



Global Knowledge.®

OpenShift Technical Overview & Key Features

Presented by John Walter

Building Skills to Enable Success

Attendee Information

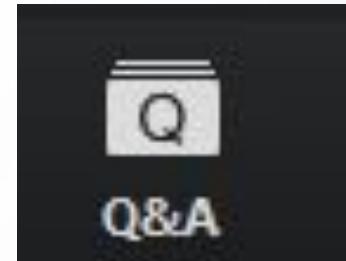
Open and hide your control panel with orange **arrow**

Join **audio**

- Mic and Speakers to use VoIP
- Telephone and dial in using the info provided



Note: Today's webinar is being **recorded**.





Red Hat
Training and
Certification

Kubernetes 101

An introduction to containers,
Kubernetes, and OpenShift

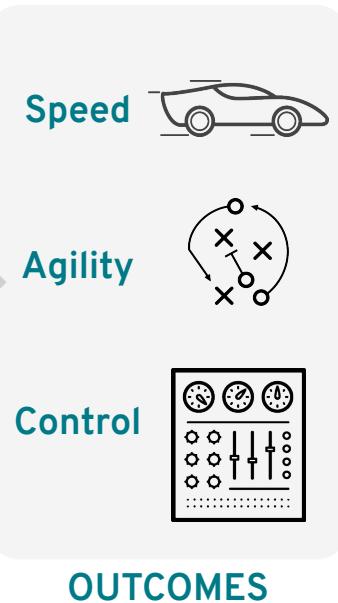
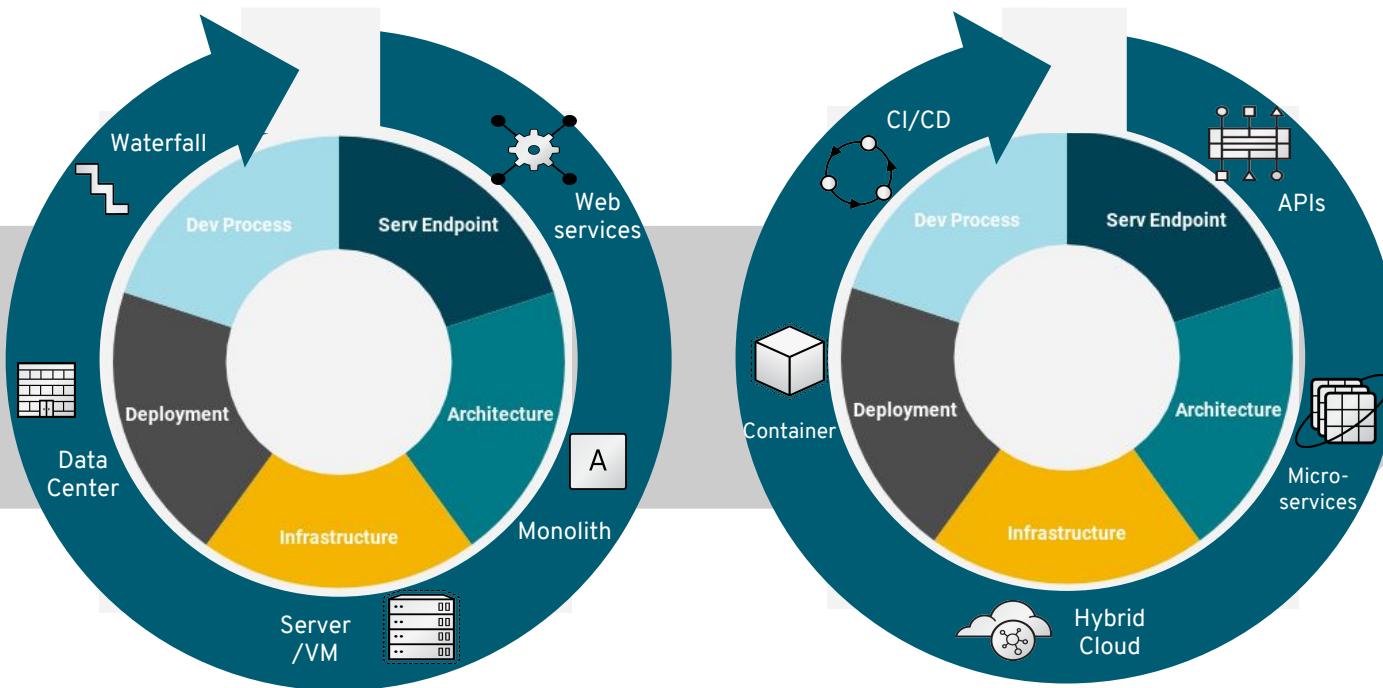
John Walter, Solutions Architect

