A look at a container platform: What's in the box?

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@laelbrecht

Red Hat

Why have containers become so popular?

Organizations require an evolution in....

Applications
New ways of developing, delivering, and integrating applications

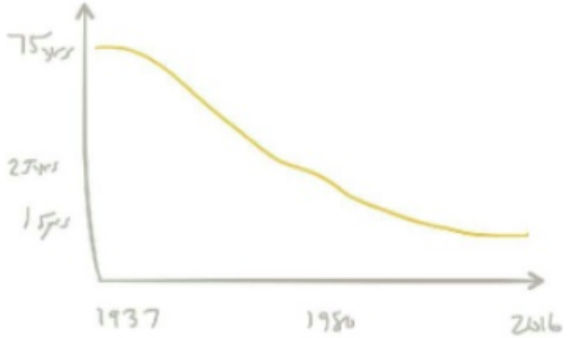
Platform
Modernize existing and build new cloud-based infrastructure

Process
More agile process across both IT and the business

Why is Innovation Important?

If change is happening on the outside faster than on the inside the end is in sight.

Jack Welch, former CEO, GE



S&P company life expectancy

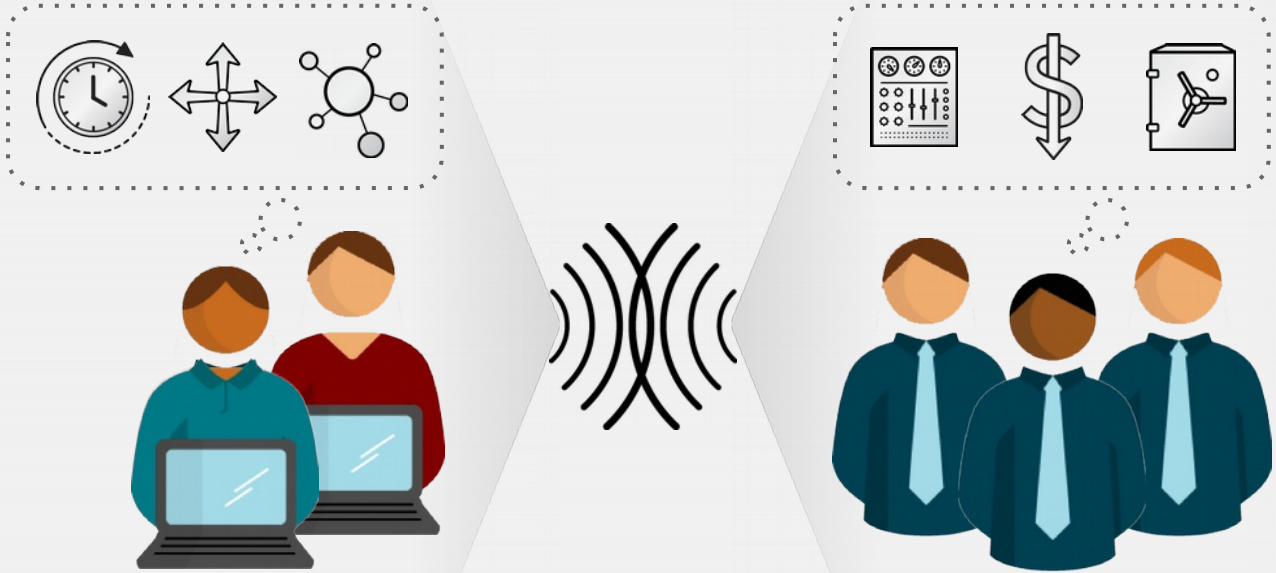
Photo: rawpixel on Unsplash

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

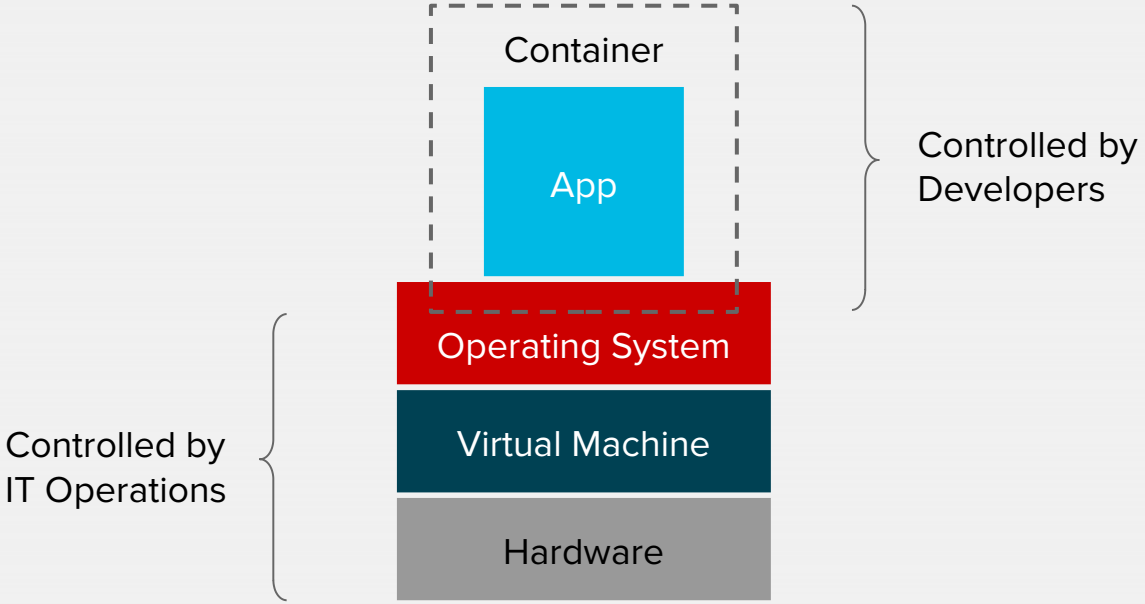
They don't want to have to worry about the infrastructure.

A PROBLEM



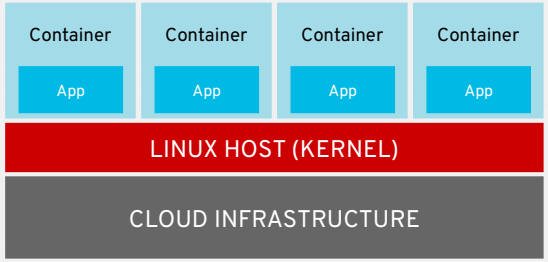
A key ingredient of the Solution

Adopting a container strategy will allow applications to be easily shared, run and deployed in a controlled yet flexible manner.


Container
App
Operating System
Virtual Machine
Hardware
Controlled by
Developers
Controlled by
IT Operations

WHAT ARE CONTAINERS?

