

AN INTRODUCTION TO CONTAINERS,
KUBERNETES, AND OPENSHIFT

INTRODUCTION TO OPENSHIFT CONTAINER PLATFORM



AGENDA

What is a container?

- Virtual machines vs. Containers
- Linux container infrastructure

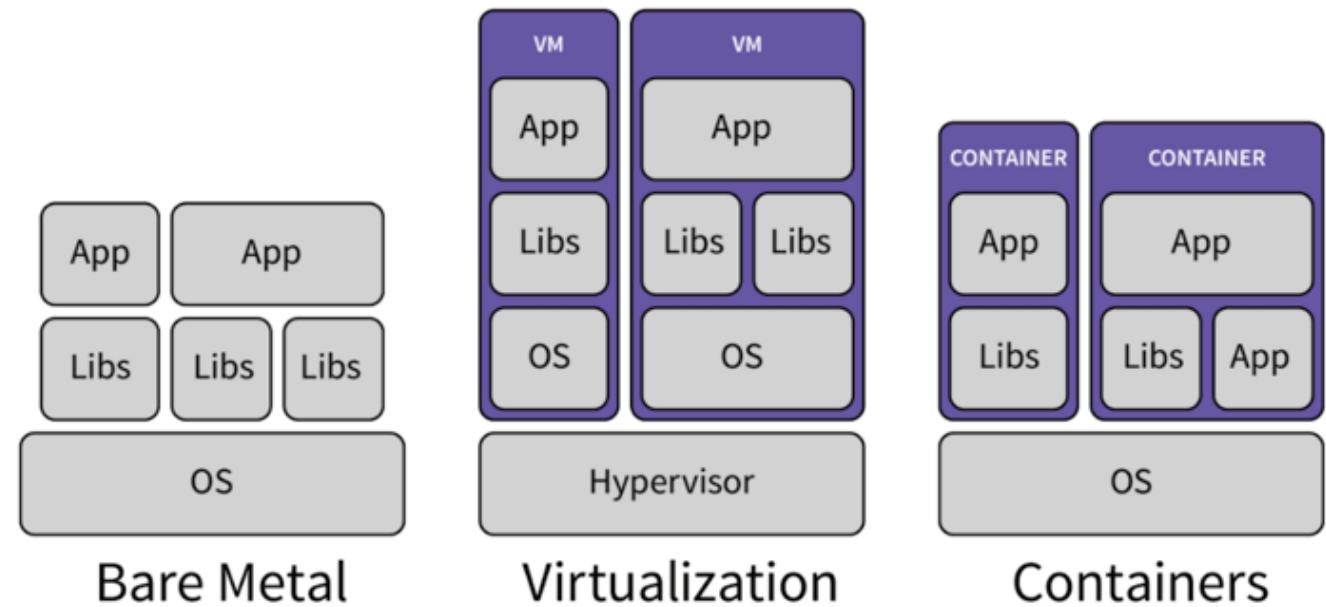
What is Kubernetes?

- Container orchestration
- Platform for Openshift

What is Openshift?

- Enterprise Kubernetes platform
- DO180 – Introduction to containers, Kubernetes and OpenShift

WHAT IS A CONTAINER?