AGENDA

- What is a container?
 - Virtual Machines vs. Containers
 - Linux and container infrastructure
- What is Kubernetes?
 - Container orchestration
 - A platform for OpenShift
- What is OpenShift?
 - Enterprise Kubernetes platform
- Red Hat Training
 - DO180 - Introduction to containers, Kubernetes, and OpenShift
- Q&A

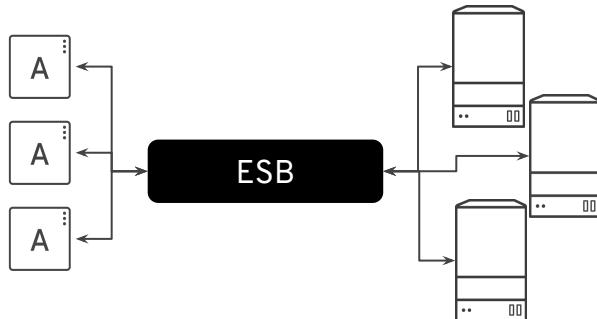
What is a container?

NEW PATTERNS FOR DEVELOPMENT



AGILE INTEGRATION

Traditional integration incompatible with
Cloud development



Centralize ♦ Leverage ♦ Simplify
Internal teams ♦ Maximize use of resources

Modern architectures and app development
requires more agile integration

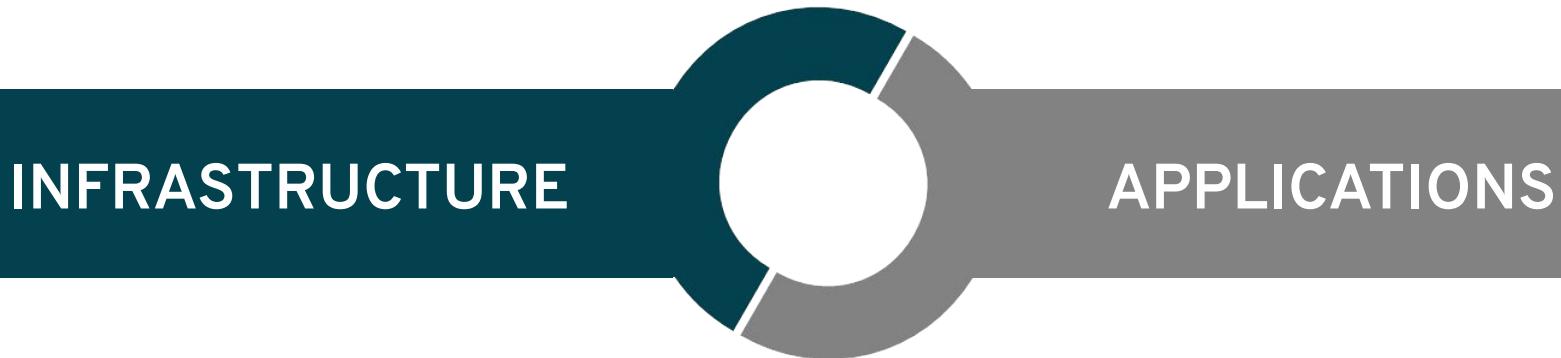


Distributed Integration ♦ Scalability ♦ Reusability
Agile Teams ♦ Distributed App Dev

USE INTEGRATION WHERE NEEDED, RATHER THAN CENTRALIZING

WHAT ARE CONTAINERS?

