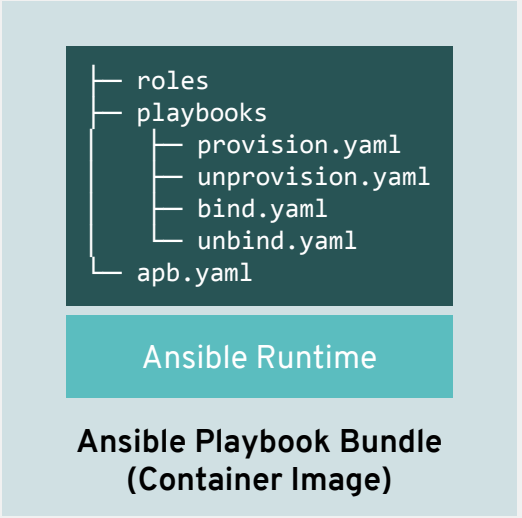
redhat.

OPENSHIFT ANSIBLE BROKER

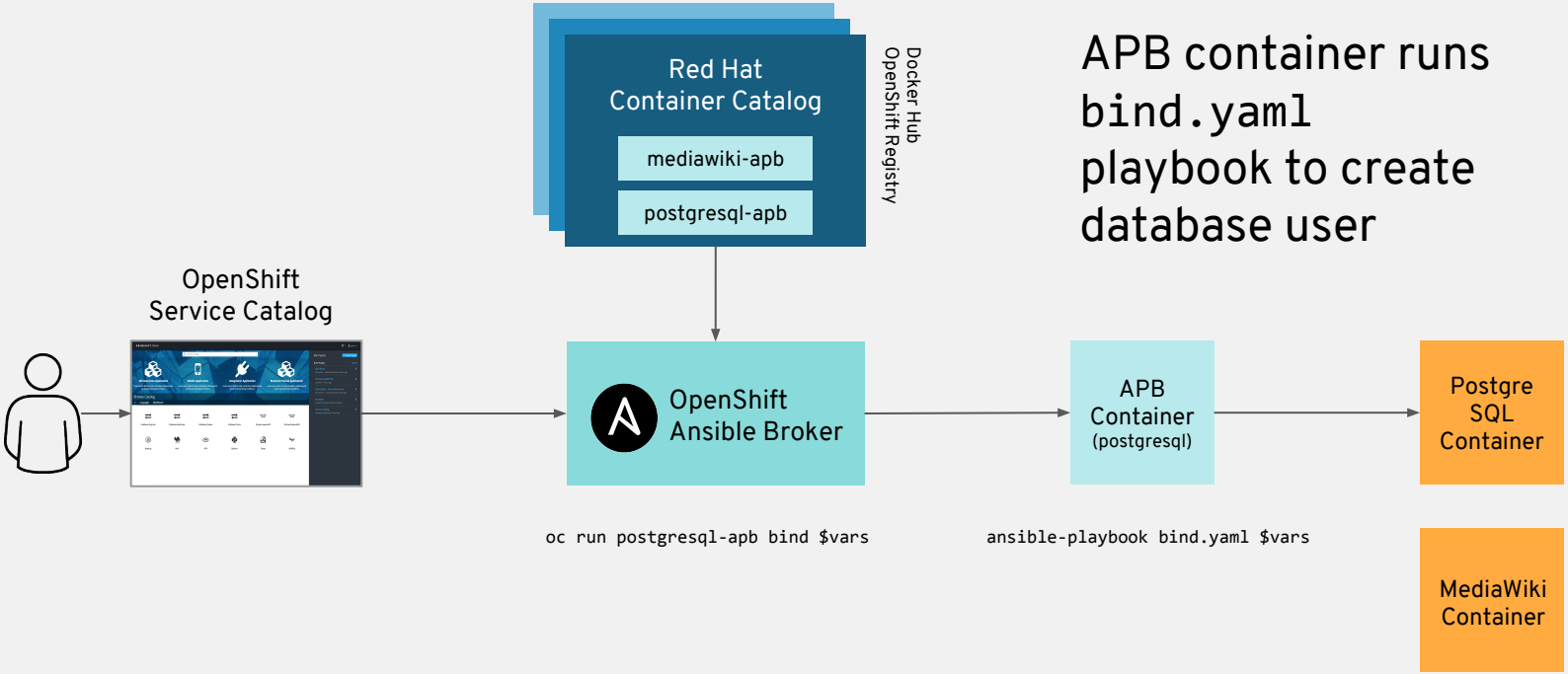
- Use Ansible on OpenShift
  - Deploy containerized applications
  - Provision external services (e.g. Oracle database)
  - Provision cloud services (e.g. AWS RDS)
  - Orchestrate multi-service solutions
  - Conditional logic for control on deployments (e.g. database is initialized)
- Leverage existing Ansible playbooks
- Anything you can do with Ansible, you can do with OAB

ANSIBLE PLAYBOOK BUNDLES (APB)

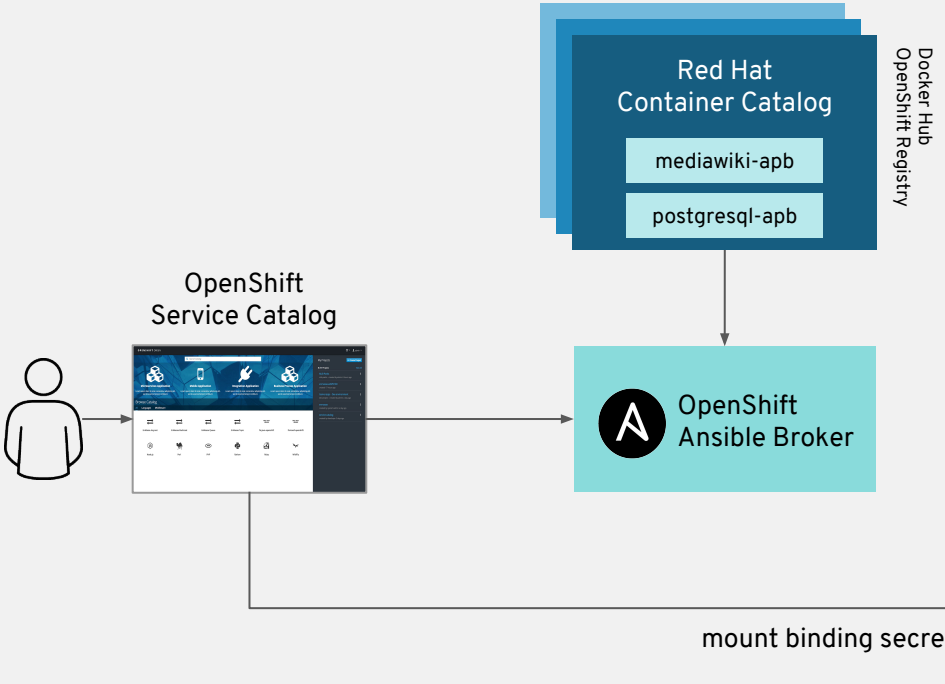
- Lightweight application definition
- Packaged as a container image
- Embedded Ansible runtime
- Metadata for parameters
- Named playbooks for actions
- Leverage existing Ansible playbooks
- Registry is queried to discover APBs



OPENSHIFT ANSIBLE BROKER BINDING

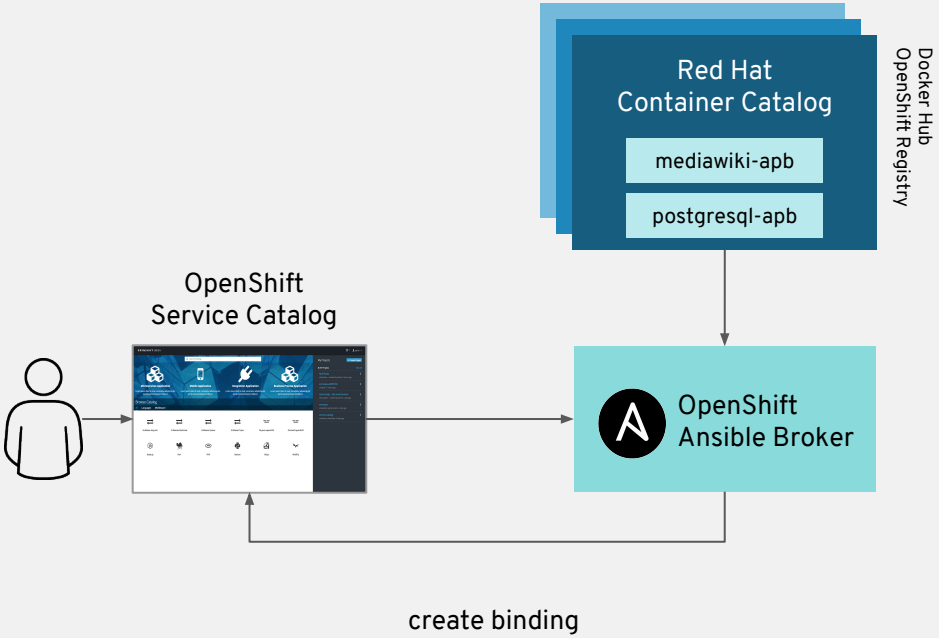


OPENSHIFT ANSIBLE BROKER BINDING



Service Catalog creates a `secret` for the binding, containing the database credentials

OPENSHIFT ANSIBLE BROKER BINDING

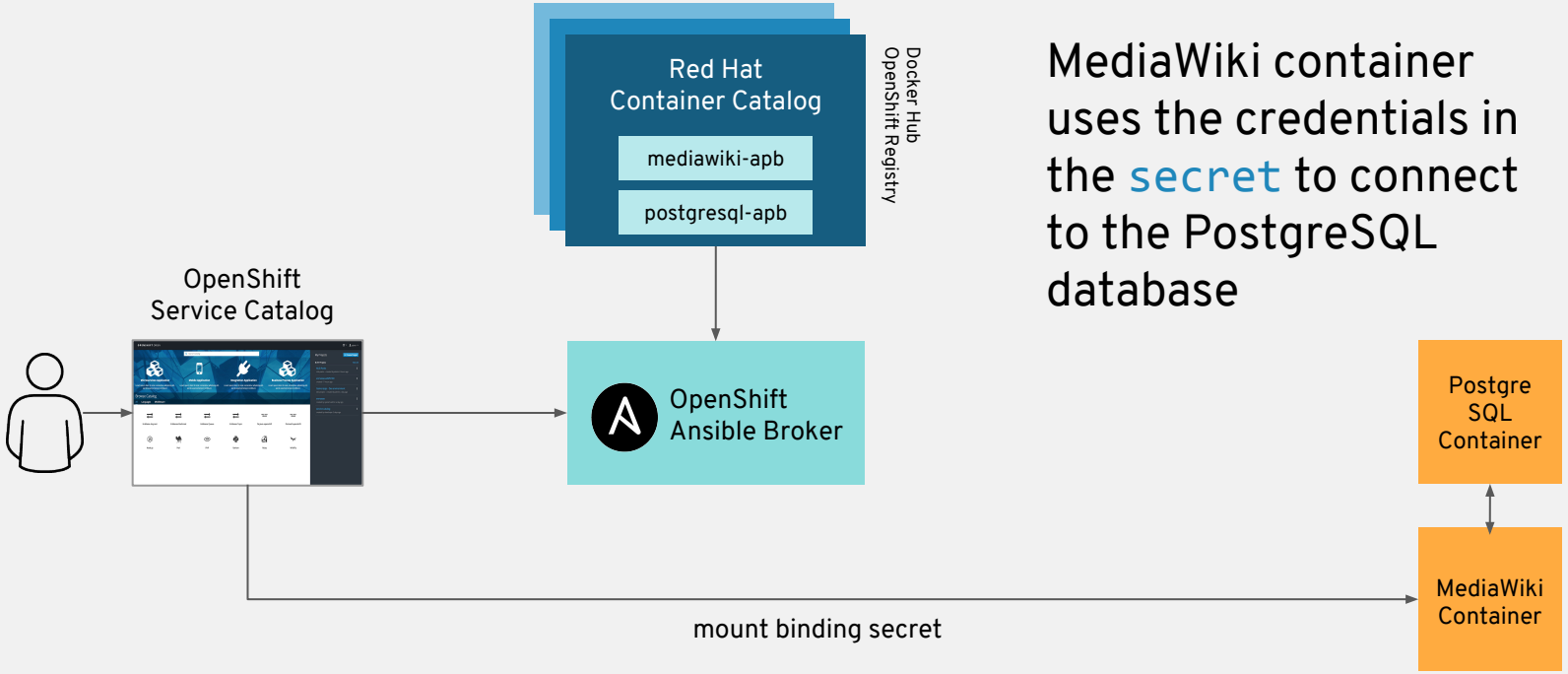


APB container goes away and Service Broker creates a `binding` for the PostgreSQL service