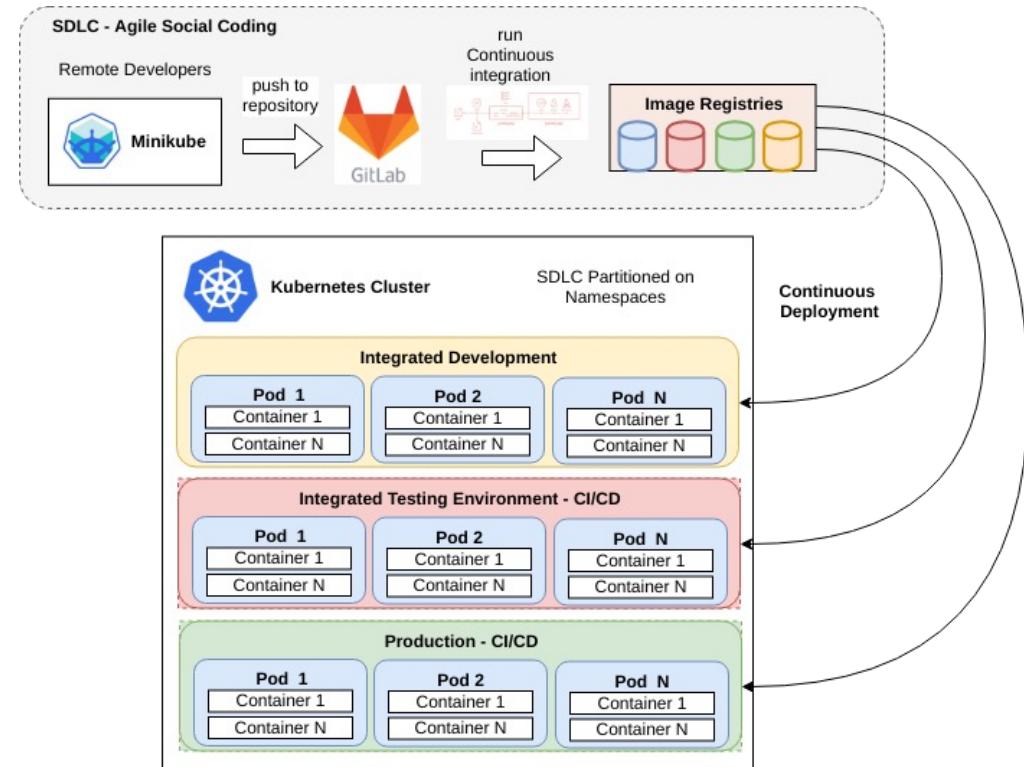
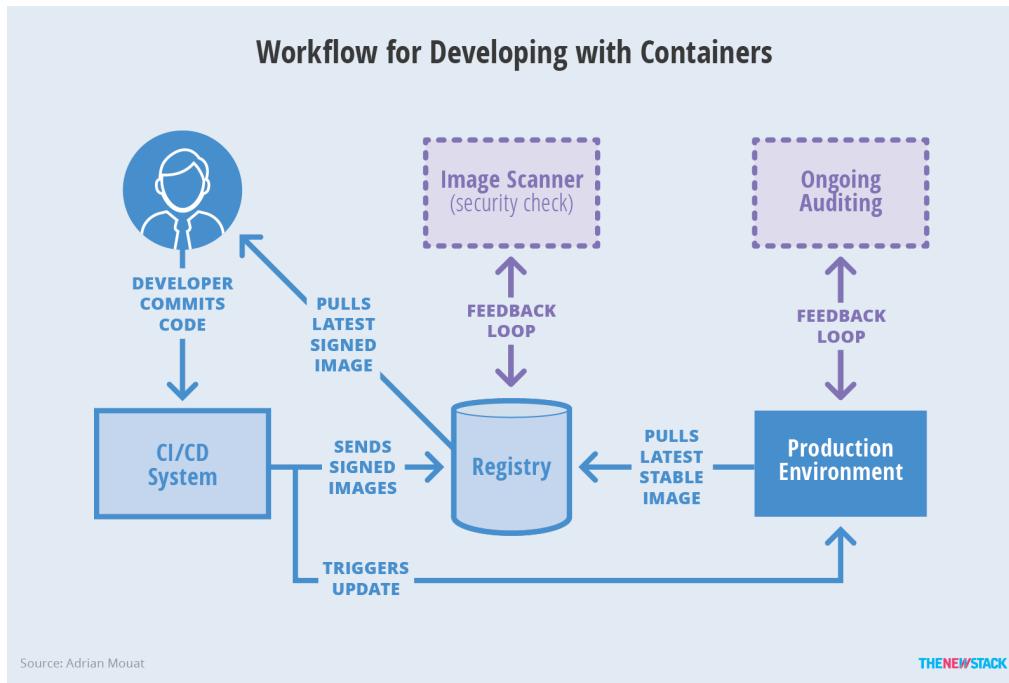