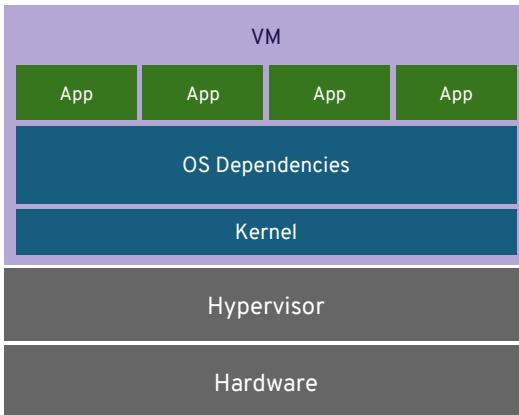
It Depends Who You Ask



- Application processes on a shared kernel
- Simpler, lighter, and denser than VMs
- Portable across different environments
- Package apps with all dependencies
- Deploy to any environment in seconds
- Easily accessed and shared

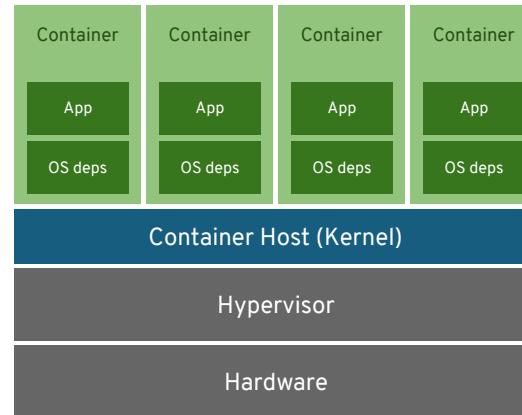
VIRTUAL MACHINES AND CONTAINERS

VIRTUAL MACHINES



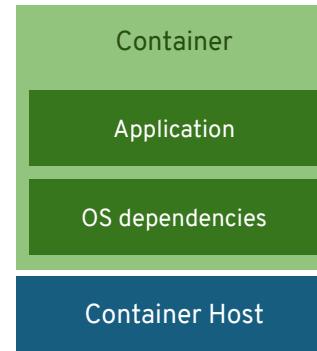
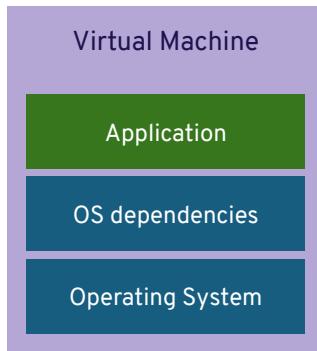
VM isolates the hardware

CONTAINERS



Container isolates the process

VIRTUAL MACHINES AND CONTAINERS



- + VM Isolation
- Complete OS
- Static Compute
- Static Memory
- High Resource Usage

- + Container Isolation
- + Shared Kernel
- + Burstable Compute
- + Burstable Memory
- + Low Resource Usage