CONTAINER BENEFITS FOR MULTIPLE TEAMS



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

- SIMPLIFY PACKAGING
- SIMPLIFY TESTING

IT OPERATIONS

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

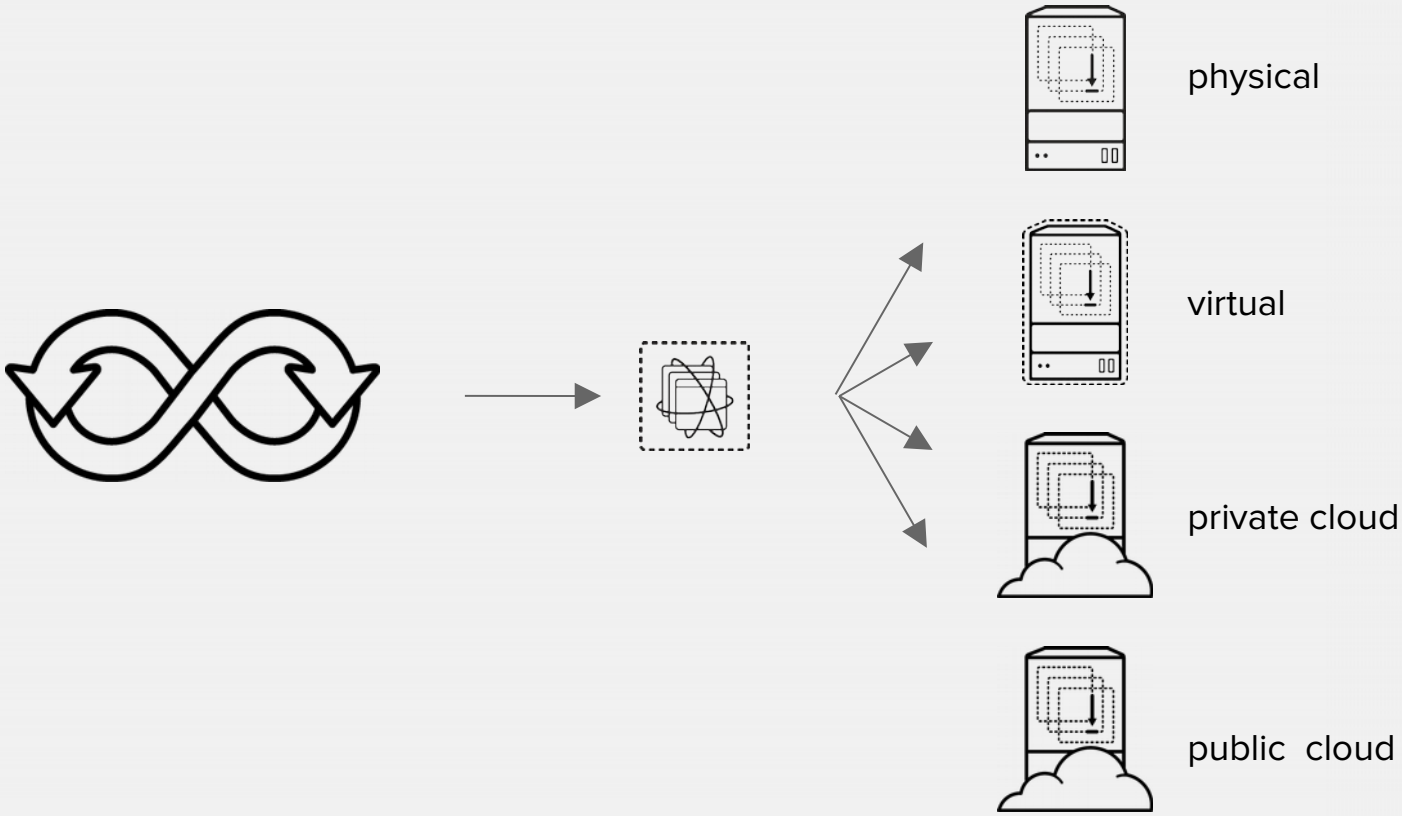
BUSINESS LEADERS

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

```
$ docker build -t app:v1 .
```

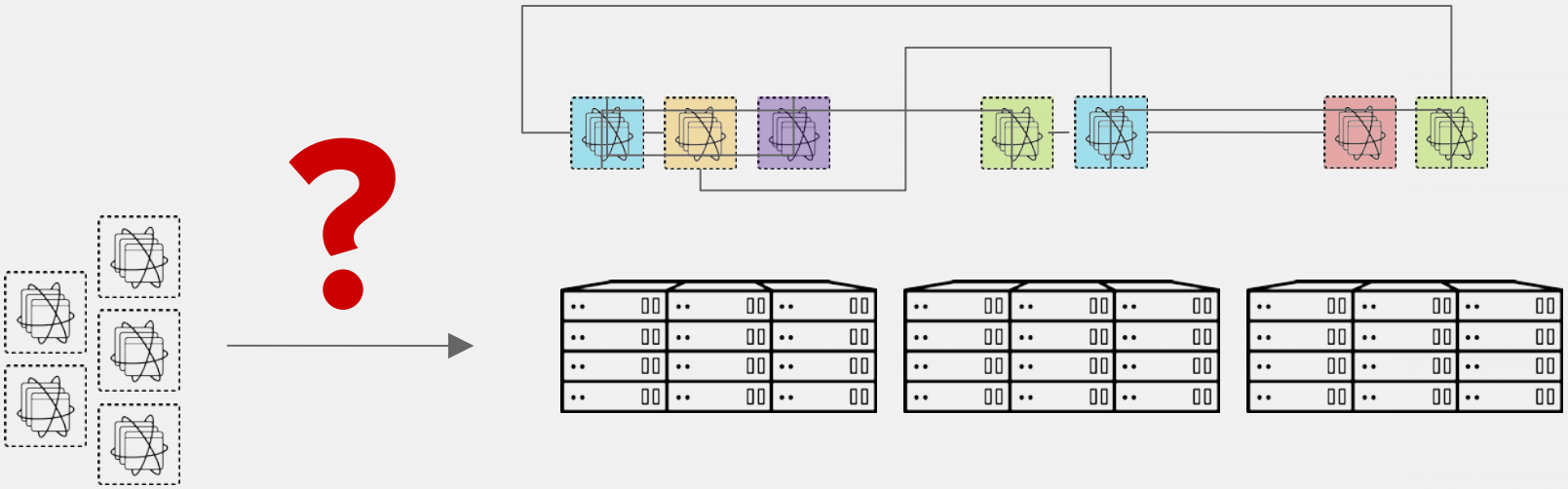
```
$ docker build -t app:v1 .

$ docker run app:v1
```


physical
virtual
private cloud
public cloud

```
$ docker build -t app/frontend:v1 .
$ docker build -t app/backend:v1 .
$ docker build -t app/database:v1 .
$ docker build -t app/cache:v1 .
$ docker build -t app/messaging:v1 .
```

```
$ docker run app/frontend:v1 link-to-backend
$ docker run app/frontend:v1 link-to-backend
$ docker run app/backend:v1 link-to-db-cache-messaging
$ docker run app/backend:v1 link-to-db-cache-messaging
$ docker run app/database:v1
$ docker run app/cache:v1 link-to-db
$ docker run app/messaging:v1
```