Postgre SQL Container

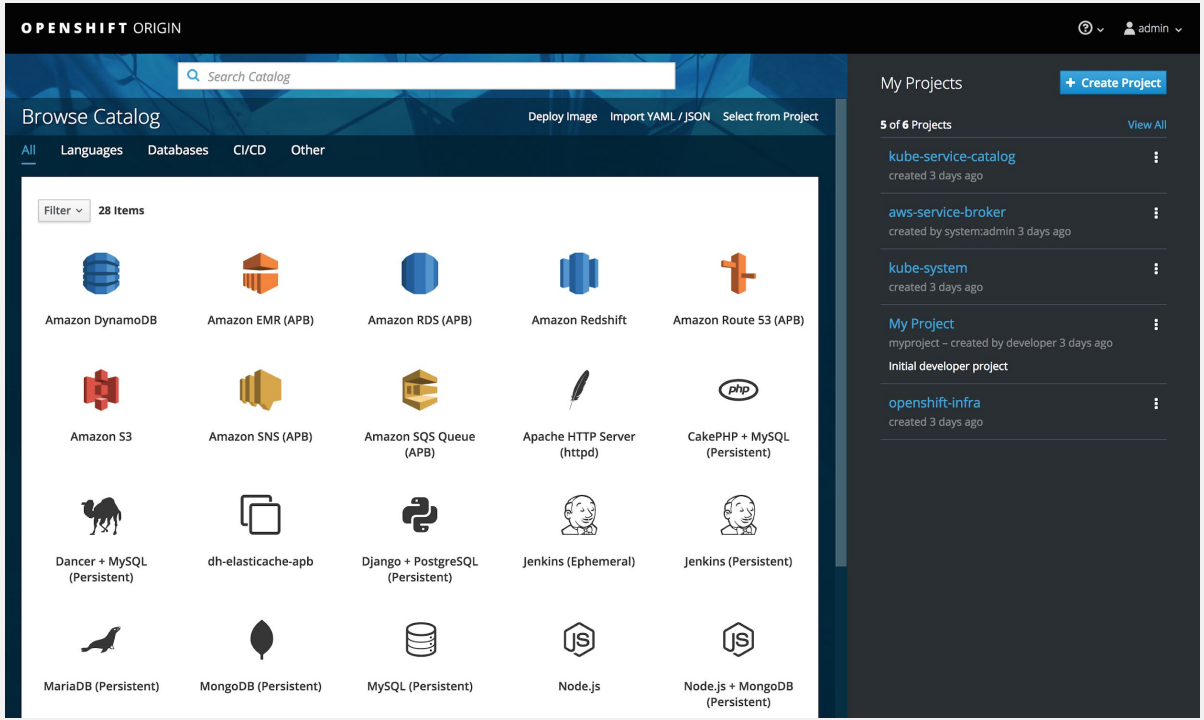
MediaWiki Container

OPENSHIFT ANSIBLE BROKER BINDING



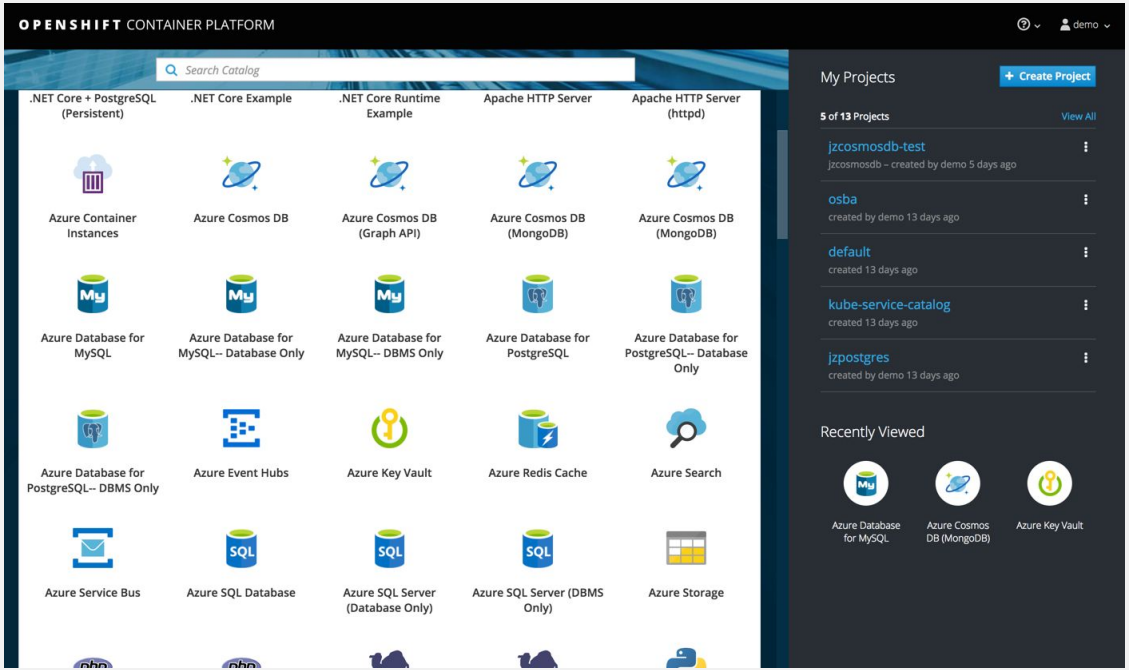
MediaWiki container uses the credentials in the `secret` to connect to the PostgreSQL database

AWS SERVICE BROKER



- Amazon Athena
- Amazon DynamoDB
- Amazon ElastiCache
- Amazon EMR
- Amazon Kinesis Data Streams
- Amazon KMS
- Amazon Lex
- Amazon Polly
- Amazon RDS for MariaDB
- Amazon RDS for MySQL
- Amazon RDS for PostgreSQL
- Amazon RedShift
- Amazon Rekognition
- Amazon Route 53
- Amazon S3
- Amazon SNS
- Amazon SQS
- Amazon Translate

AZURE SERVICE BROKER



Available on OpenShift on Azure managed-service and Azure Stack

- Azure Cosmos DB
- Azure KeyVault
- Azure Storage
- Azure Redis Cache
- Azure DocumentDB
- Azure Service Bus and Event Hub
- Azure SQL Database
- Azure SQL Database Failover Group
- Azure Database for MySQL
- Azure Database for PostgreSQL

RED HAT SERVICES FOR OPENSHIFT ADOPTION

RED HAT OPEN INNOVATION LABS

EXPERIMENT
Rapidly build prototypes, do DevOps, and be agile.

CATALYZE INNOVATION
Bring modern application development back to your team.

IMMERSE YOUR TEAM
Work side-by-side with experts in a residency-style engagement.

TO SHOW YOUR TEAMS HOW OPENSHIFT AND MODERN DEVELOPMENT PRACTICES CAN DRIVE INNOVATION: START WITH A 4- TO 12-WEEK LABS RESIDENCY

RED HAT CONTAINER ADOPTION PROGRAM

FRAMEWORK FOR SUCCESSFUL CONTAINER ADOPTION AND IT TRANSFORMATION:

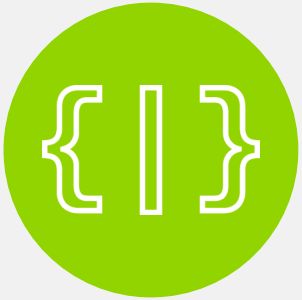
Mentoring, training, and side-by-side collaboration to:

- Create a production platform and team to run it
- Create end-to-end container-driven deployment automation
- Scale application onboarding expertise
- Guide new Kubernetes-native development
- Align business with IT through **included Red Hat Open Innovation Labs**

TO BEGIN A COMPREHENSIVE PROGRAM (INCLUDING OPEN INNOVATION LABS): START WITH THE 12-WEEK RED HAT CONSULTING CONTAINER PLATFORM PILOT