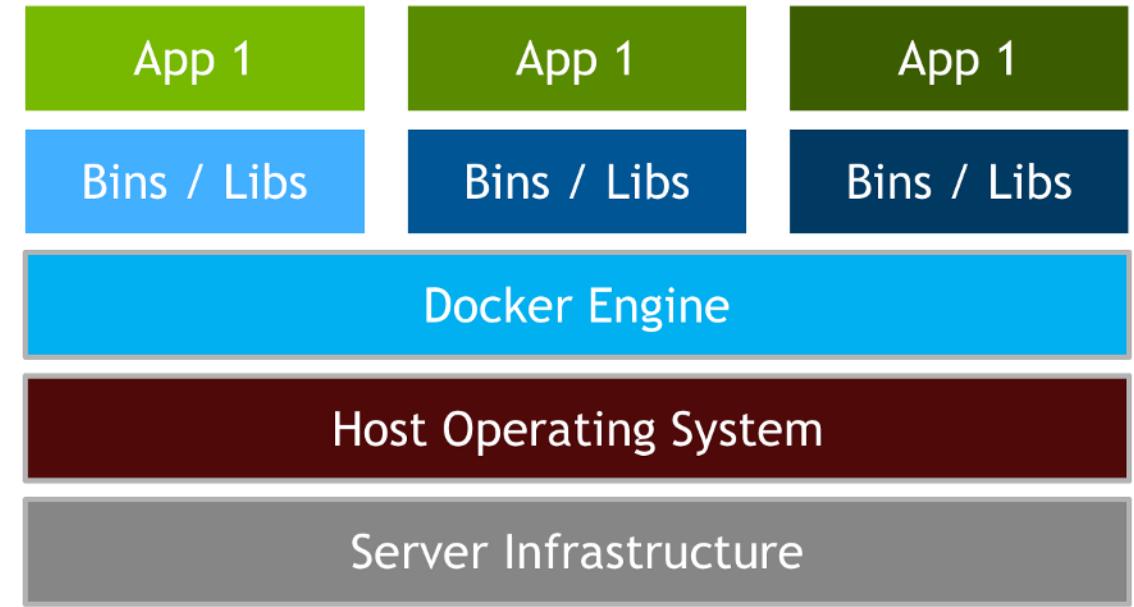
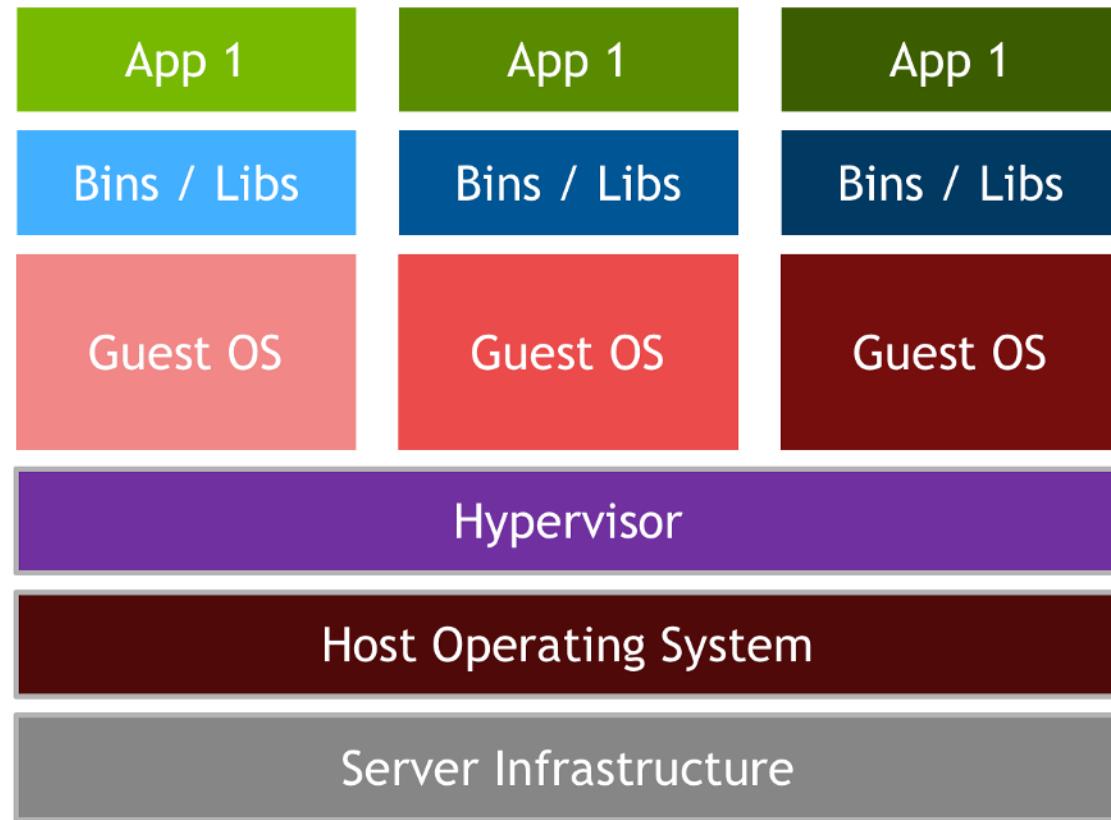
WHAT ARE CONTAINERS?

- Infrastructure AND applications
- Application processes on a shared kernel
- Simpler, lighter, and denser than virtual machines
- Portable across different environments
- Applications itself packaged as a self-contained unit, with all dependencies
- Applications can be deployed to ANY environment within seconds



NEW PATTERNS FOR DEVELOPMENT





VIRTUAL MACHINES VS CONTAINERS

VIRTUAL MACHINES VS CONTAINERS

Virtual machine

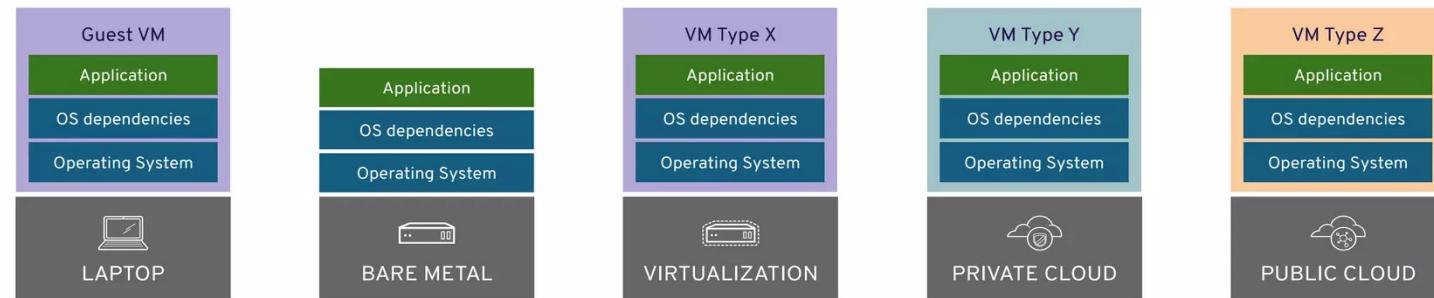
- VM isolation
- Complete OS
- Static compute
- Static memory
- High resource usage

Container

- Container isolation
- Shared kernel
- Burstable compute
- Burstable memory
- Low resource usage