WE NEED MORE THAN JUST CONTAINERS

Scheduling
Decide where to deploy containers

Lifecycle and health
Keep containers running despite failures

Discovery
Find other containers on the network

Monitoring
Visibility into running containers

Security
Control who can do what

Scaling
Scale containers up and down

Persistence
Survive data beyond container lifecycle

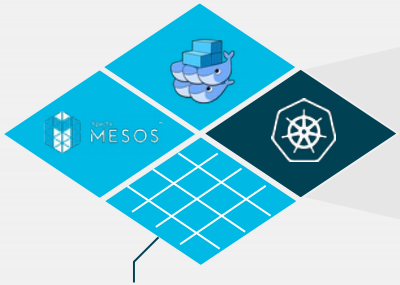
Aggregation
Compose apps from multiple containers

Kubernetes is an open-source system for automating deployment, operations, and scaling of containerized applications across multiple hosts

kubernetes

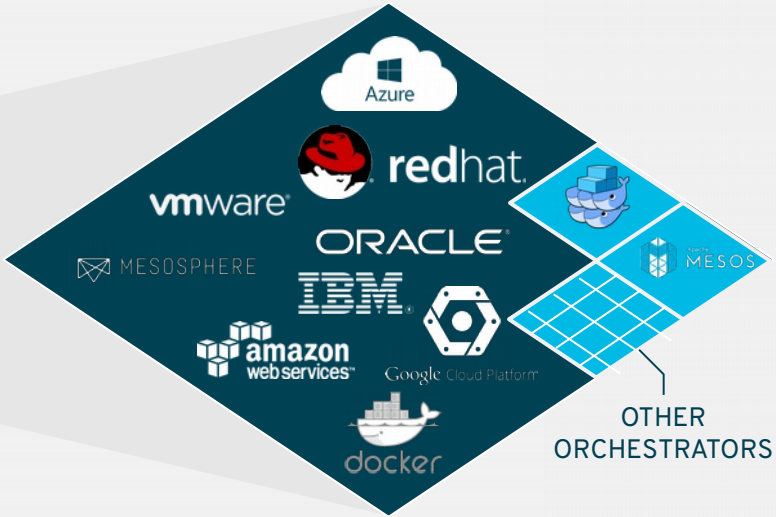
KUBERNETES IS THE CONTAINER ORCHESTRATION STANDARD

2 YEARS AGO
Fragmented landscape



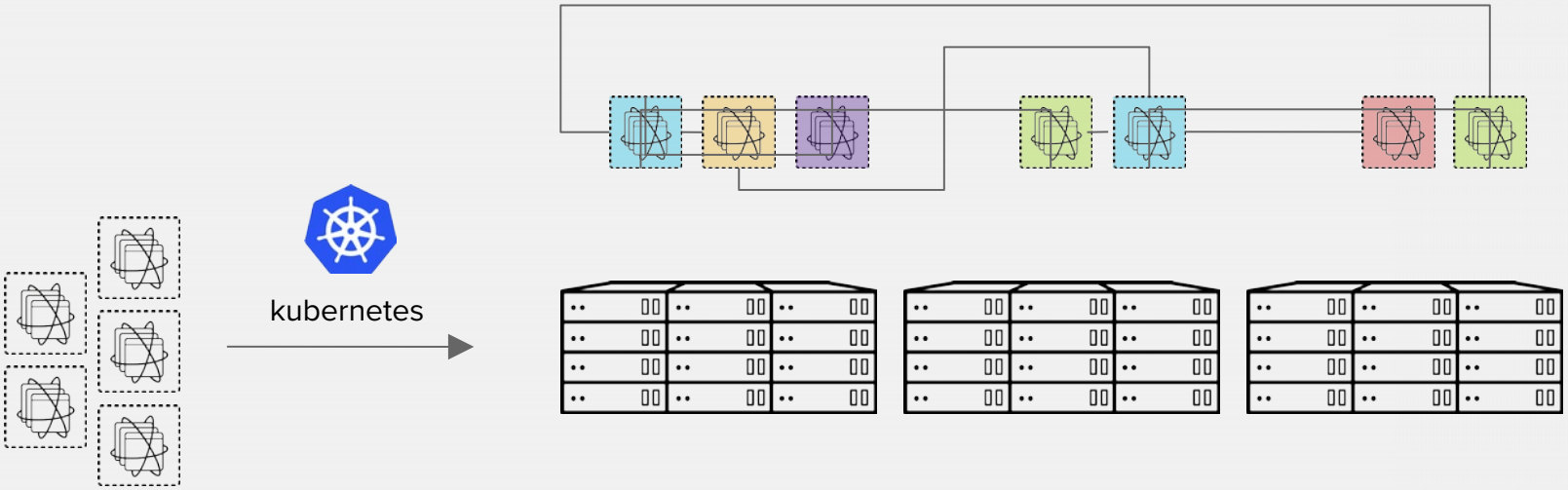
OTHER ORCHESTRATORS
(Cloud Foundry Diego,
Nomad, Blox, etc.)

TODAY
Kubernetes consolidation

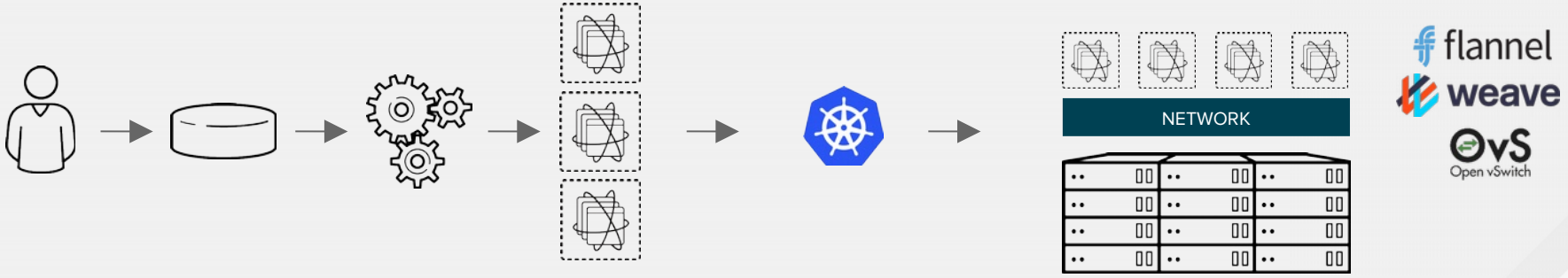


OTHER
ORCHESTRATORS

Red Hat bet on Kubernetes from the start. It has now become the dominant orchestration ecosystem