BUILD AND DEPLOY CONTAINER IMAGES

BUILD AND DEPLOY CONTAINER IMAGES

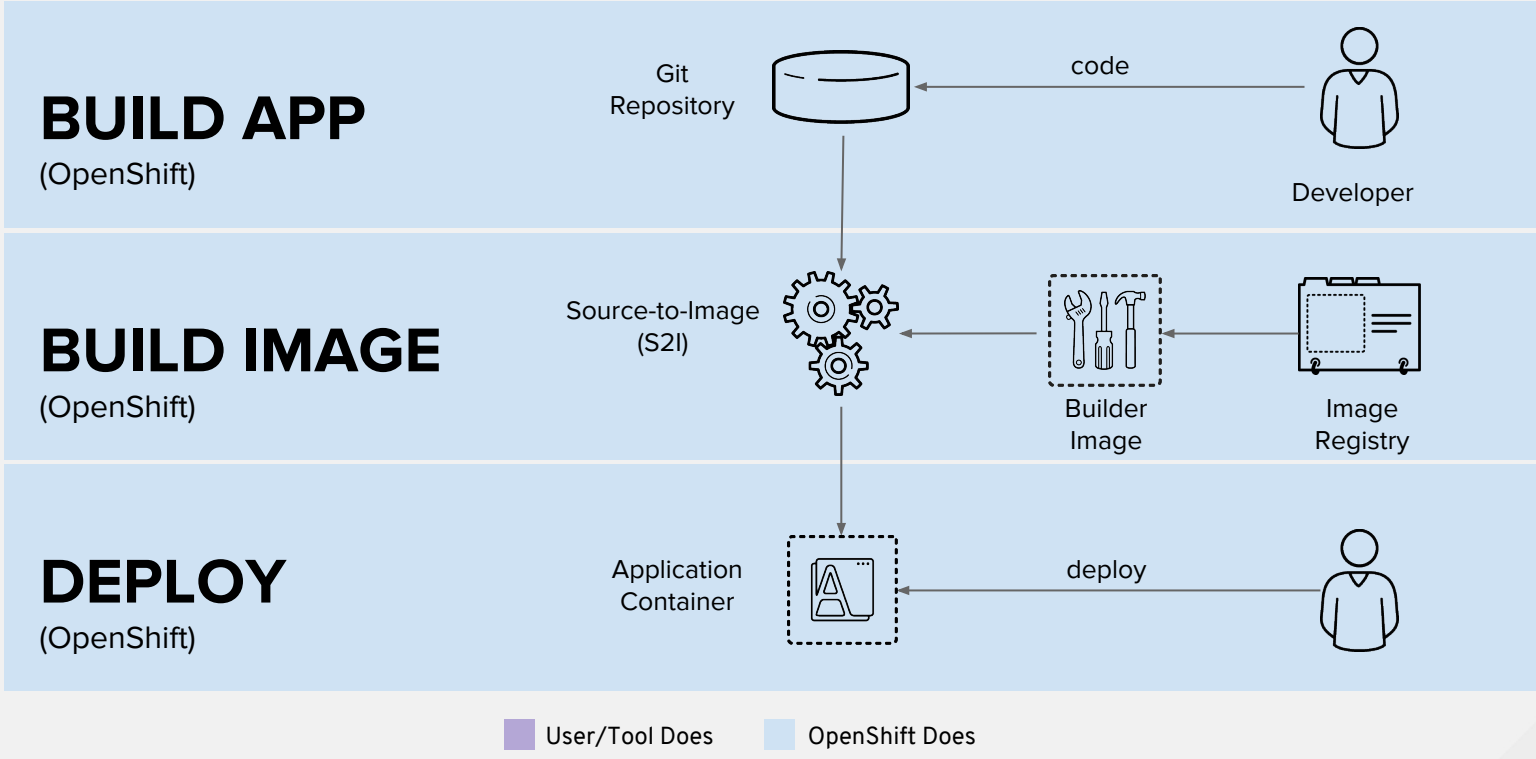


DEPLOY YOUR SOURCE CODE

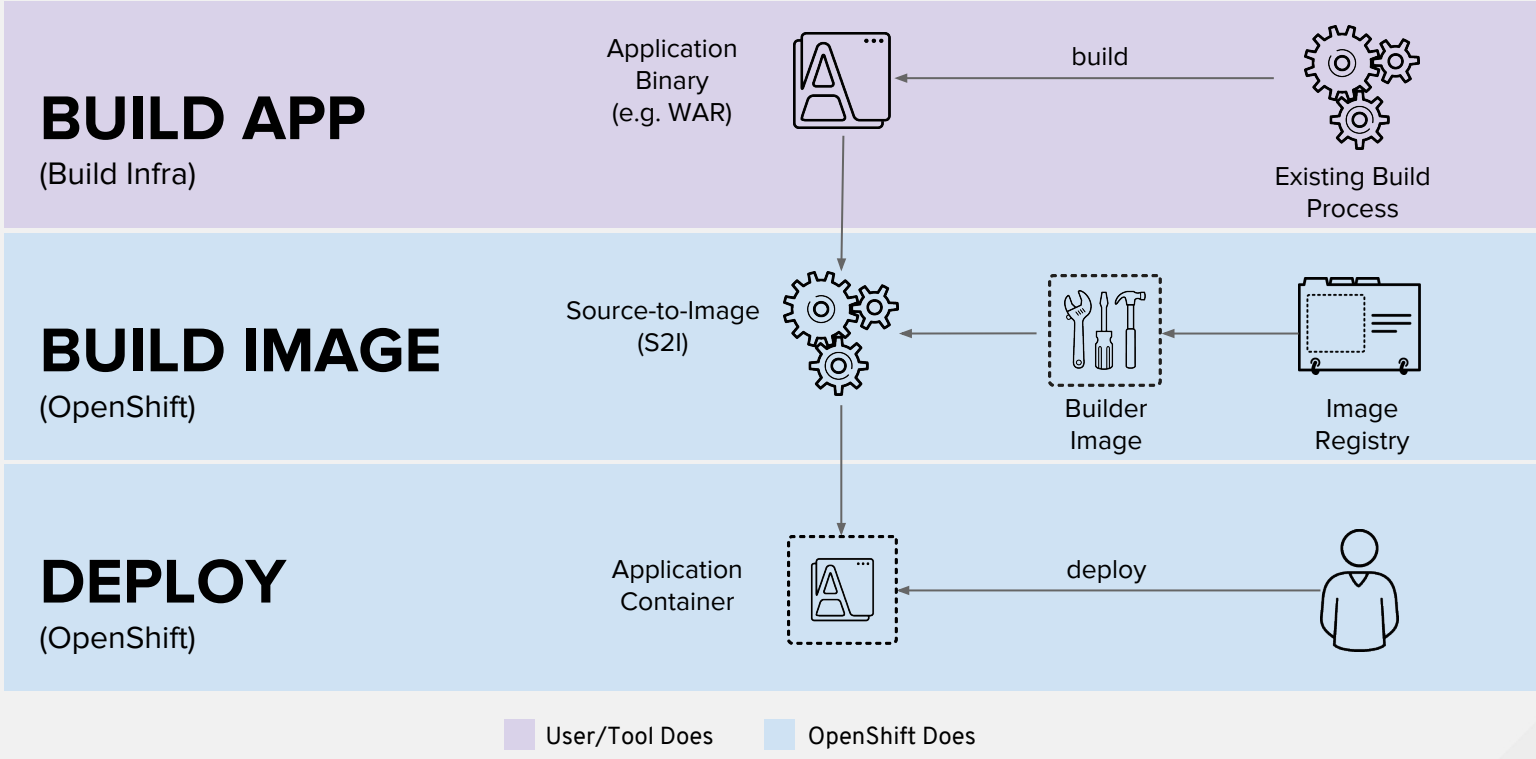
DEPLOY YOUR APP BINARY

DEPLOY YOUR CONTAINER IMAGE

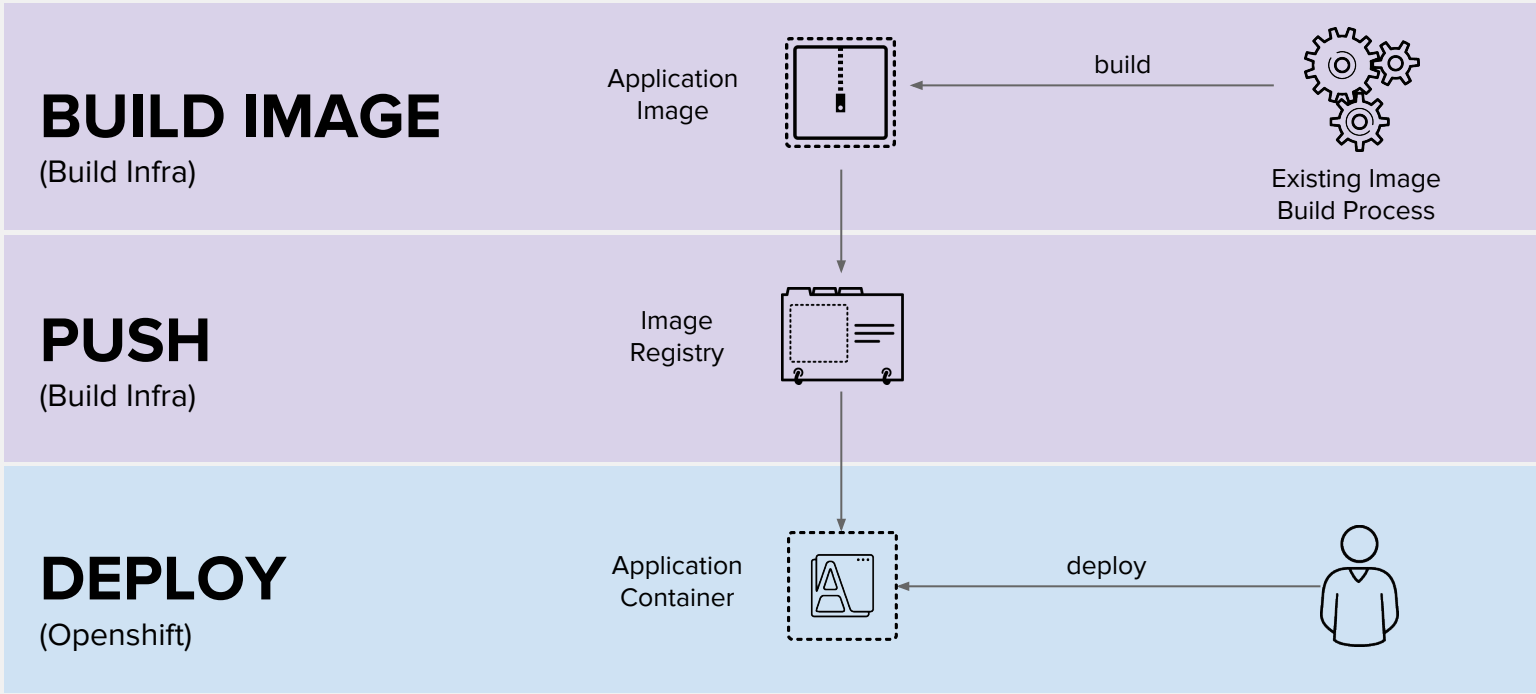
DEPLOY SOURCE CODE WITH SOURCE-TO-IMAGE (S2I)



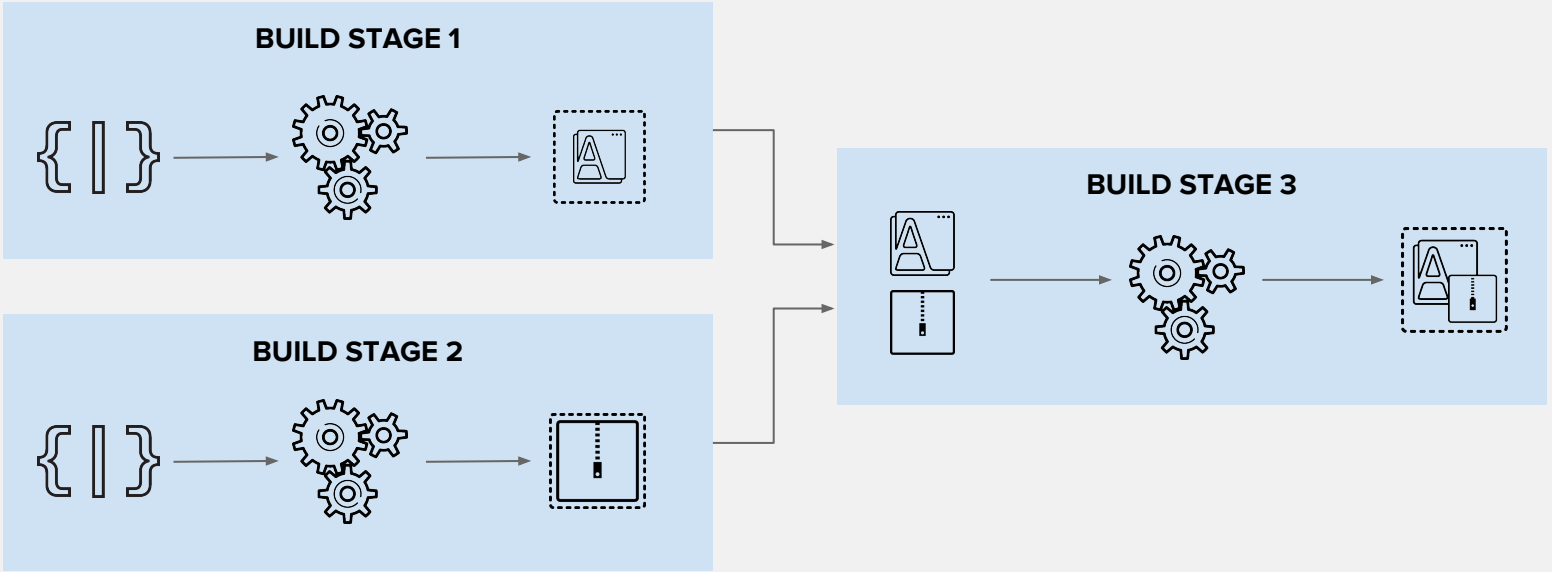
DEPLOY APP BINARY WITH SOURCE-TO-IMAGE (S2I)