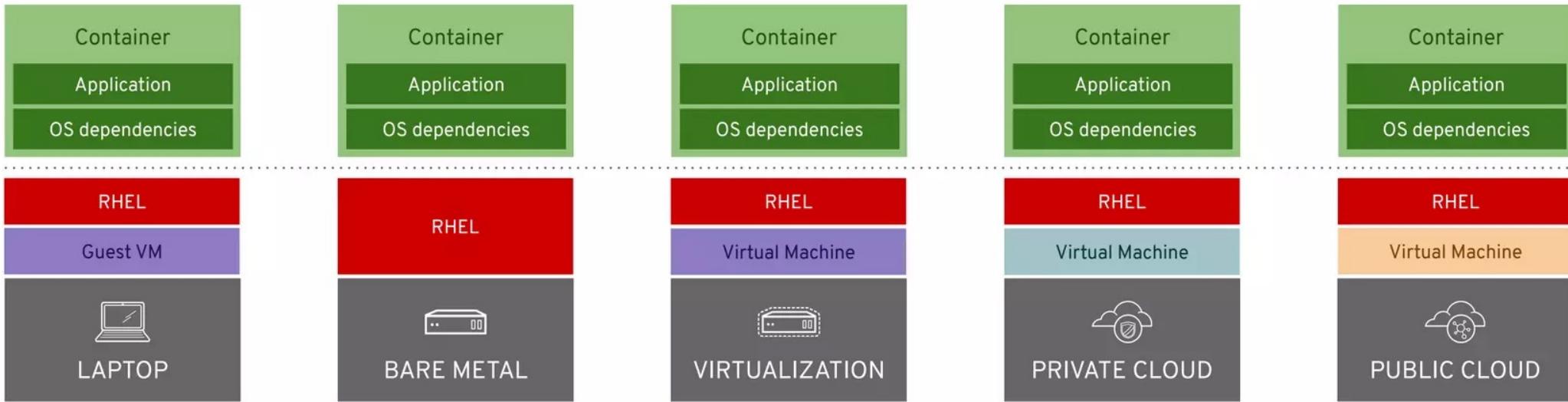
APPLICATION PORTABILITY WITH VM

Virtual machines are **NOT** portable across hypervisor and
do **NOT** provide portable packaging for applications



APPLICATION PORTABILITY WITH VM

Across Any Infrastructure



APPLICATION PORTABILITY

CONTAINERS IN A NUTSHELL

Container technology supports application portability across different environments

Allow developer to focus on the application development instead of the infrastructure

Deployed for shorter periods of time than VMs

Removes complexity through minimalism

Introduce new complexity for operation teams

HOW DO I MANAGE MY CONTAINERS?

How do I manage configuration, service discovery and resource scaling?

How to configure my cluster?

How to update a running application?

How to update the underlying cluster?

How to simplify complext applications?

KUBERNETES IN A NUTSHELL

Application portability across on-premise or hybrid cloud environments

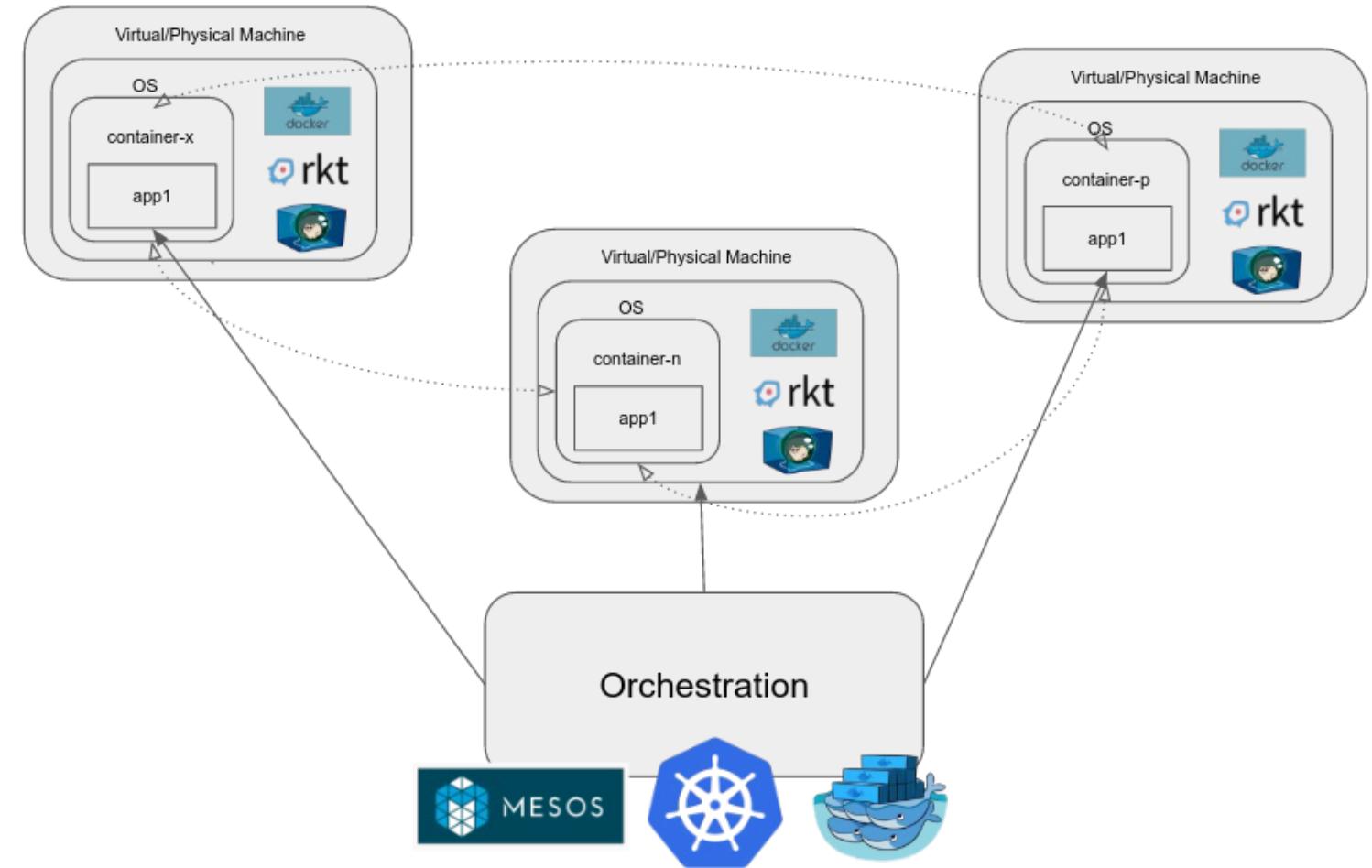
Allow developers to focus on their application vs. Underlying infrastructure