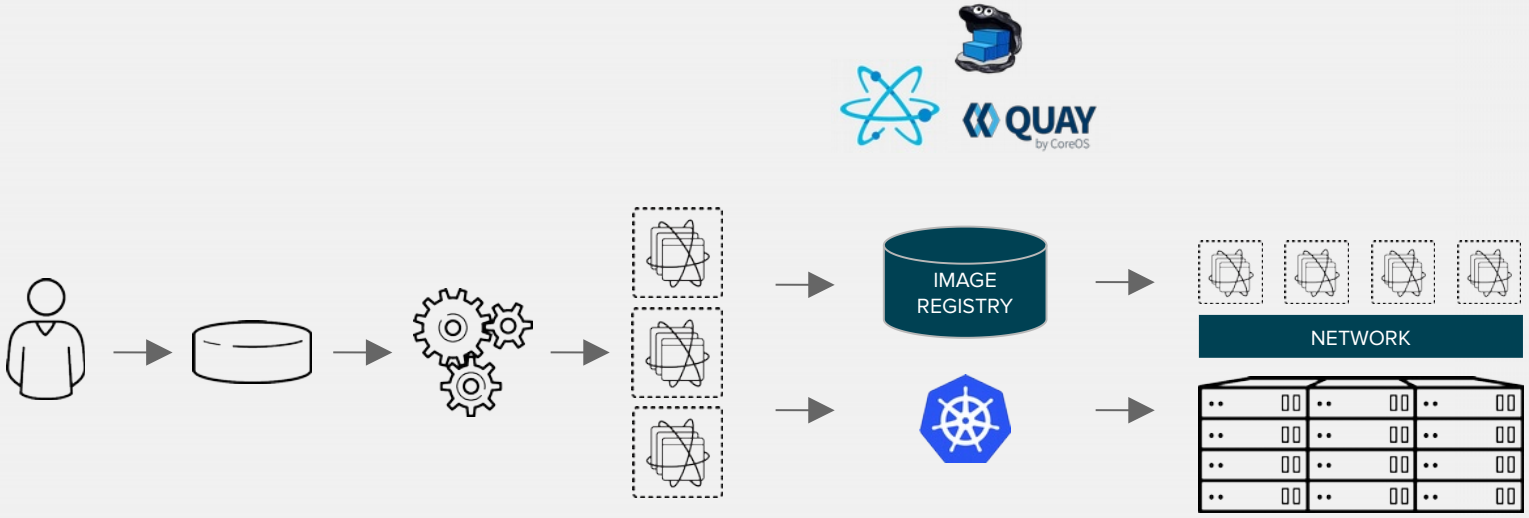

kubernetes

DEVOPS WITH CONTAINERS AND KUBERNETES



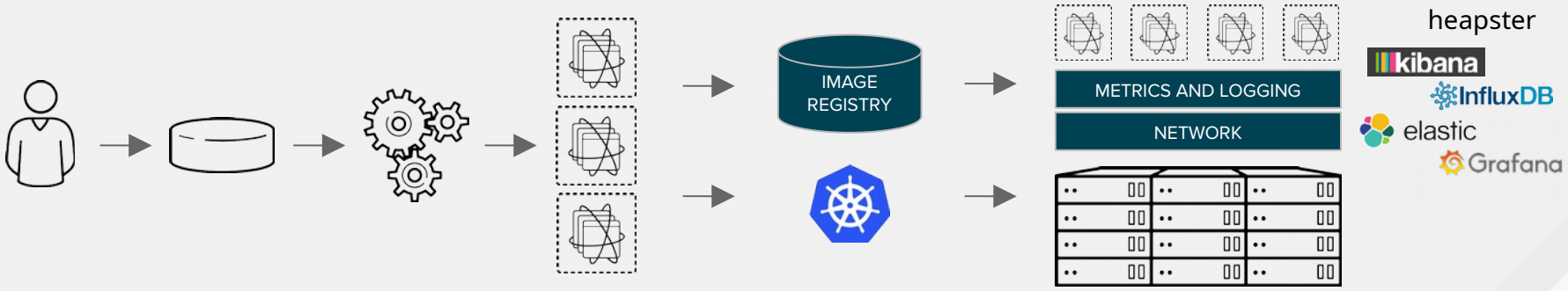
Not enough! Need networking

DEVOPS WITH CONTAINERS AND KUBERNETES



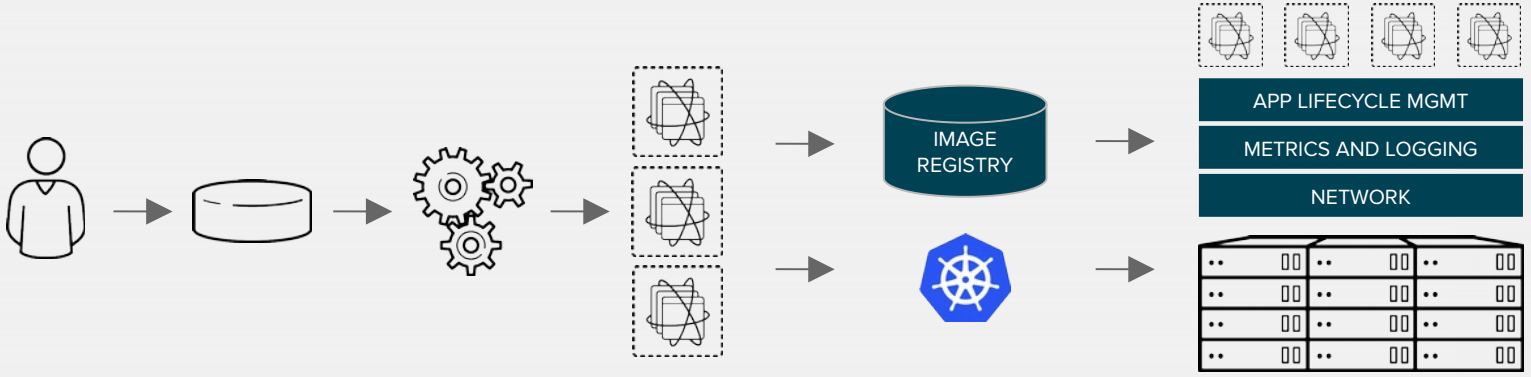
Not enough! Need an image registry

DEVOPS WITH CONTAINERS AND KUBERNETES



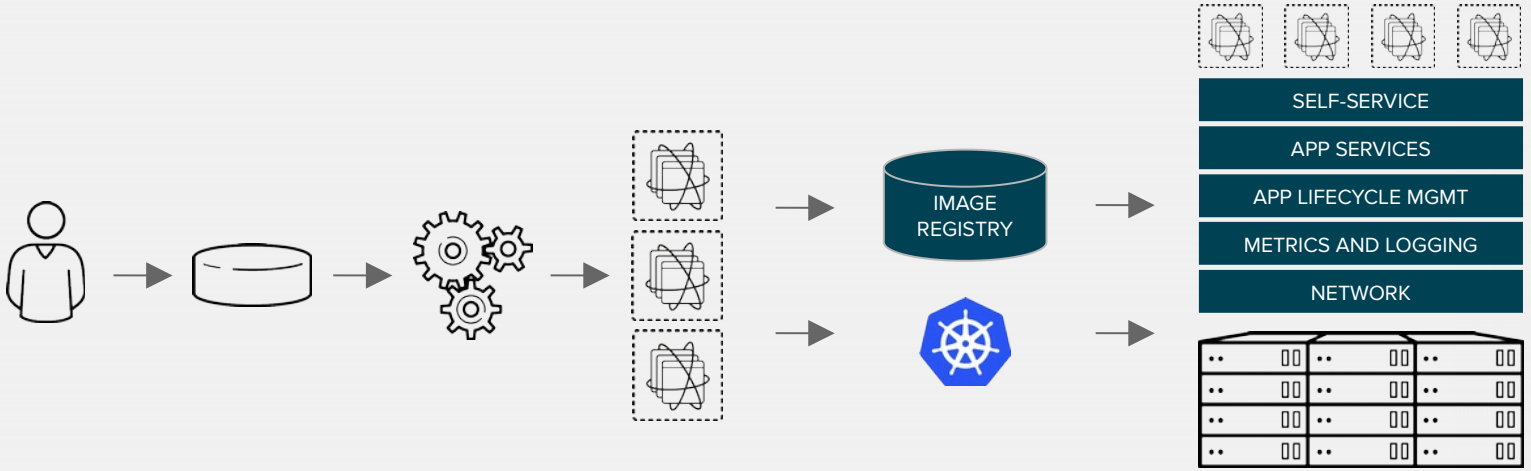
Not enough! Need metrics and logging

DEVOPS WITH CONTAINERS AND KUBERNETES



Not enough! Need application lifecycle management

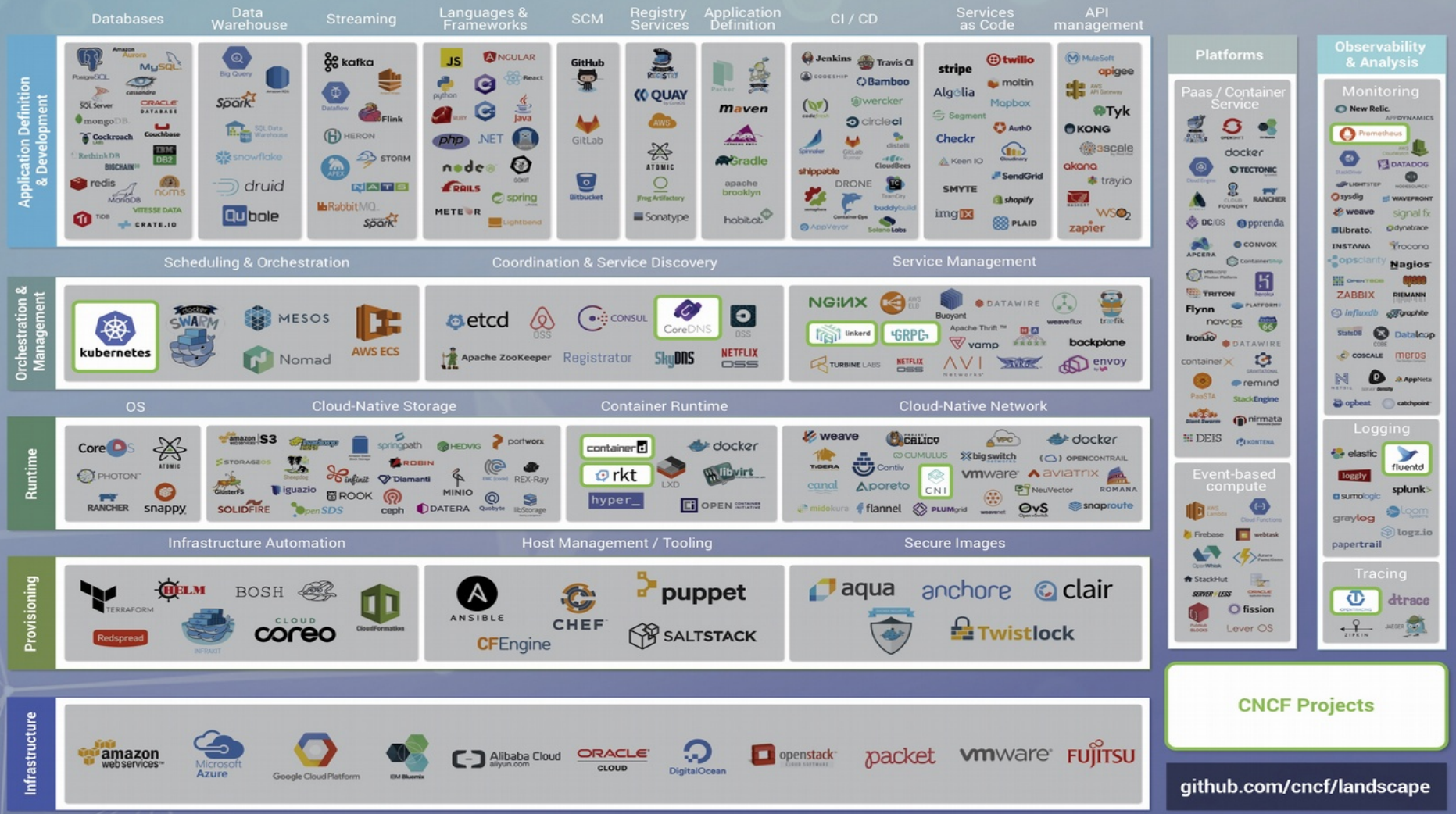
DEVOPS WITH CONTAINERS AND KUBERNETES



Not enough! Need self-service portal

NOT ENOUGH, THERE IS MORE!

Multi-tenancy	Teams and Collaboration
Routing & Load Balancing	Quota Management
CI/CD Pipelines	Image Build Automation
Role-based Authorization	Container Isolation
Capacity Management	Vulnerability Scanning
Infrastructure Visibility	Chargeback


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
DOCKER SWARM
MESOS
Nomad
AWS ECS
etcd
CONSUL
CoreDNS
Apache ZooKeeper
Registrator
SkyDNS
NETFLIX OSS
NGINX
linkerd
GRPC
Buoyant
DATAWIRE
vamp
backplane
envoy
OS
Cloud-Native Storage