DEPLOY DOCKER IMAGE

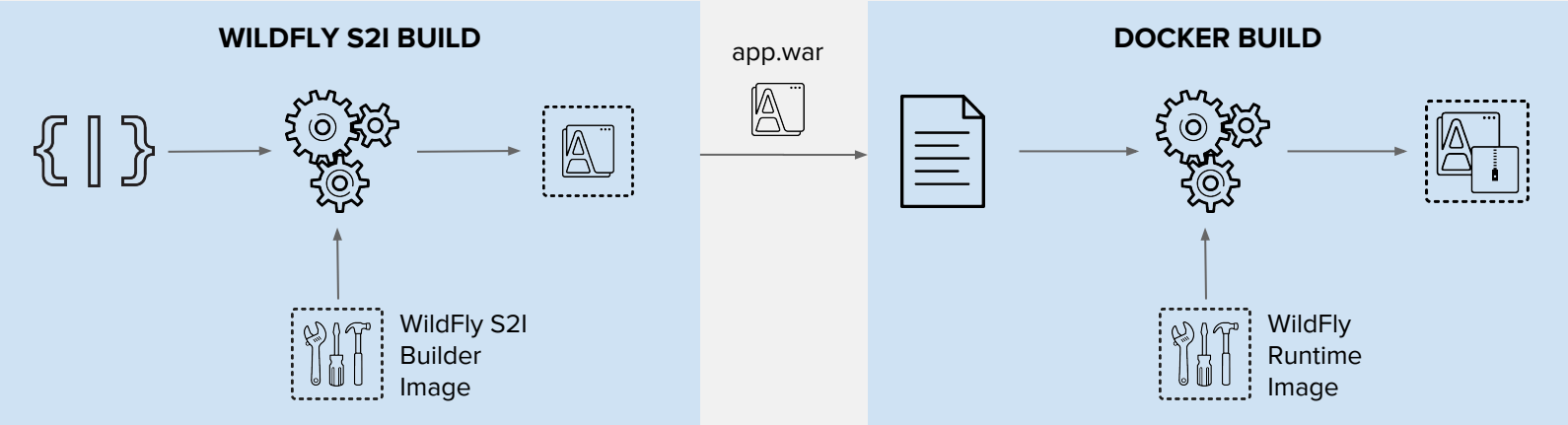


BUILD IMAGES IN MULTIPLE STAGES



EXAMPLE: USE ANY RUNTIME IMAGE WITH SOURCE-TO-IMAGE BUILDS

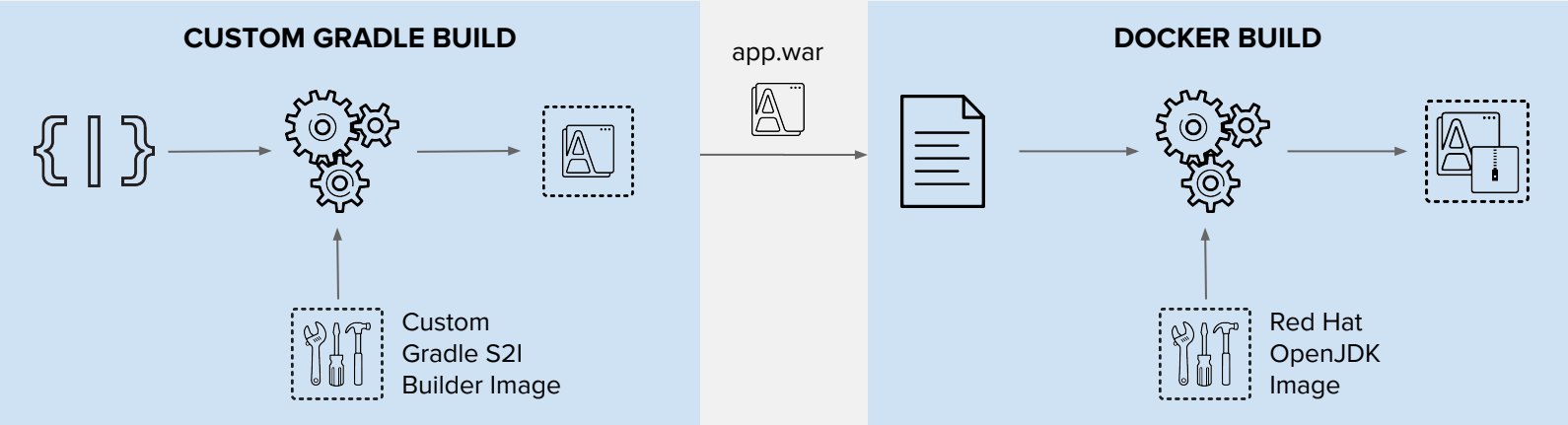
Use Source-to-Image to build app binaries and deploy on lean vanilla runtimes



read more on https://blog.openshift.com/chaining-builds/

EXAMPLE: USE ANY BUILD TOOL WITH OFFICIAL RUNTIME IMAGES

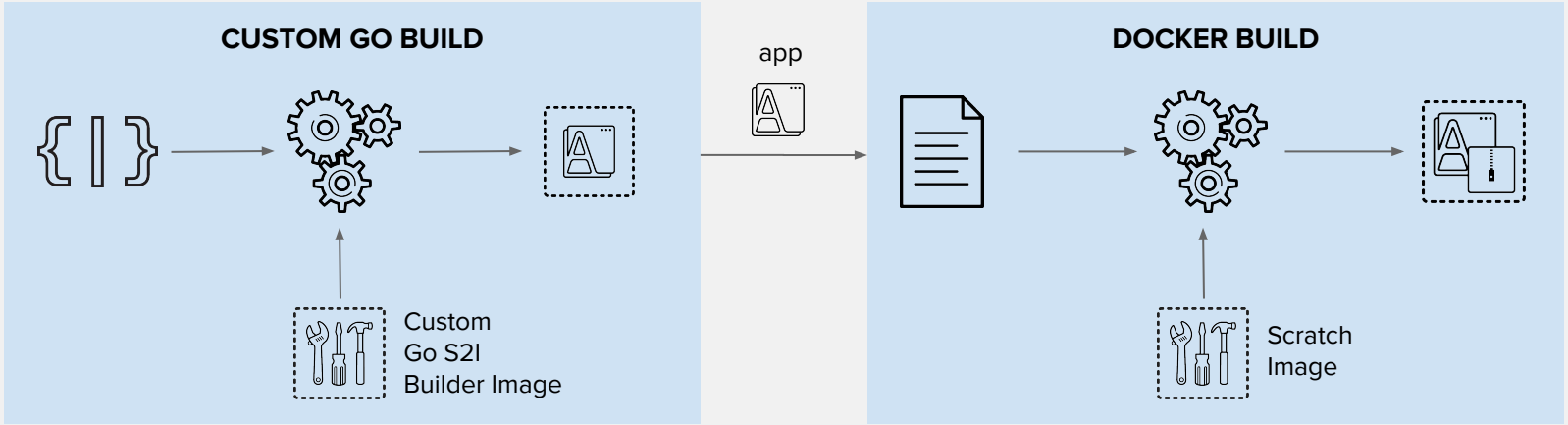
Use your choice of build tool like Gradle and deploy to official images like the JDK image



read more on https://blog.openshift.com/chaining-builds/

EXAMPLE: SMALL LEAN RUNTIMES

Build the app binary and deploy on small scratch images



read more on https://blog.openshift.com/chaining-builds/

CI/CD

CI/CD WITH BUILD AND DEPLOYMENTS

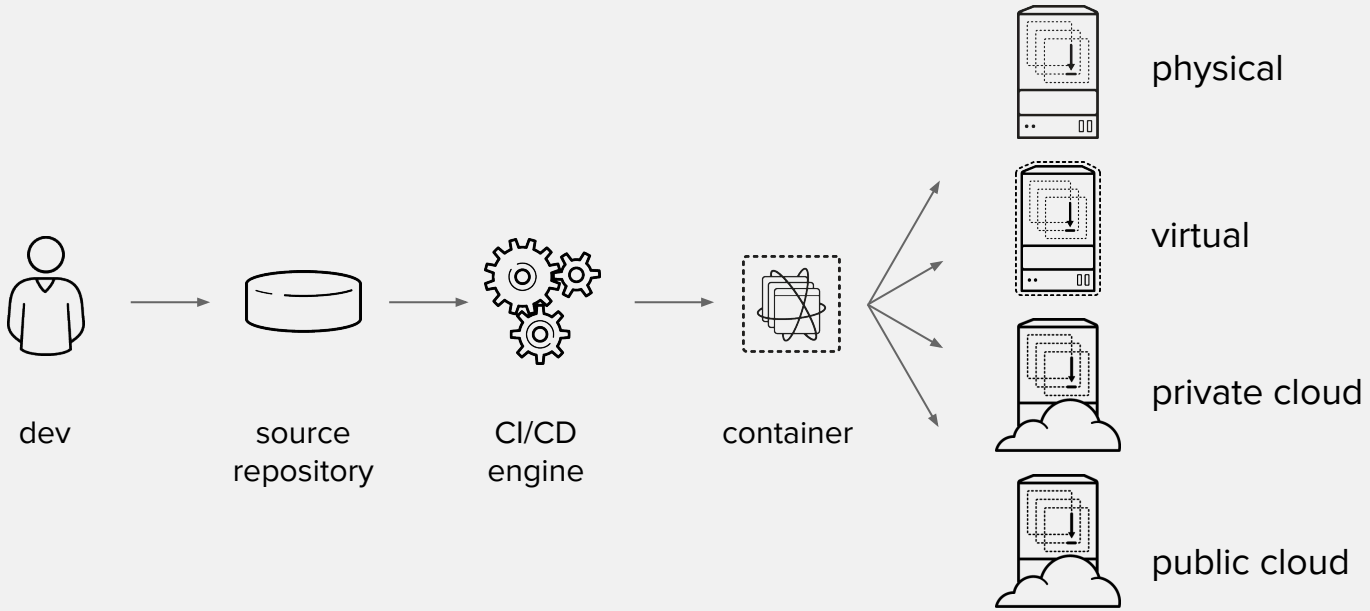
BUILDS

- Webhook triggers: build the app image whenever the code changes
- Image trigger: build the app image whenever the base language or app runtime changes
- Build hooks: test the app image before pushing it to an image registry

DEPLOYMENTS

- Deployment triggers: redeploy app containers whenever configuration changes or the image changes in the OpenShift integrated registry or upstream registries

CONTINUOUS DELIVERY WITH CONTAINERS

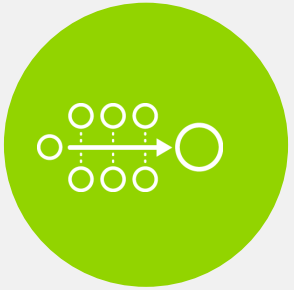


DevOps Excellence Awards 2017

OPENSHIFT LOVES CI/CD

JENKINS-AS-A SERVICE ON OPENSHIFT

HYBRID JENKINS INFRA WITH OPENSHIFT

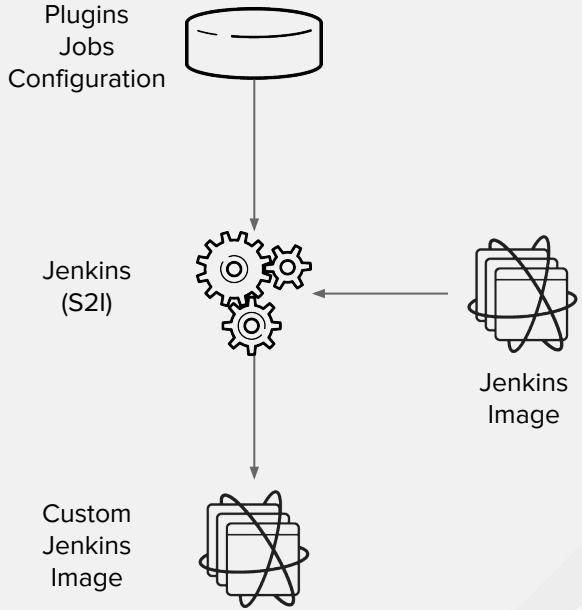


EXISTING CI/CD DEPLOY TO OPENSHIFT

redhat.