Deployed for shorter periods of time than VMs

Removing complexity through minimalism

New challenges for Operations teams

KUBERNETES AS CONTAINER ORCHESTRATOR



BENEFITS OF KUBERNETES/OPENSIFT

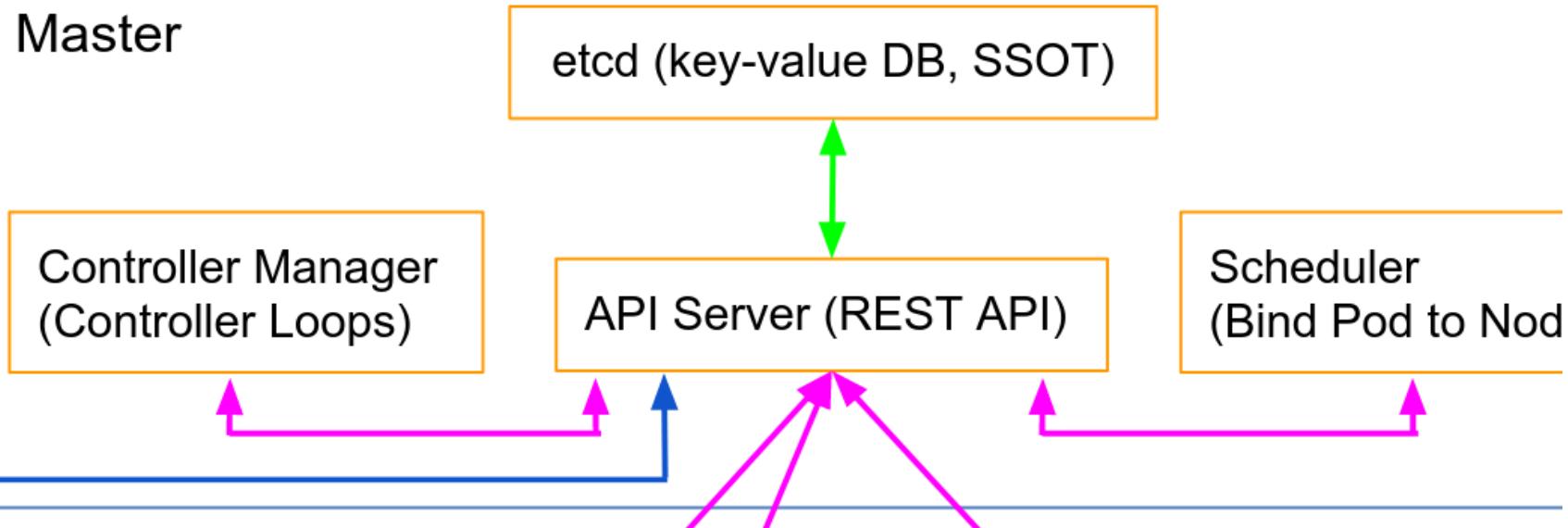
Scalability

Portability

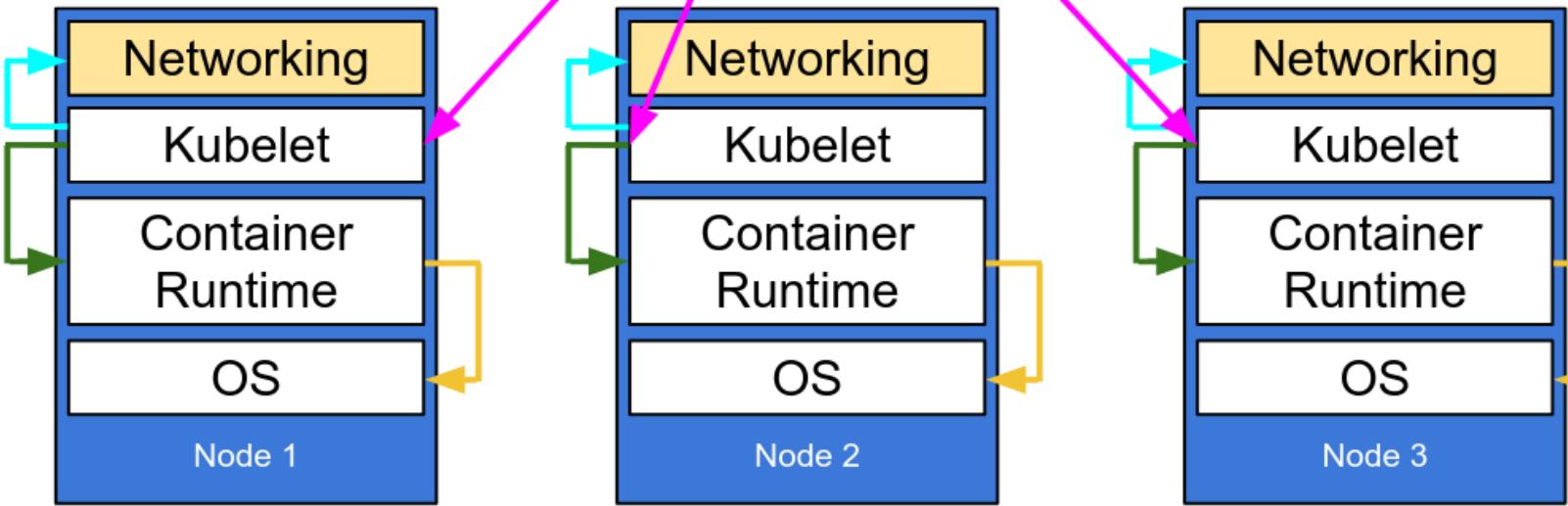
Consistent
deployments

Separated and
automated
operations and
development

Master



Nodes



K U B E R N E T E S A R C H I T E C T U R E

Operating Systems

Containers

Scaling

Alerting

Telemetry

High Availability

Log Aggregation

Metrics

WHY SO HARD?

Image Management

Patching

Self Healing

VMs

Security

Monitoring

App Servers

Networking

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.