Container Runtime
Cloud-Native Network
Runtime
CoreOS
PHOTON
RANCHER
snappy
container
rkt
hyper_
docker
LXD
libvirt
OPEN CONTAINER INITIATIVE
weave
CALICO
CUMULUS
big switch
OPENCONTRAIL
Contiv
vmware
aviatrix
canal
Aporeto
CNI
NeuVector
ROMANA
flannel
PLUMgrid
OvS
snaproute
Infrastructure Automation
Host Management / Tooling
Secure Images
Provisioning
TERRAFORM
HELM
BOSH
CLOUD coreo
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
docker
TECTONIC
RANCHER
DC/OS
pprenda
CONVOX
TRITON
Flynn
navops
DATAWIRE
container
remind
StackEngine
nirmata
DEIS
KONTENA
Event-based compute
Firebase
webtask
fission
Lever OS
Observability & Analysis
Monitoring
New Relic.
Prometheus
DATADOG
LIGHTSTEP
sysdig
WAVEFRONT
weave
signal fx
Librato.
dynatrace
INSTANA
Nagios
opsclarity
ZABBIX
RIEMANN
influxdb
graphite
StatsDB
Datadog
COSCALE
meros
AppNeta
opbeat
catchpoint
Logging
elastic
fluentd
loggly
splunk
sumologic
graylog
logz.io
papertrail
Tracing
dtrace
OPENTRACING
ZIPKIN
JAEGER
CNCF Projects
github.com/cncf/landscape

THE CLOUD-NATIVE APP DEV CHALLENGE

OperatorHub.io

Aqua Security Operator
provided by Aqua Security, Inc.