JENKINS-AS-A-SERVICE ON OPENSHIFT

- Certified Jenkins images with pre-configured plugins
  - Provided out-of-the-box
  - Follows Jenkins 1.x and 2.x LTS versions
- Jenkins S2I Builder for customizing the image
  - Install Plugins
  - Configure Jenkins
  - Configure Build Jobs
- OpenShift plugins to integrate authentication with OpenShift and also CI/CD pipelines
- Dynamically deploys Jenkins agent containers

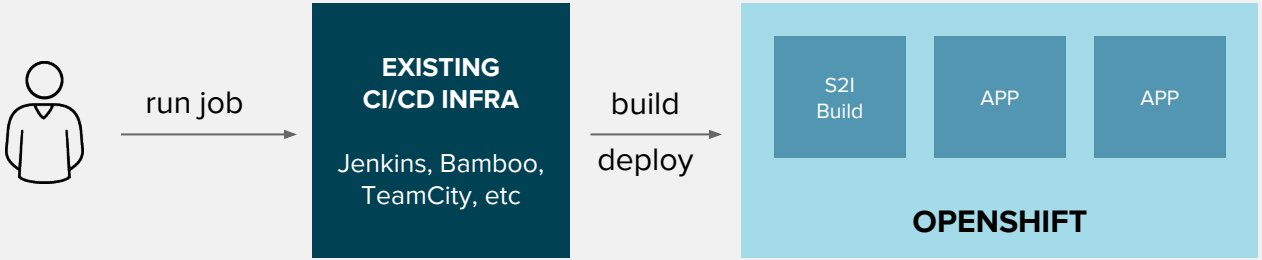


HYBRID JENKINS INFRA WITH OPENSHIFT

- Scale existing Jenkins infrastructure by dynamically provisioning Jenkins agents on OpenShift
- Use Kubernetes plug-in on existing Jenkin servers

EXISTING CI/CD DEPLOY TO OPENSHIFT

- Existing CI/CD infrastructure outside OpenShift performs operations against OpenShift
  - OpenShift Pipeline Jenkins Plugin for Jenkins
  - OpenShift CLI for integrating other CI Engines with OpenShift
- Without disrupting existing processes, can be combined with previous alternative



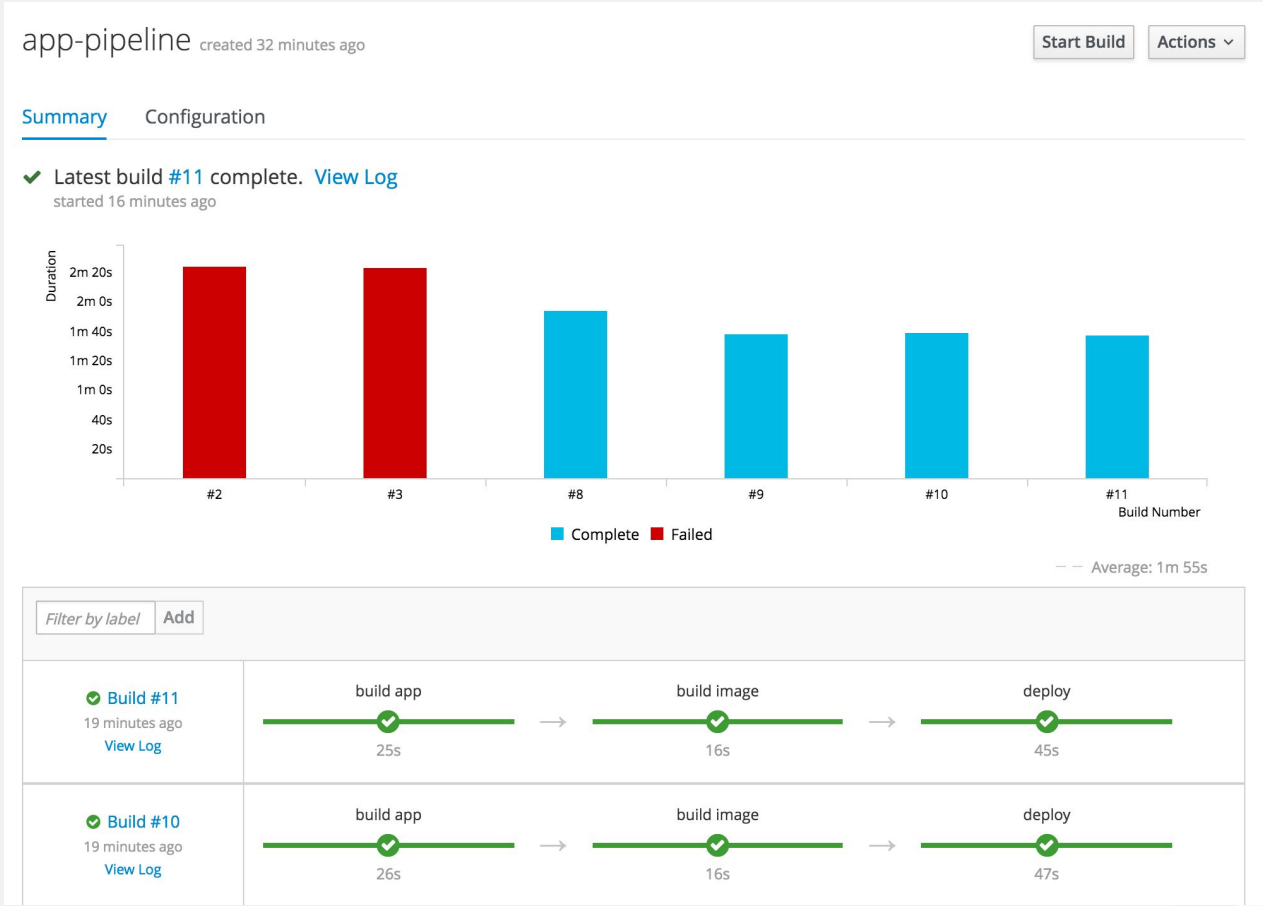
OPENSHIFT PIPELINES

- OpenShift Pipelines allow defining a CI/CD workflow via a Jenkins pipeline which can be started, monitored, and managed similar to other builds
- Dynamic provisioning of Jenkins agents
- Auto-provisioning of Jenkins server
- OpenShift Pipeline strategies
  - Embedded Jenkinsfile
  - Jenkinsfile from a Git repository

```
apiVersion: v1
kind: BuildConfig
metadata:
  name: app-pipeline
spec:
  strategy:
    type: JenkinsPipeline
    jenkinsPipelineStrategy:
      jenkinsfile: |-
        node('maven') {
          stage('build app') {
            git url: 'https://git/app.git'
            sh "mvn package"
          }
          stage('build image') {
            sh "oc start-build app --from-file=target/app.jar
          }
          stage('deploy') {
            openshiftDeploy deploymentConfig: 'app'
          }
        }
```

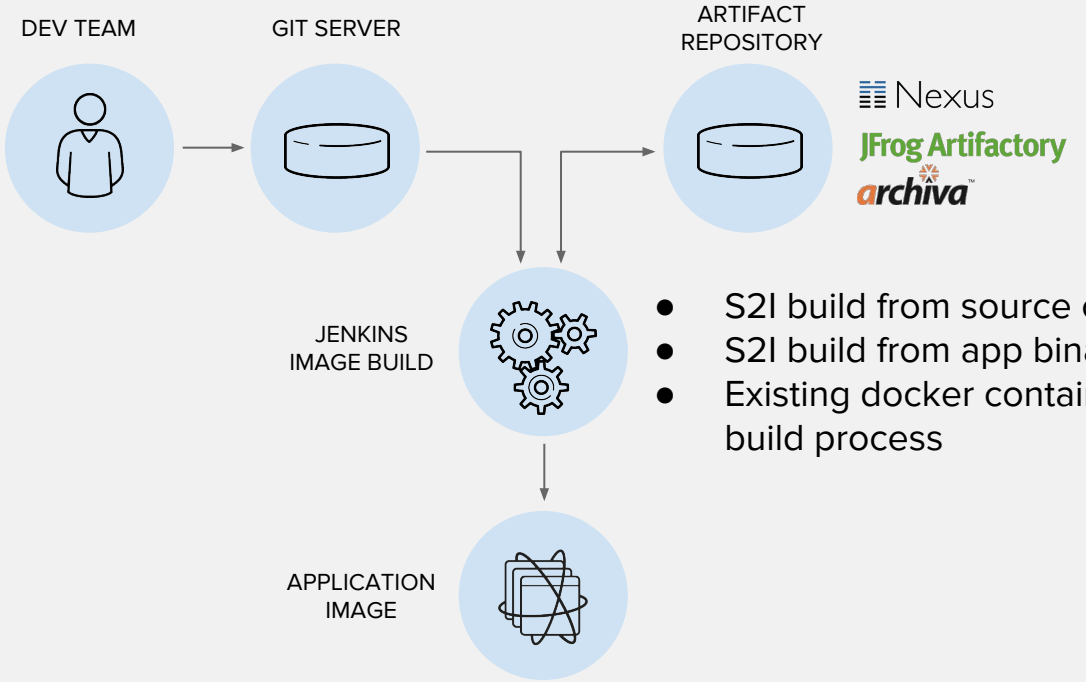
Provision a Jenkins agent for running Maven