WHAT IS OPENSHIFT

DEVELOPER
TOOLSRED HAT[®] JBOSS[™]
DEVELOPER STUDIORED HAT[®]
CONTAINER
DEVELOPMENT KITRED HAT[®]
APPLICATION
LIFECYCLE TOOLS

APPLICATIONS AND BUSINESS PROCESSES

MIDDLEWARE AND APPLICATION SERVICES

RED HAT[®] JBOSS[™]
BPM SUITERED HAT[®] JBOSS[™]
BRMSRED HAT[®] JBOSS[™]
FUSERED HAT[®] JBOSS[™]
A-MQRED HAT[®] JBOSS[™]
DATA GRIDRED HAT[®] JBOSS[™]
DATA VIRTUALIZATIONRED HAT[®] JBOSS[™]
ENTERPRISE
APPLICATION PLATFORMRED HAT[®]
MOBILE APPLICATION
PLATFORM

CONTAINER PLATFORMS



INFRASTRUCTURE SOFTWARE

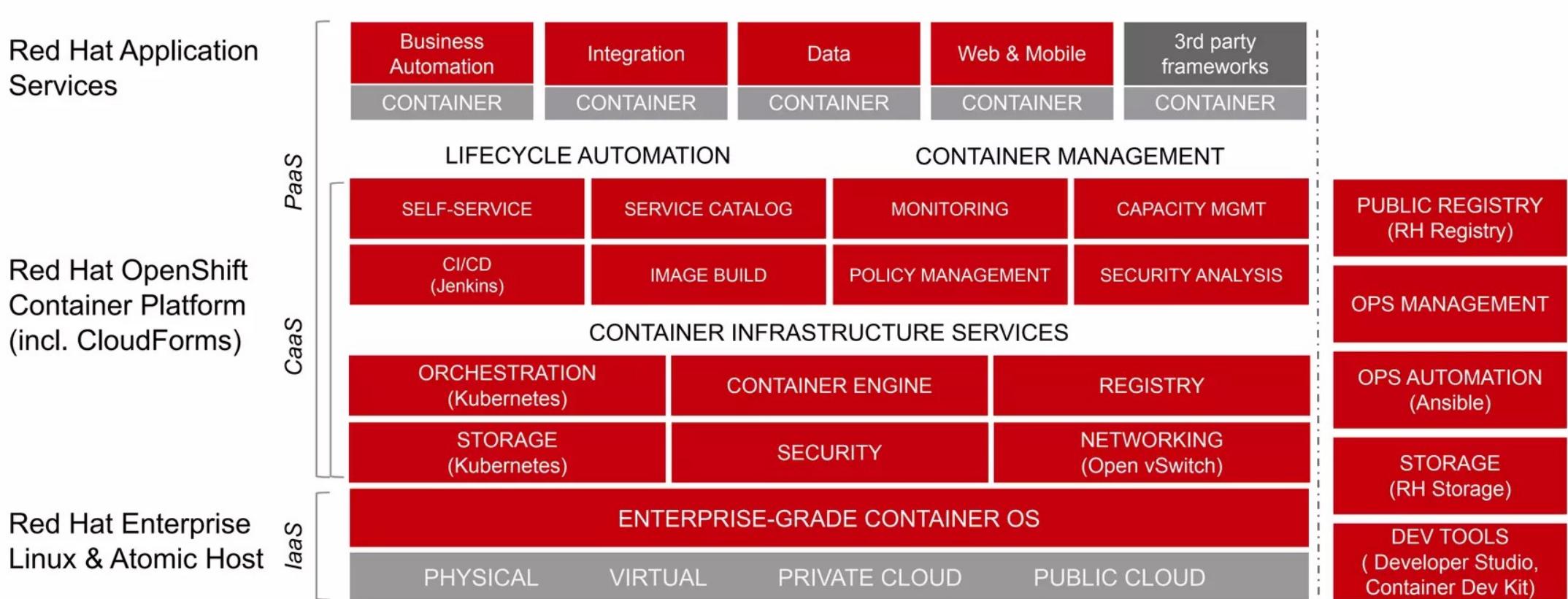
RED HAT[®]
ENTERPRISE LINUX[®]RED HAT[®]
ENTERPRISE LINUX[®]
ATOMIC HOSTRED HAT[®]
STORAGERED HAT[®]
OPENSTACK[®]
PLATFORMRED HAT[®]
VIRTUALIZATION