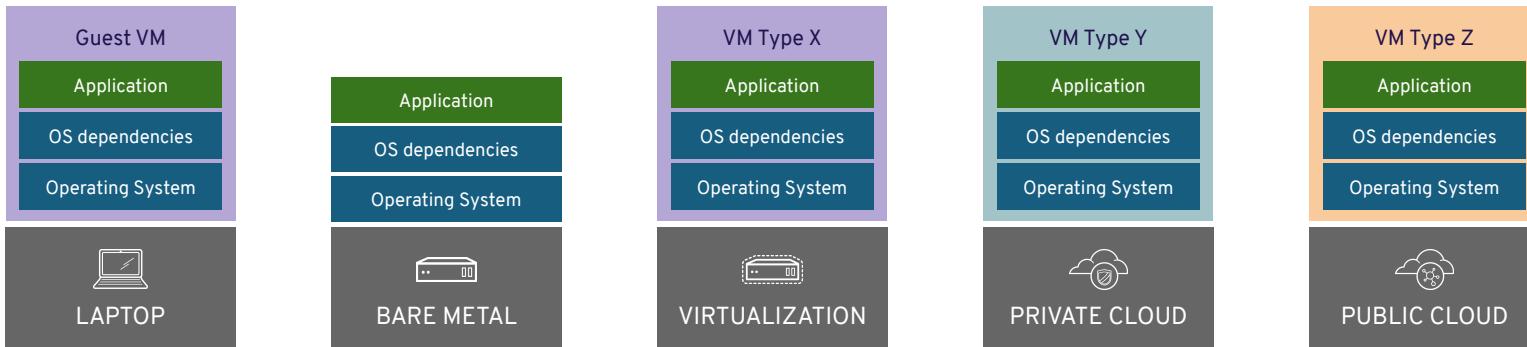
VIRTUAL MACHINES AND CONTAINERS



- Optimized for stability
- Optimized for agility

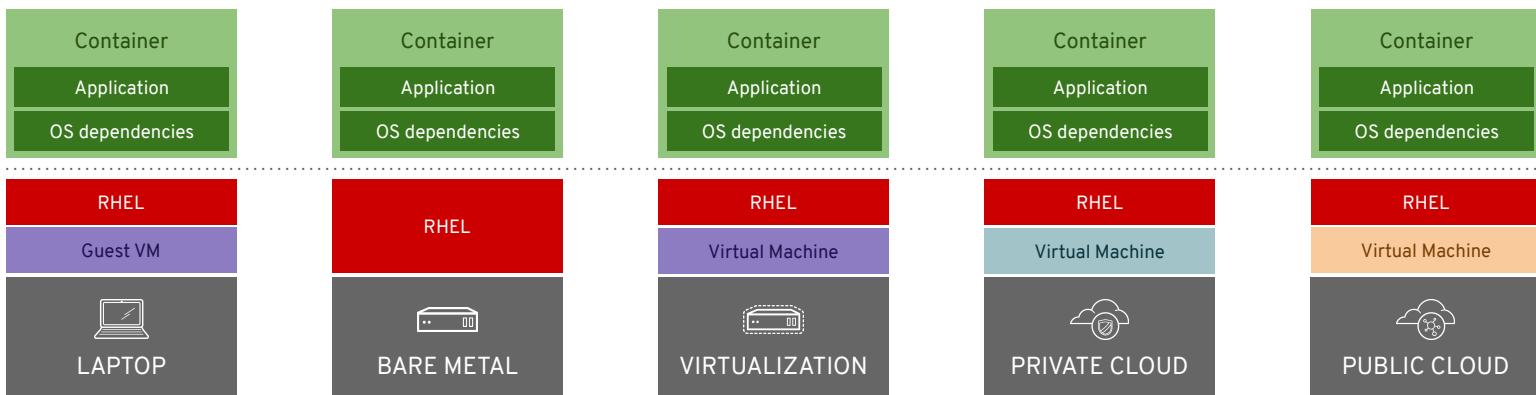
APPLICATION PORTABILITY WITH VM

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

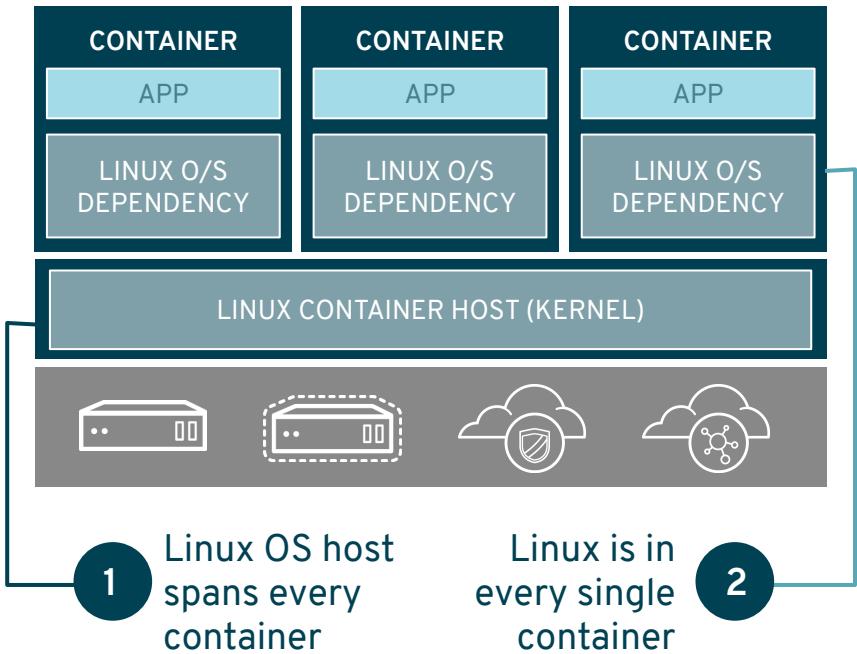


APPLICATION PORTABILITY WITH CONTAINERS

RHEL Containers + RHEL Host = Guaranteed Portability
Across Any Infrastructure



LINUX AND CONTAINER INFRASTRUCTURE



CONTAINERS ARE LINUX

Red Hat
Enterprise Linux
is a leader in paid
Linux

70%
CY2016 paid
Linux share

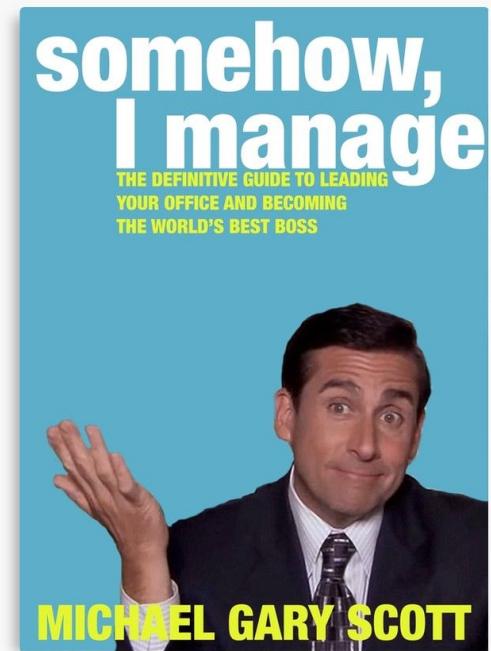
CONTAINERS IN A NUTSHELL

- Application portability across 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
- **Presents new challenges for Operations teams**

What is Kubernetes?

HOW DO I MANAGE THESE CONTAINERS?

- How do I manage configuration, service discovery, and resource scaling?
- Where do I configure my cluster?
- How do I update my applications?
- How do I update the underlying cluster?
- How can I simplify my complex applications?

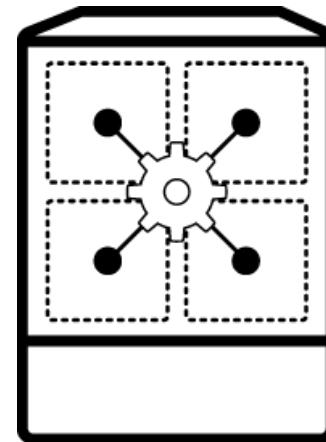


KUBERNETES IN A NUTSHELL

- Application portability across 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
- **Presents new challenges for Operations teams**

KUBERNETES AS CONTAINER ORCHESTRATION

- Schedulers and scheduling
- Service discovery and load balancing
- Resource management