The Aqua Security Operator runs within Kubernetes clu

AWS Service Operator
provided by Amazon Web Services, Inc.

The AWS Service Operator allows you to manage AW

CockroachDB
provided by Helm Community

CockroachDB Operator based on the CockroachDB helm chart

Community Jaeger Operator
provided by CNCF

Provides tracing, monitoring and troubleshooting microservices-based

Couchbase Operator
provided by Couchbase

The Couchbase Autonomous Operator allows users to easily deploy, manage, and maint

Crunchy PostgreSQL Enterprise
provided by Crunchy Data

PostgreSQL is a powerful, open source object-relatio

Dynatrace OneAgent
provided by Dynatrace LLC

Install full-stack monitoring of Kubernetes clusters with the Dynatrace OneAgent.

etcd
provided by CNCF

Create and maintain highly-available etcd clusters on Kubernetes

Falco Operator
provided by Sysdig

Falco is a behavioral activity monitor designed to detect anomalous activity in your

Federation
provided by Red Hat

Gain Hybrid Cloud capabilities between your clusters with Kubernetes Federation.

Federator.ai
provided by ProphetStor Data Services, Inc.

Federator.ai Operator provides easy configuration and

Hazelcast Operator
provided by Hazelcast, Inc

Install Hazelcast Enterprise cluster.

infinispan
provided by Infinispan

Operator that creates and manages Infinispan clusters.

Instana Agent Operator
provided by Instana

Instana APM Agent

Istio
provided by Banzai Cloud

Installs and maintain Istio service mesh

Kiali Operator
provided by Kiali

Kong Operator
provided by Kong Inc

KubeVirt
provided by KubeVirt project

Microcks Operator
provided by Microcks.io

MongoDB
provided by MongoDB, Inc

Red Hat

THE KUBERNETES NEWS YOU DON'T WANT

TESLA

- K8s dashboard exposed
- AWS environment with telemetry data compromised
- Tesla's infrastructure was used for crypto mining

Unnecessary Costs

weightwatchers

- No security on K8s dashboard
- IT infrastructure credentials exposed
- Enabled access to a large part of Weight Watchers' network

Increased Risk

monzo

- K8S and etcd bug introduced to servers during update
- New features and changes deployed cause failures
- Restart backend components leading to full platform outage

Unrealized Value

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

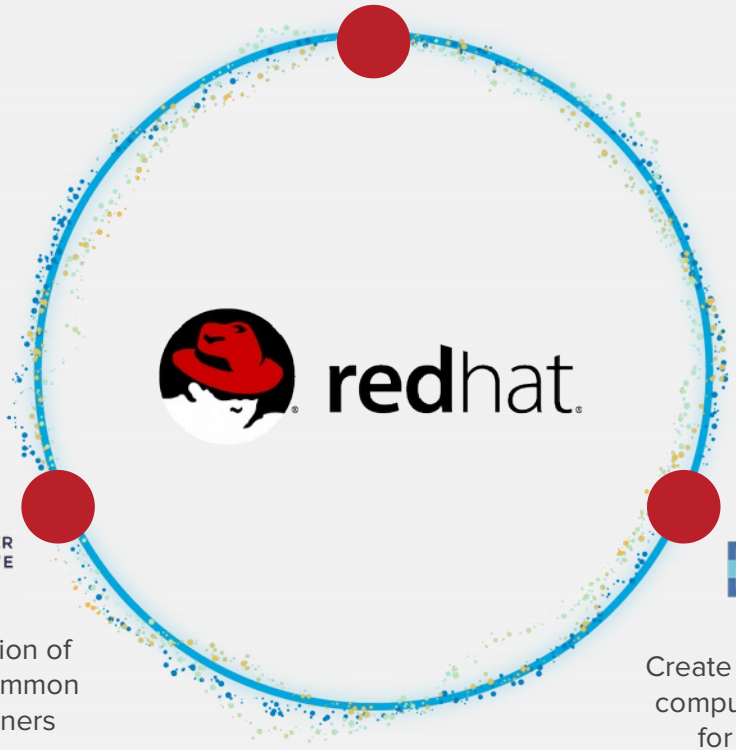
Source: The New Stack, The State of the Kubernetes Ecosystem, August 2017

Red Hat

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

Facilitating A Rich Container Ecosystem



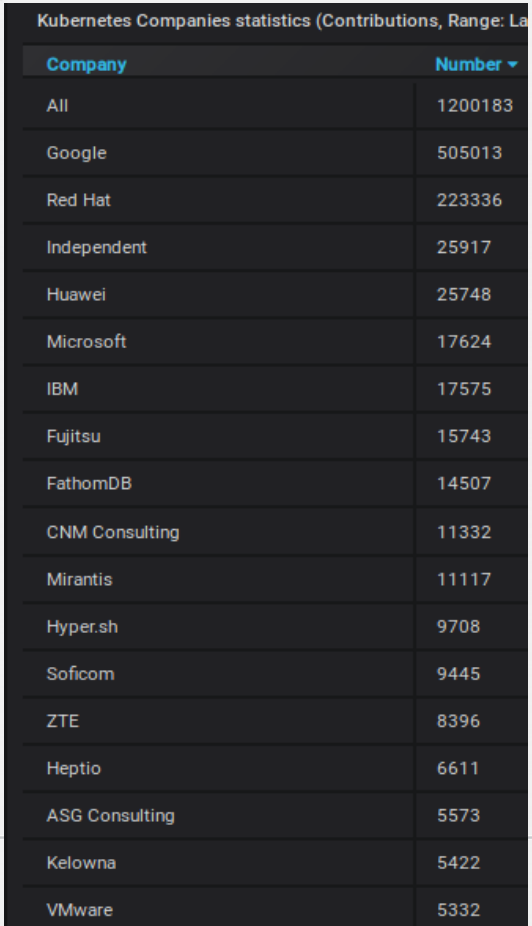
OPEN CONTAINER INITIATIVE

Represented by a broad coalition of industry leaders focused on common standards for software containers

CLOUD NATIVE COMPUTING FOUNDATION

Create and drive the adoption of a new computing paradigm that is optimized for modern distributed systems

KUBERNETES PROJECT CONTRIBUTIONS



Kubernetes Companies statistics (Contributions, Range: La

Company	Number
All	1200183
Google	505013
Red Hat	223336
Independent	25917
Huawei	25748
Microsoft	17624
IBM	17575
Fujitsu	15743
FathomDB	14507
CNM Consulting	11332
Mirantis	11117
Hyper.sh	9708
Soficom	9445
ZTE	8396
Heptio	6611
ASG Consulting	5573
Kelowna	5422
VMware	5332

Google – 505,013
Red Hat – 223,336
Independent – 25,917
Huawei – 25,748
Microsoft – 17,624
IBM – 17,575
Fujitsu – 15,743
FathomDB – 14,507
…

Source: Kubernetes Companies Statistics (https://k8s.devstats.cncf.io/d/9/ – July, 2018)