OpenShift Pipelines in Web Console



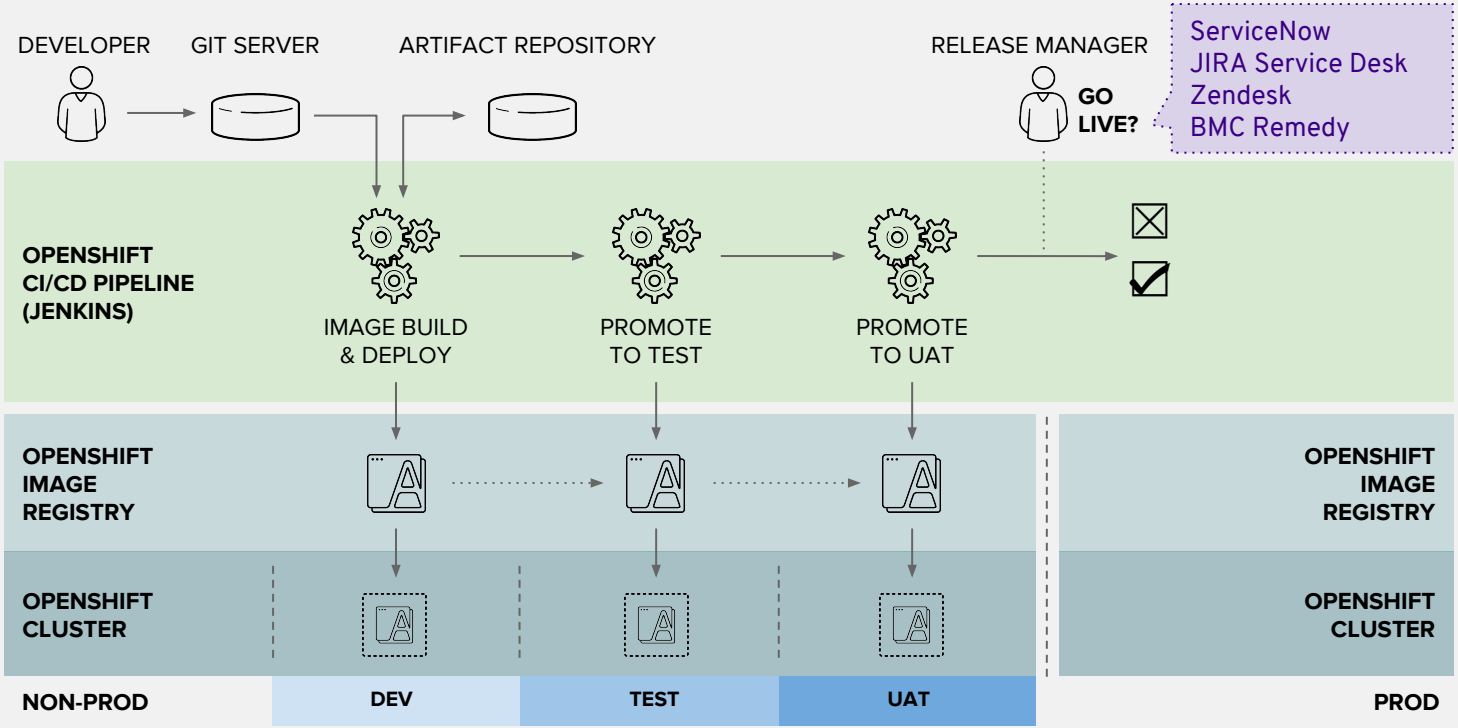
redhat.

CONTINUOUS DELIVERY PIPELINE

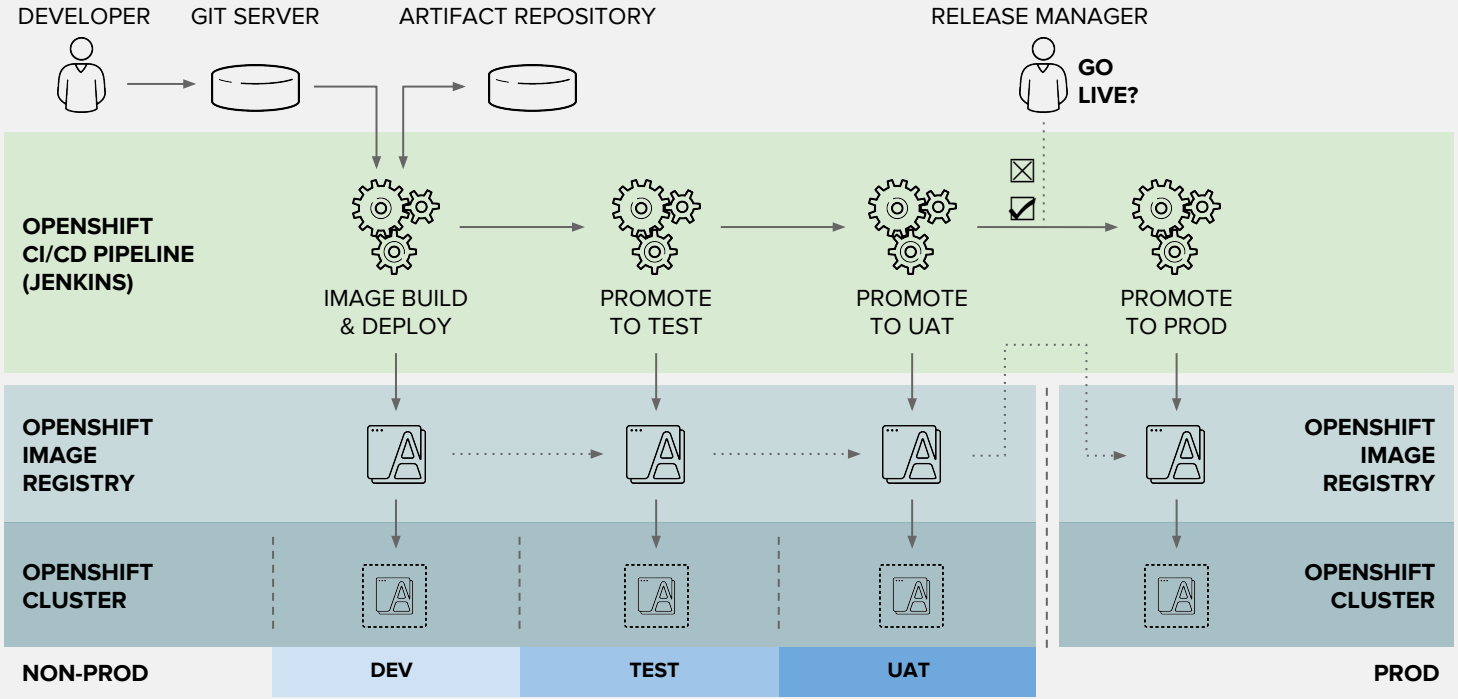


- S2I build from source code
- S2I build from app binary
- Existing docker container image build process