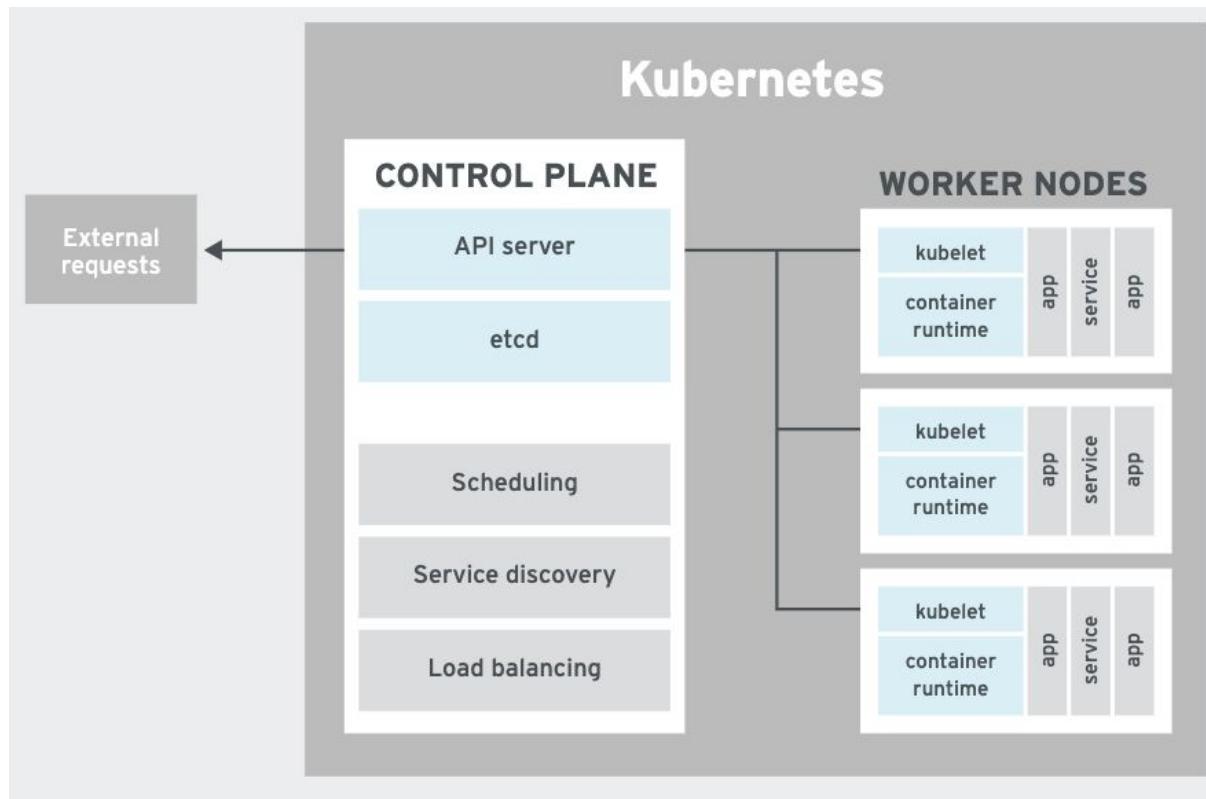


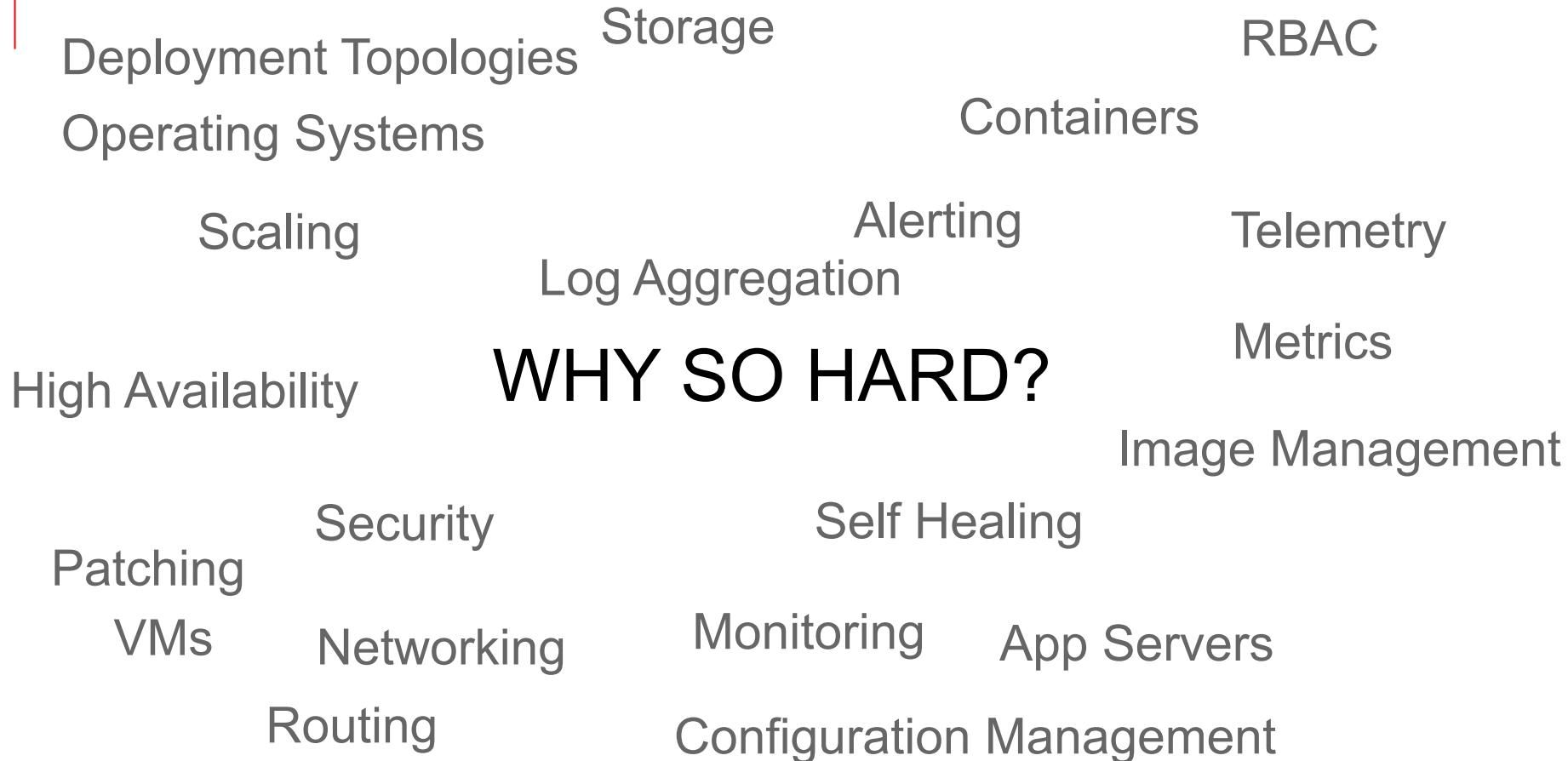
THE BENEFITS OF KUBERNETES