PHYSICAL AND CLOUD INFRASTRUCTURE

SECURITY &
MANAGEMENTRED HAT[®] REGISTRYRED HAT[®]
INSIGHTSANSIBLE[®]
by Red HatRED HAT[®]
SATELLITERED HAT[®]
CLOUDFORMS

OPENShift IS ENTERPRISE KUBERNETES

Red Hat makes building application with containers easy



OPENSHIFT FEATURES

Automated, full-stack installation from the container host to application services

Seamless Kubernetes deployment to any cloud or on-premises environment

Autoscaling of cloud resources

One-click updates for platform, services, and applications

Comprehensive container security



CONTROL

Application
security



DEFEND

Infrastructure



EXTEND

Container content	CI/CD pipeline
Container registry	Deployment policies
Container platform	Container host multi-tenancy
Network isolation	Storage
Audit & logging	API management
Security ecosystem	

A consistent container application platform

FROM YOUR DATACENTER TO THE CLOUD



Automated
operations



Multi-tenant



Secure by
default



Network
traffic control



Over-the-air
updates



Monitoring
& chargeback



Pluggable
architecture



Bare metal, VMware vSphere, Red Hat Virtualization, Red Hat OpenStack Platform,
Amazon Web Services, Microsoft Azure, Google

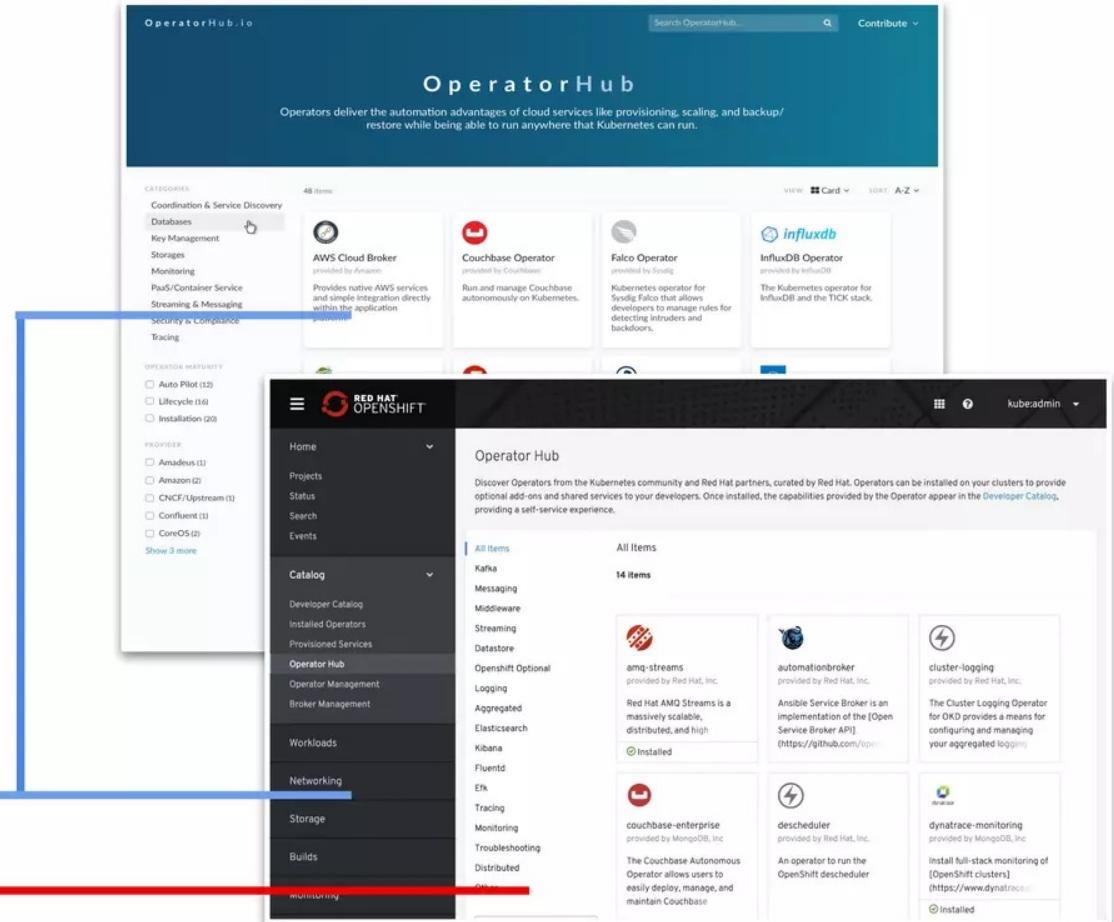
Automated container operations

FULLY AUTOMATED DAY-1 AND DAY-2 OPERATIONS

INSTALL	DEPLOY	HARDEN	OPERATE
AUTOMATED OPERATIONS			
Infra provisioning	Full-stack deployment	Secure defaults	Multicloud aware
Embedded OS	On-premises and cloud	Network isolation	Monitoring and alerts
	Unified experience	Audit and logs	Full-stack patch & upgrade
		Signing and policies	Zero-downtime upgrades
			Vulnerability scanning

OperatorHub and certified Operators

- OperatorHub.io launched by Red Hat, AWS, Microsoft and Google
- OpenShift Operator Certification
- OperatorHub integrated into OpenShift 4





Administrator

Home

Dashboards

Projects

Search

Explore

Events

Operators

Workloads

Networking

Storage

Builds

Monitoring

Compute

You are logged in as a temporary administrative user. Update the [cluster OAuth configuration](#) to allow others to log in.