Red Hat

KUBERNETES SIGs - ENGINEERING LEADERSHIP

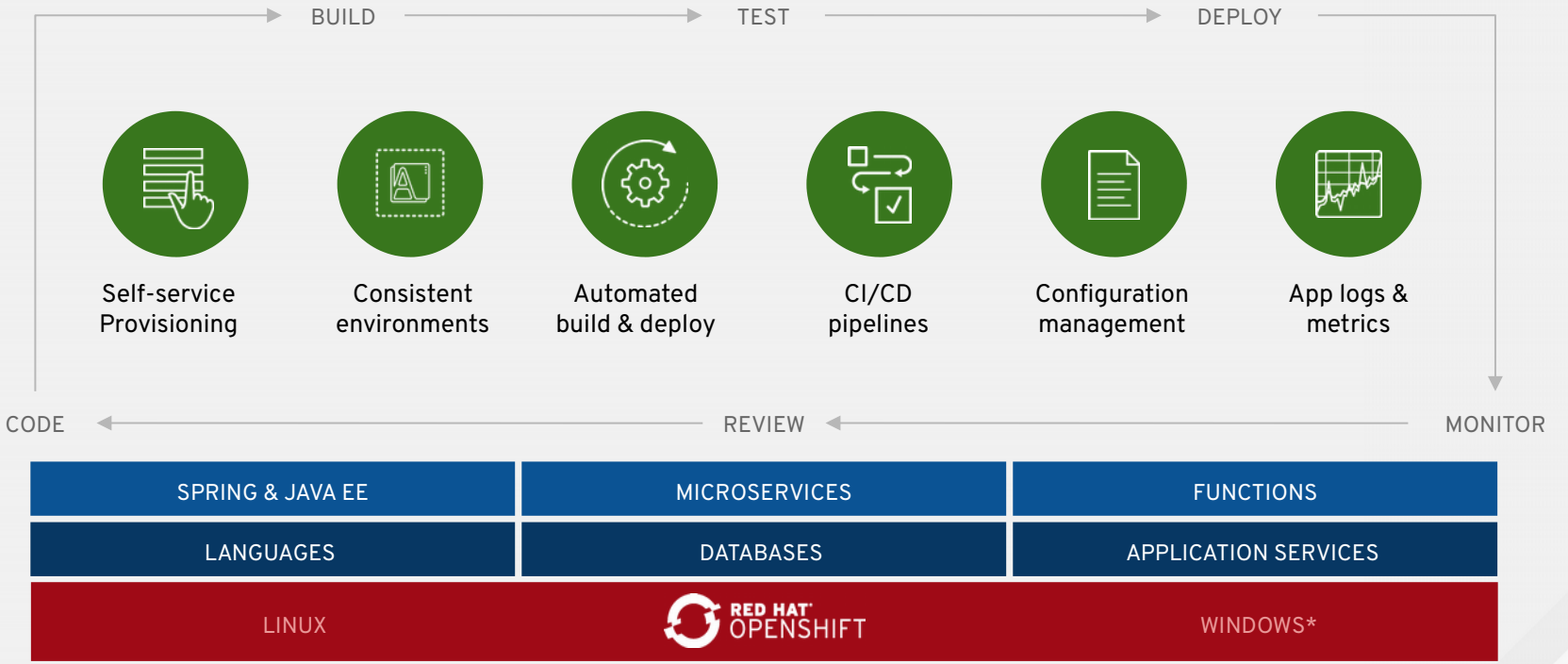
API MACHINERY	AWS	APPS	ARCHITECTURE	AUTH	AUTO SCALING
AZURE	BIG DATA	CLI	CLUSTER LIFECYCLE	CLUSTER OPS	CONTRIBUTOR EXPERIENCE
DOCS	INSTRUMENTATION	MULTI CLUSTER	NETWORK	NODE	ON-PREM
OPENSTACK	PRODUCT MANAGEMENT	RELEASE	SCALABILITY	SCHEDULING	SERVICE CATALOG
STORAGE	TESTING	UI	WINDOWS	APP DEF	CLUSTER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

RED HAT LEAD or CO-LEAD

15 of 33 GROUPS

Red Hat

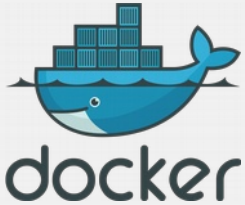
HOW OPENSHIFT ENABLES
DEVELOPER PRODUCTIVITY



* coming soon

Red Hat

Container runtimes



OPENSHIFT SERVICE MESH

Jaeger

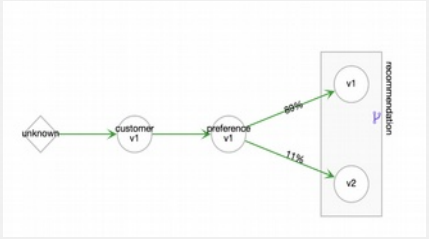
Secure

Istio

Prometheus
(metrics)