CONTINUOUS DELIVERY PIPELINE

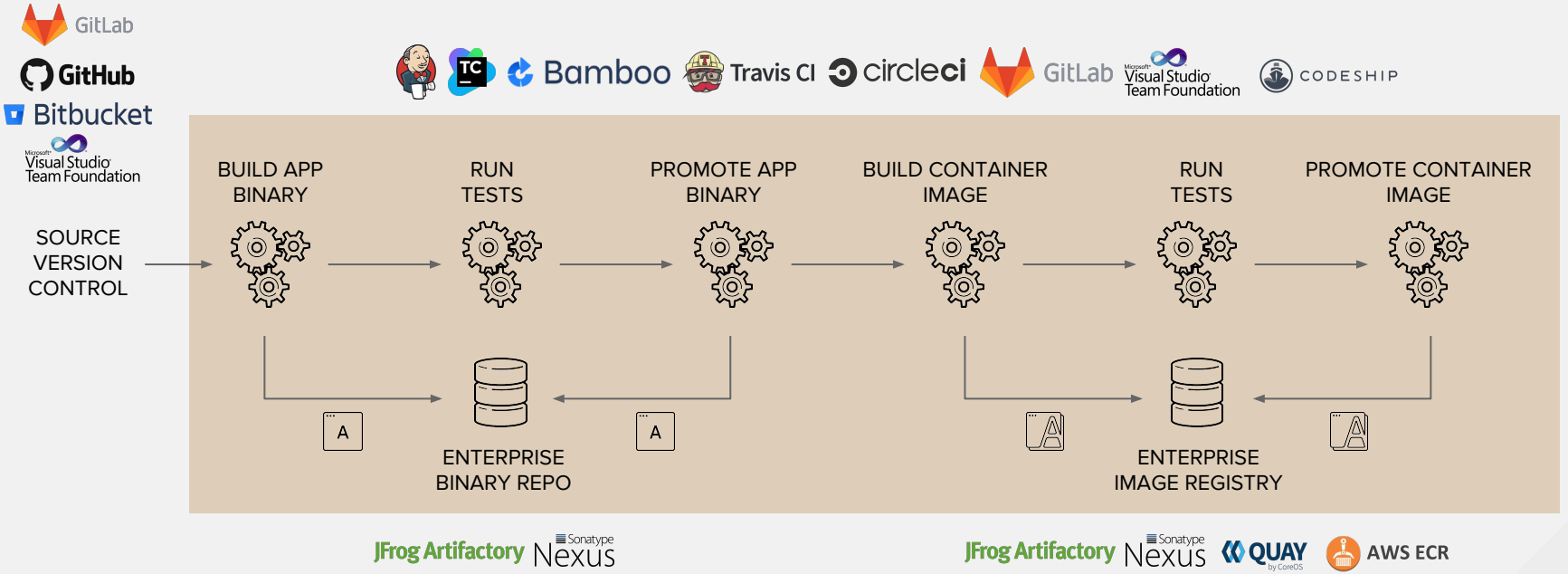


CONTINUOUS DELIVERY PIPELINE

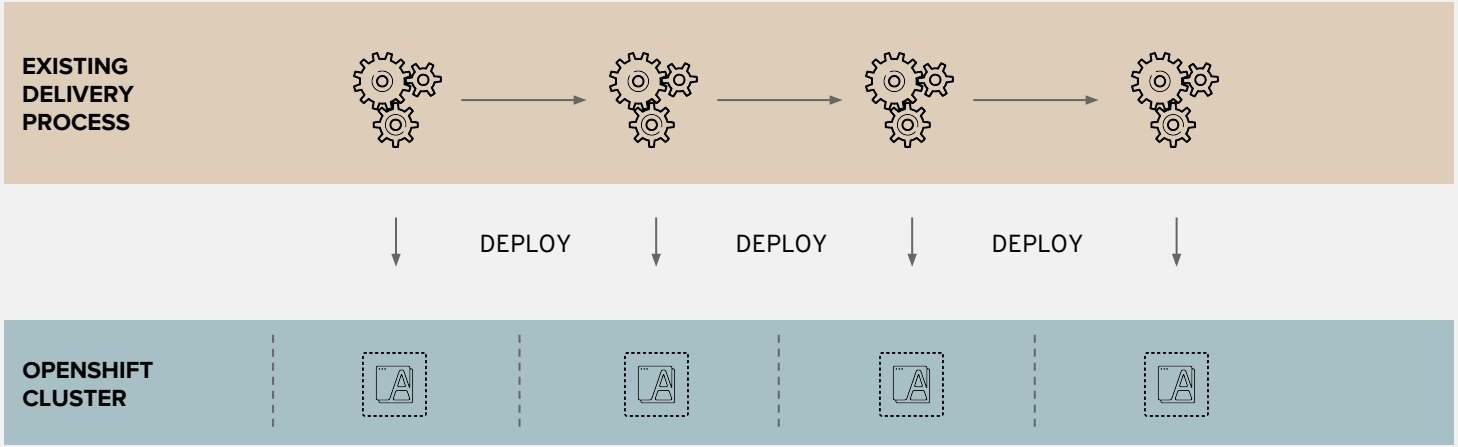


BUT...
SOME TEAMS ALREADY HAVE AUTOMATED DELIVERY PIPELINES

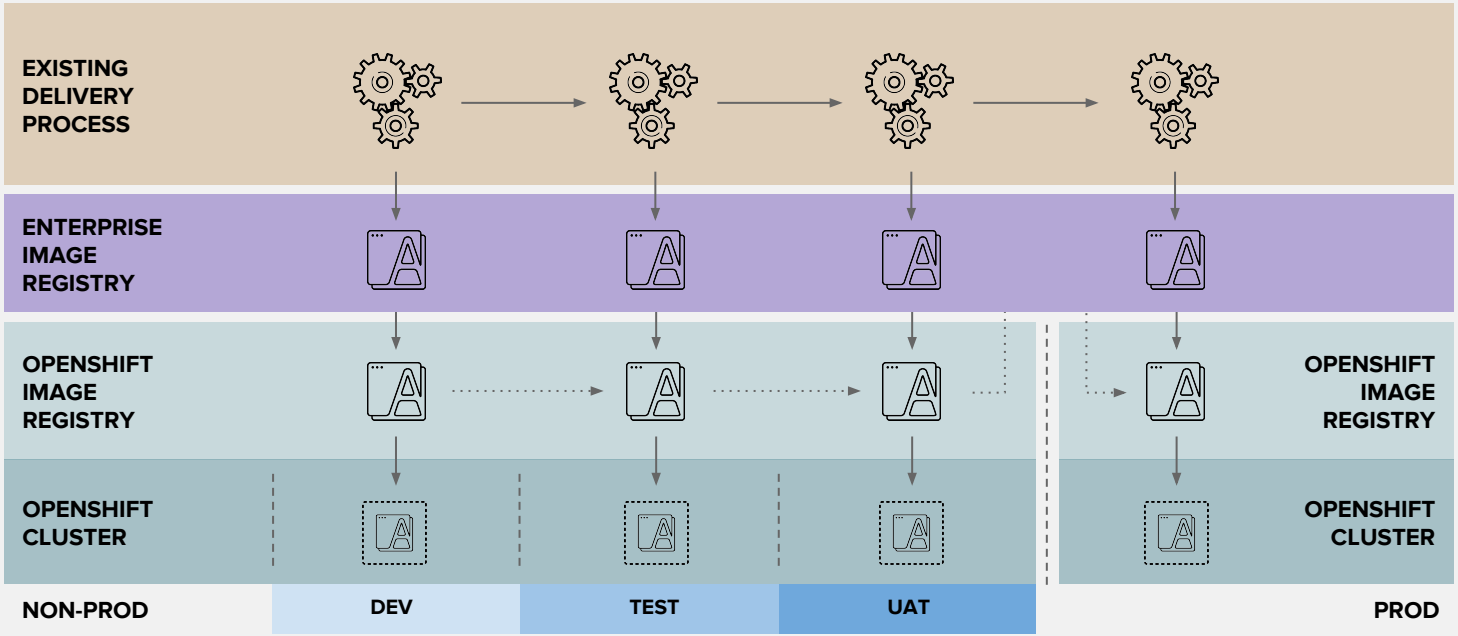
WHAT IF THERE ARE EXISTING DELIVERY PROCESSES?



ENRICHING EXISTING DELIVERY PROCESSES WITH OPENSHIFT

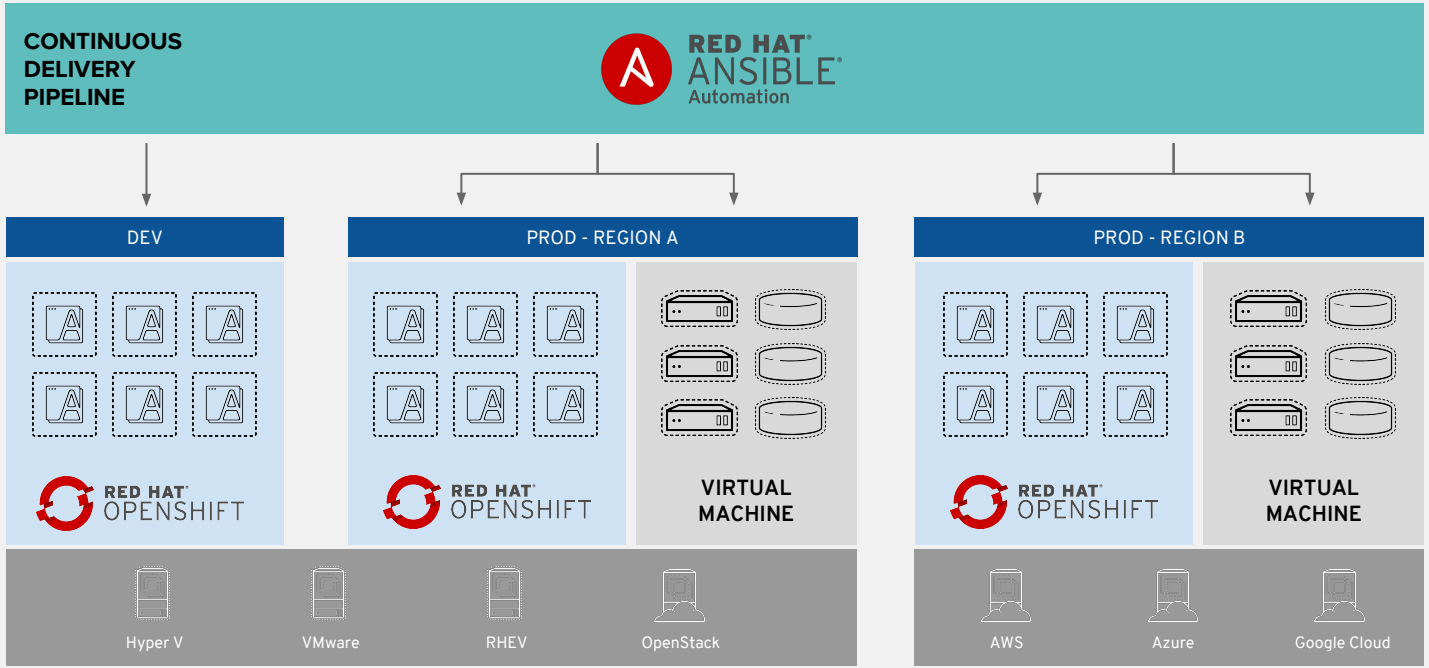


ENRICHING EXISTING DELIVERY PROCESSES WITH OPENSHIFT



HYBRID APPLICATION AUTOMATION WITH OPENSHIFT AND ANSIBLE

HYBRID APPLICATION AUTOMATION WITH OPENSHIFT AND ANSIBLE



redhat.

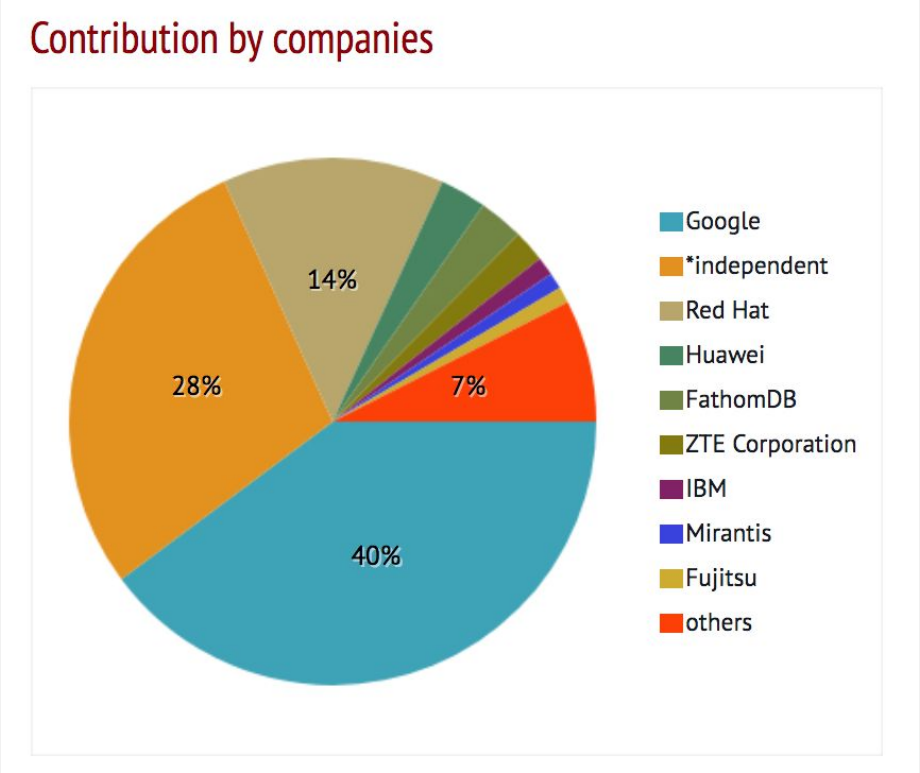
THANK YOU

Appendices

- What are containers, and why do you need them
- OpenShift momentum
- Comparing OpenShift vs Community Projects
- What's included with an OpenShift subscription
- OpenShift Container Engine
- Automation with Operators in OpenShift
- OpenShift Service Mesh (Tech Preview)
- Key Red Hat alliances and partnerships
- Getting started with Red Hat OpenShift
- Press and analyst coverage

Appendix:
What are containers & why do you need them?

KUBERNETES PROJECT CONTRIBUTIONS



#1 - Google - 41,649
#2 - Red Hat - 14,410
#6 - IBM - 1230
#9 - CoreOS - 964*
#10 - Microsoft - 728
#13 - VMware - 433
#15 - Intel - 400
#23 - Cisco - 192
#26 - Pivotal - 141
#41 - Oracle - 36
#56 - Docker - 14
Amazon/AWS - ?

* Most CoreOS commits were done using personal email addresses (Independent)

RED HAT CONTRIBUTIONS TO KUBERNETES

Operators Framework | ClusterRole Aggregation | RBAC Authorization | StatefulSets | Init Containers | Rolling Update Status | Pod Security Policy Limits | Memory based Pod Eviction | Quota Controlled Services | 1,000+ Nodes | Dynamic PV Provisioning | Multiple Schedulers | SECCOMP | Audit | Job Scheduler | Access Review API | Whitelisting Sysctls | Secure Cluster Policy | Evict Pods Disk IO | Storage Classes | Azure Data Disk | etcdv3 | RBAC API | Auth to kubelet API | Pod-level cGroups QoS | Kublet Eviction Model | RBAC | Storage Class | CustomResourceDefinitions | API Aggregation | Encrypted secrets in etcd | Limit Node Access | HPA Status Conditions | Network Policy | CRI Validation Test Suite | Local Persistent Storage | Audit Logging |

RED HAT-LED KUBERNETES SIGs & WGs

17 of 40 GROUPS

API MACHINERY	AWS	APPS	ARCHITECTURE	AUTH	AUTO SCALING
AZURE	BIG DATA	CLI	CLUSTER LIFECYCLE	CLUSTER OPS	CONTRIBUTOR EXPERIENCE
DOCS	INSTRUMENTATION	MULTI CLUSTER	NETWORK	NODE	ON-PREM
OPENSTACK	PRODUCT MANAGEMENT	RELEASE	SCALABILITY	SCHEDULING	SERVICE CATALOG
STORAGE	TESTING	UI	WINDOWS	APP DEF	CLUSTER API
CONTAINER IDENTITY	KUBEADM ADOPTION	RESOURCE MANAGEMENT	IOT EDGE	POLICY	