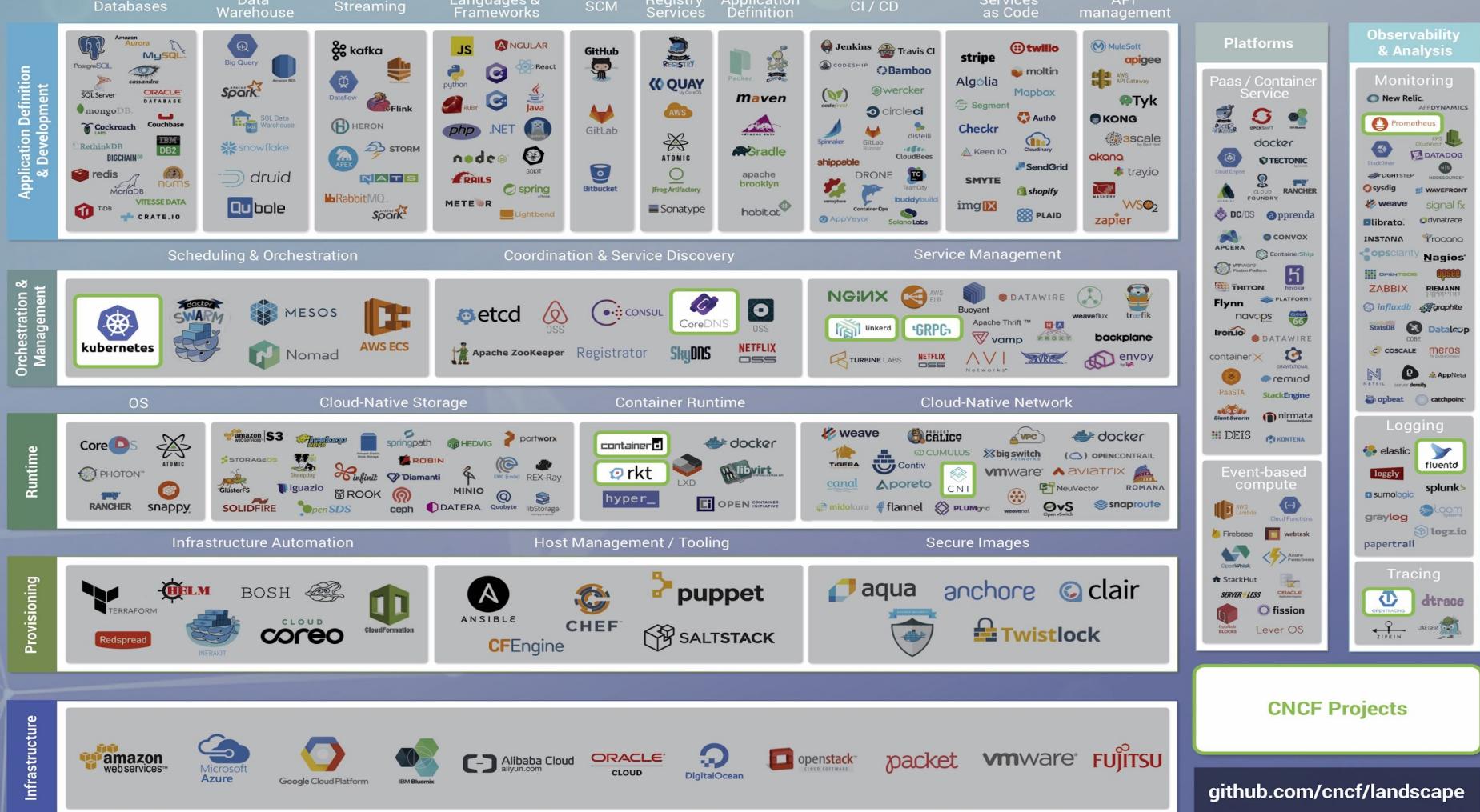
- Scalability
- Portability
- Consistent deployments
- Separated and automated operations and development