Observe

Observe



Connect

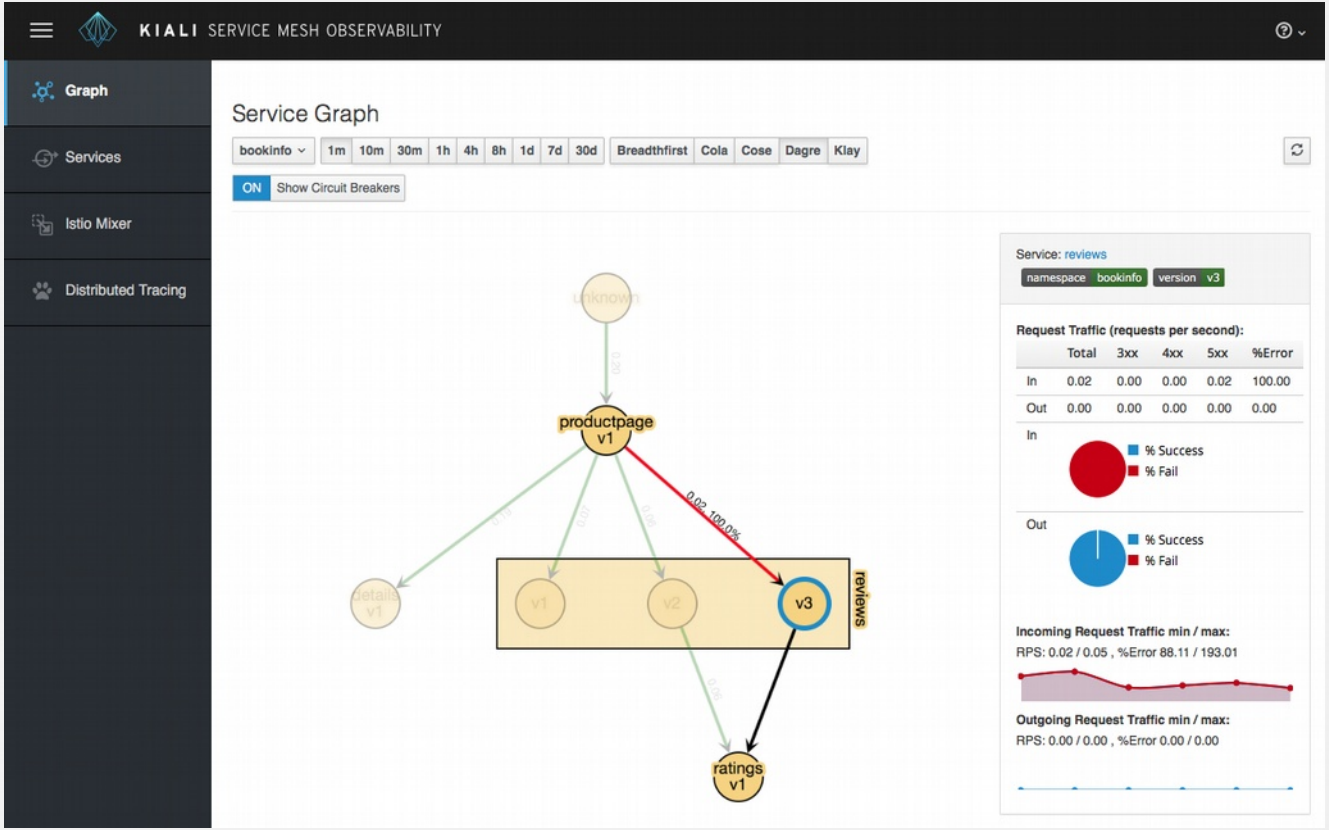
Control

Kiali
(service mesh
observability)

Grafana
(metrics graphing)

Red Hat

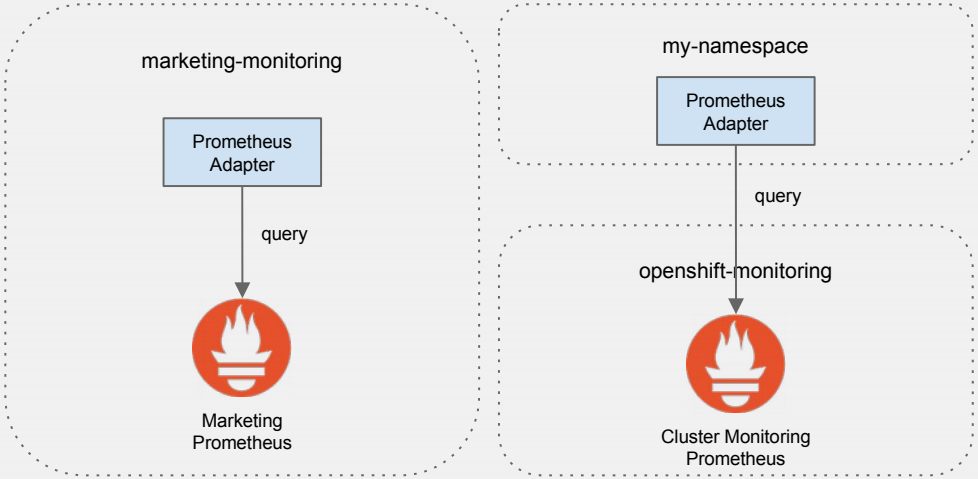
Kiali (GUI for Istio / OSM)



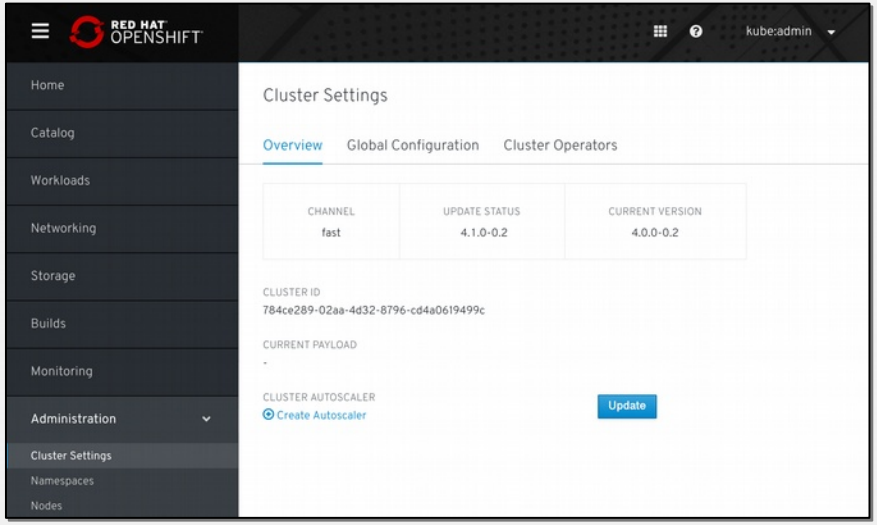
Red Hat

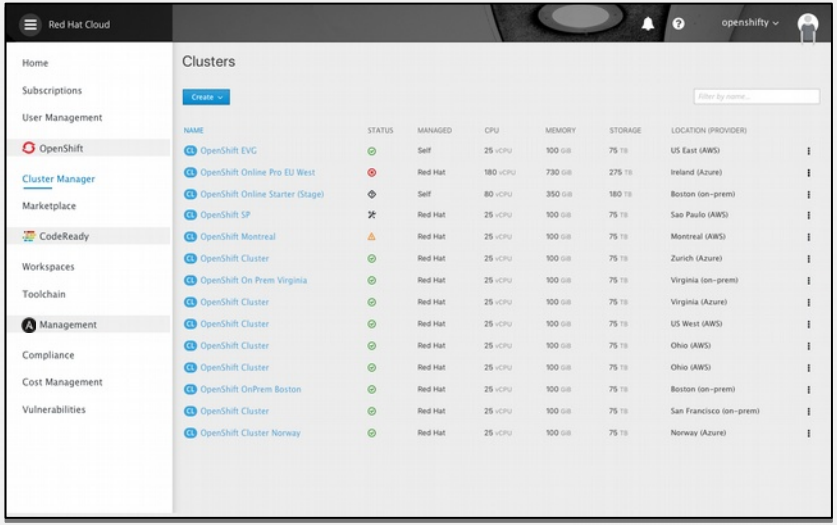
Horizontal Pod Autoscaling

Based on any metrics in Prometheus (Tech Preview)



OVER-THE-AIR UPDATES





- “Over-the-air” updates can be performed from either OpenShift Cluster Console: “Administration→Cluster Settings” menu or Red Hat Cloud web interface at https://cloud.openshift.com
- Updates images are comprised of top level controller manifests, roles, and other resources necessary to update a cluster to a particular version
    - Bundled as a container image to avoid the need for a separate content delivery mechanism

IBM’s CFO Statement (Jan 23, 2019)

We see the strong bookings Red Hat recently reported as further evidence of clients' confidence in the value," IBM CFO Jim Kavanaugh told investors on a conference call late Tuesday. "Remember, the quarter ended a month after the transaction was announced. From a value perspective, in addition to the growing Red Hat business itself, **we see an opportunity to lift all of IBM** by selling more of our own IBM Cloud and **by selling more of our analytics and AI capabilities on OpenShift** across multiple platforms."

https://www.thestreet.com/investing/earnings/ibm-jumps-after-q4-earnings-cloud-focused-outlook-following-34-bn-red-hat-deal-14842525

CONTAINERS IN PRODUCTION ARE REAL ON RED HAT OPENSHIFT


redhat