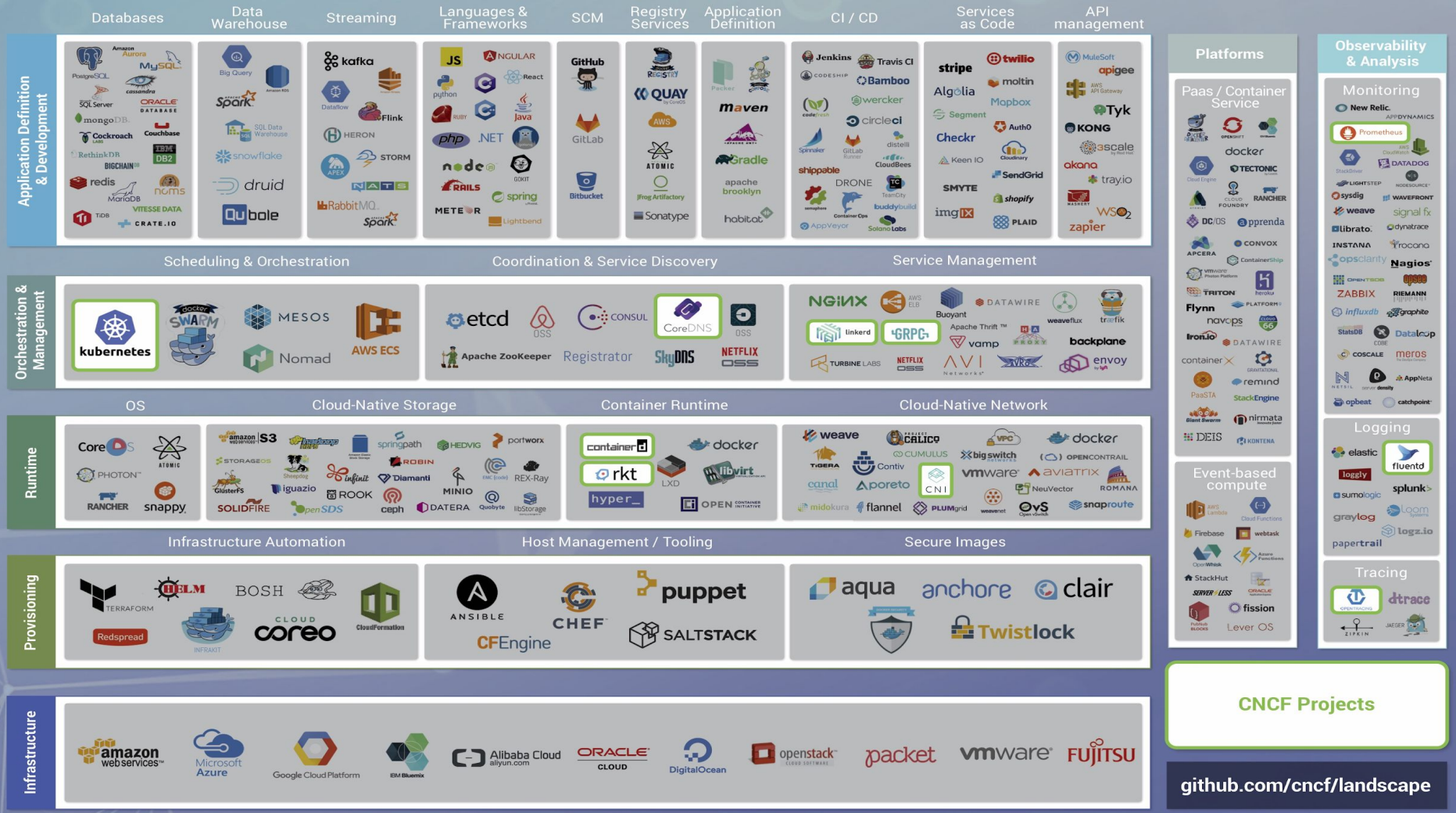
The Kubernetes platform for developers

Photo: rawpixel on Unsplash

Developers want to be productive and have choice

Choice of architectures
Choice of programming languages
Choice of databases
Choice of application services
Choice of development tools
Choice of build and deploy workflows

They don't want to have to worry about the infrastructure.


Databases
Data Warehouse
Streaming
Languages & Frameworks
SCM
Registry Services
Application Definition
CI / CD
Services as Code
API management
Application Definition & Development
Scheduling & Orchestration
Coordination & Service Discovery
Service Management
Orchestration & Management
kubernetes
MESOS
Nomad
AWS ECS
etcd
CONSUL
CoreDNS
Apache ZooKeeper
Registrator
SkyDNS
NETFLIX OSS
NGINX
linkerd
gRPC
Buoyant
DATAWIRE
Apache Thrift
vamp
backplane
envoy
OS
Cloud-Native Storage
Container Runtime
Cloud-Native Network
Runtime
RANCHER
container
rkt
hyper_
docker
LXD
libvirt
OPEN CONTAINER INITIATIVE
weave
CALICO
CUMULUS
big switch
OPENCONTRAIL
Contiv
VMware
aviatrix
CNI
NeuVector
ROMANA
Aporeto
canal
flannel
PLUMgrid
OvS
snaproute
Infrastructure Automation
Host Management / Tooling
Secure Images
Provisioning
TERRAFORM
HELM
BOSH
CLOUD FOUNDRY
Redspread
CloudFormation
ANSIBLE
CHEF
CFEngine
puppet
SALTSTACK
aqua
anchore
clair
Twistlock
Infrastructure
amazon web services
Microsoft Azure
Google Cloud Platform
IBM Bluemix
Alibaba Cloud
ORACLE CLOUD
DigitalOcean
openstack
packet
vmware
FUJITSU
Platforms
Paas / Container Service
Event-based compute
Observability & Analysis
Monitoring
New Relic.
Prometheus
DATADOG
sysdig
WAVEFRONT
weave
signal fx
Nagios
ZABBIX
RIEMANN
graphite
Logging
elastic
fluentd
loggly
splunk
sumologic
graylog
papertrail
Tracing
OPENTRACING
dtrace
JAEGER
ZIPKIN
CNCF Projects
github.com/cncf/landscape


Databases
Data Warehouse
Streaming
Languages & Frameworks
SCM
Registry Services
Application Definition
CI / CD
Services as Code
API management
Application Definition & Development
Platforms
Paas / Container Service
Observability & Analysis
Monitoring
Tracing
Infrastructure Automation
Host Management / Tooling
Secure Images
Provisioning
Infrastructure
CNCF Projects
github.com/cncf/landscape
THE CLOUD-NATIVE APP DEV CHALLENGE

THE POWER OF THE OPENSHIFT ECOSYSTEM

RED HAT PORTFOLIO
Optimized for Containers

- RED HAT OPENSHIFT Application Runtimes
- RED HAT JBOSS WEB SERVER
- RED HAT JBOSS ENTERPRISE APPLICATION PLATFORM
- RED HAT DATA GRID
- RED HAT AMQ
- RED HAT FUSE
- RED HAT MOBILE
- RED HAT ANSIBLE Engine
- RED HAT QUAY CONTAINER REGISTRY
- RED HAT DECISION MANAGER
- RED HAT PROCESS AUTOMATION MANAGER
- RED HAT 3SCALE API MANAGEMENT
- RED HAT OPENSHIFT Container Storage

THIRD-PARTY ISV
Red Hat Container Catalog (100s certified)

IBM, Microsoft, SAP, New Relic, Couchbase, Crunchy Enterprise PostgreSQL, Sysdig, f5, Veritas, Zabbix, NetApp, Sonatype, JFrog, dynatrace, nuagenetworks

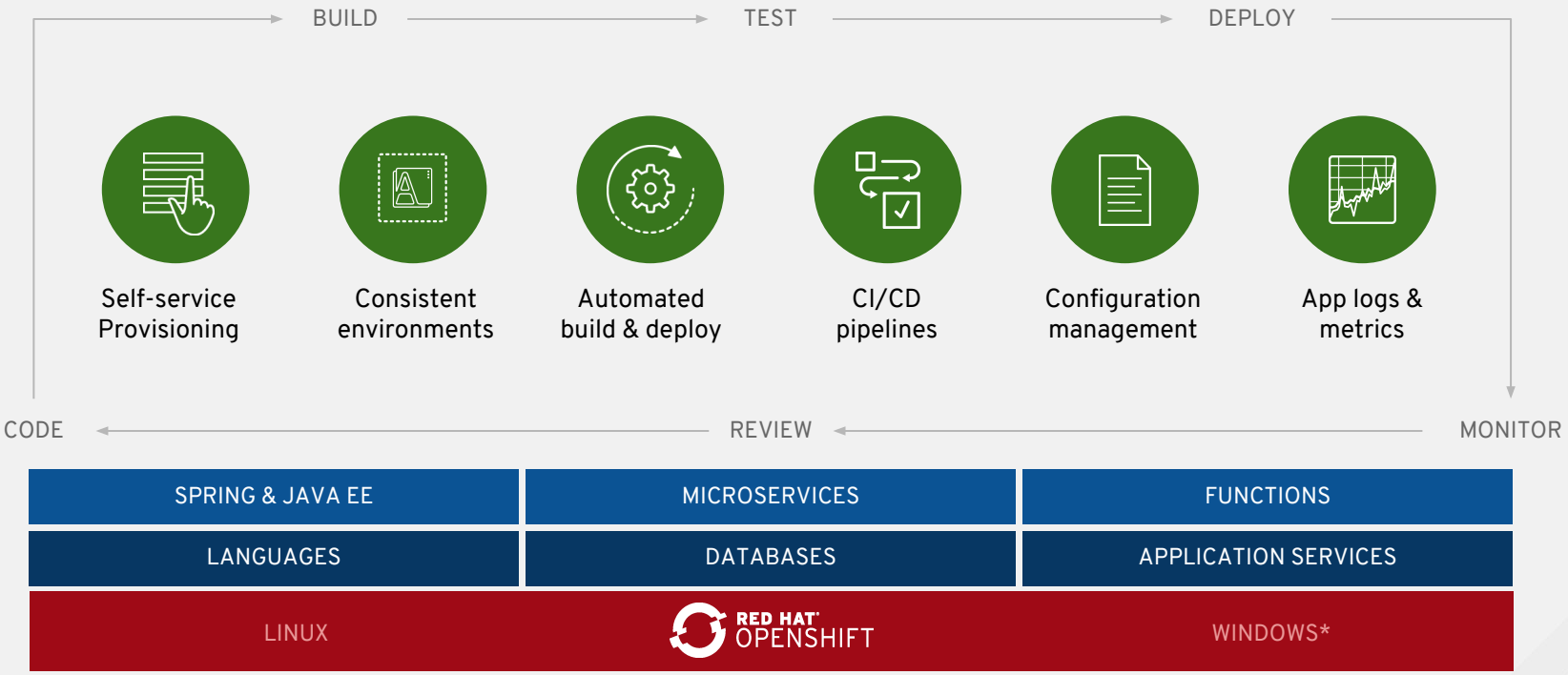
CLOUD SERVICES
Open Service Broker

amazon web services, Microsoft Azure, Google Cloud

RED HAT OPENSHIFT

RED HAT ENTERPRISE LINUX ECOSYSTEM
Hardware, Virtualization, Cloud and Service Provider Certifications

HOW OPENSHIFT ENABLES
DEVELOPER PRODUCTIVITY



* coming soon