Dashboards

Overview

Details

Cluster ID

6f5b5cad-7424-4b19-886f-
34c590d50e18

Provider

Unavailable

OpenShift Version

Updating to 4.2.0

Cluster Inventory

Nodes

Unavailable

Pods

Unavailable

PVCs

Unavailable

Cluster Health

Cluster is healthy

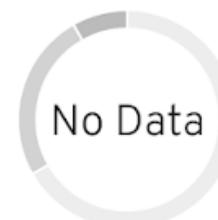
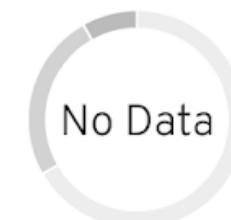
Cluster Capacity

CPU

Not available

Memory

Not available



Storage

Not available

Network

Not available

Events

[View all](#)

Error loading events

An error occurred during event retrieval. Attempting to reconnect...

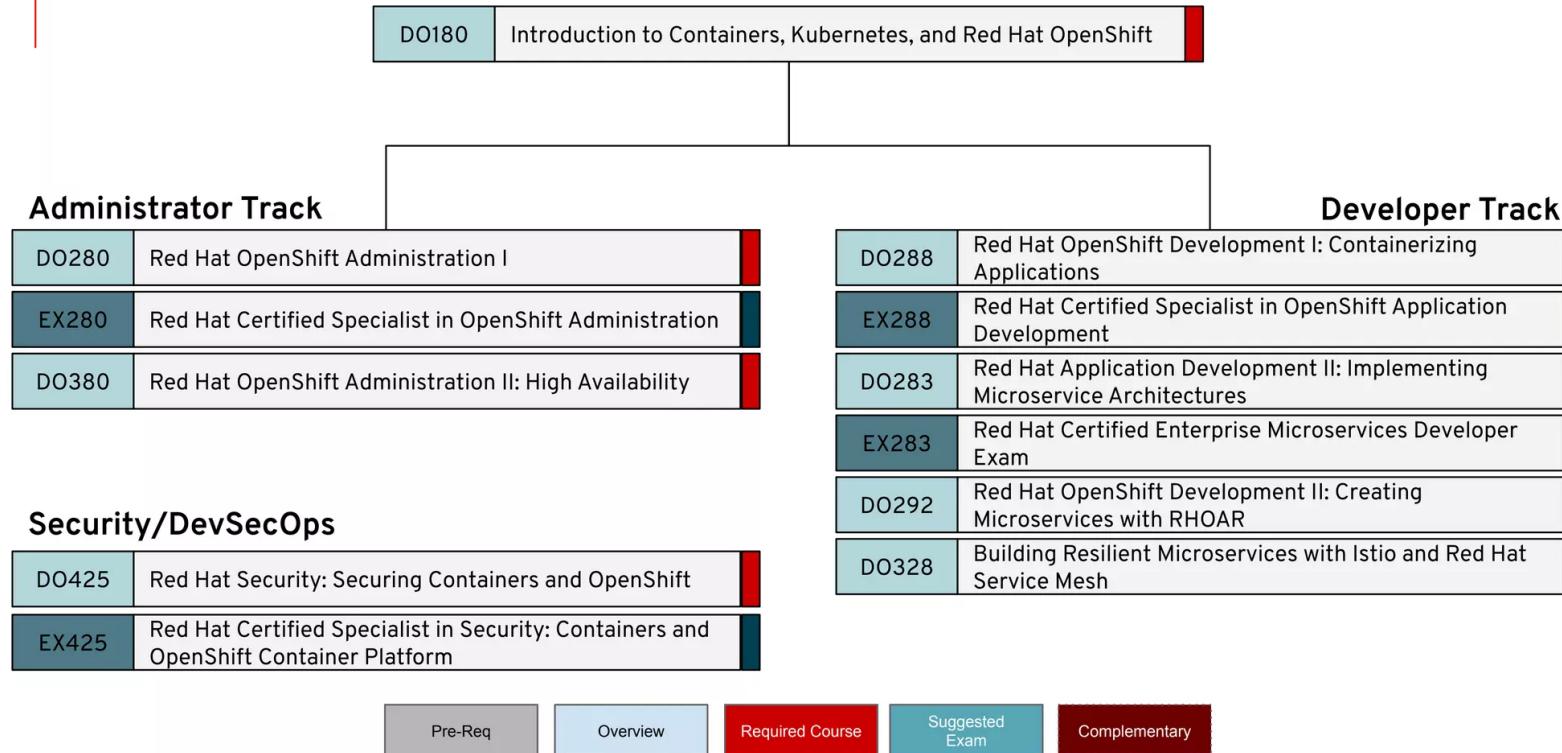
Top Consumers

Pods

By CPU

Pods by CPU time

No datapoints found.



RED HAT CERTIFICATION PATH