BASIC KUBERNETES ARCHITECTURE







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

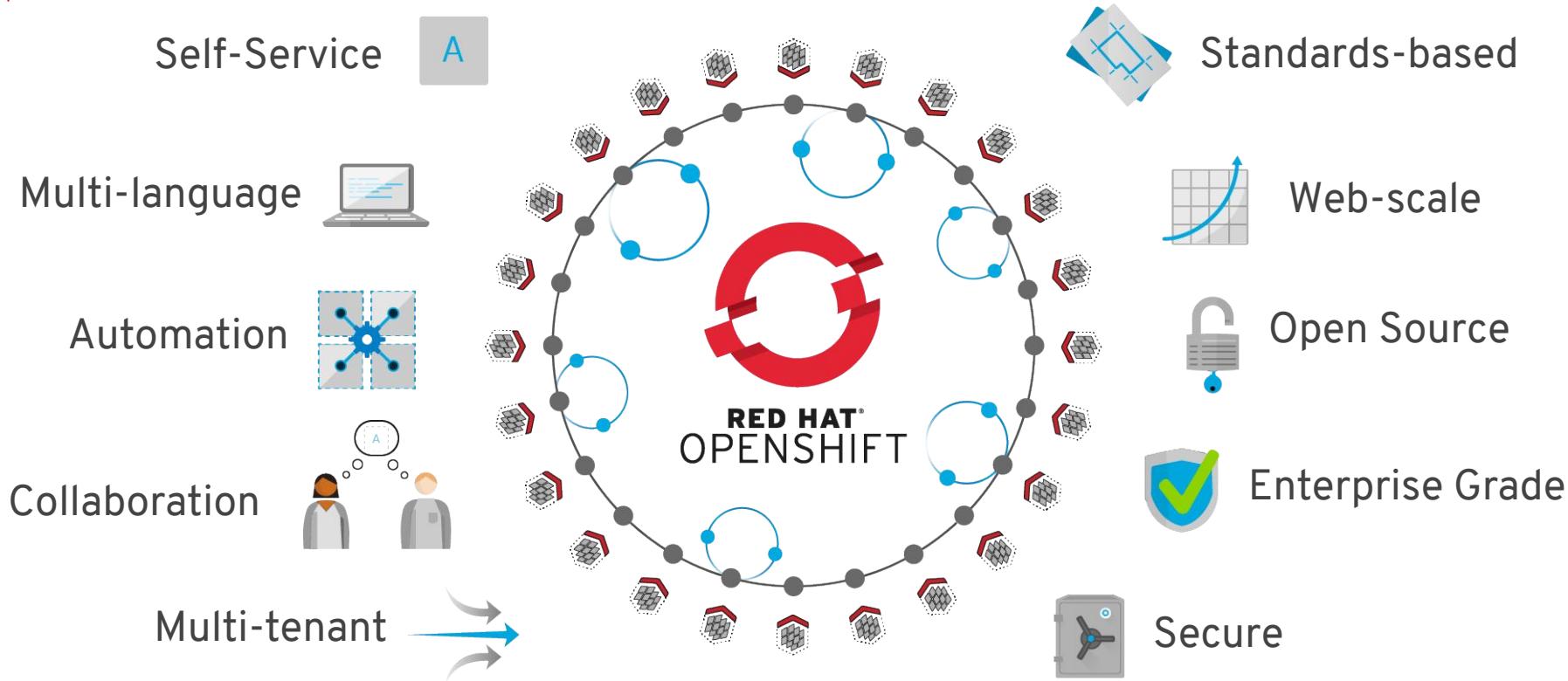
- OS upgrade & patch
- Platform upgrade & patch
- Image upgrade & patch
- App upgrade & patch
- Security patches
- Continuous security scanning
- Multi-environment rollout
- Enterprise container registry
- Cluster & app elasticity
- Monitor, alert, remediate
- Log aggregation



75%
of enterprise users identify
complexity of implementation and
operations as the top blocker to adoption

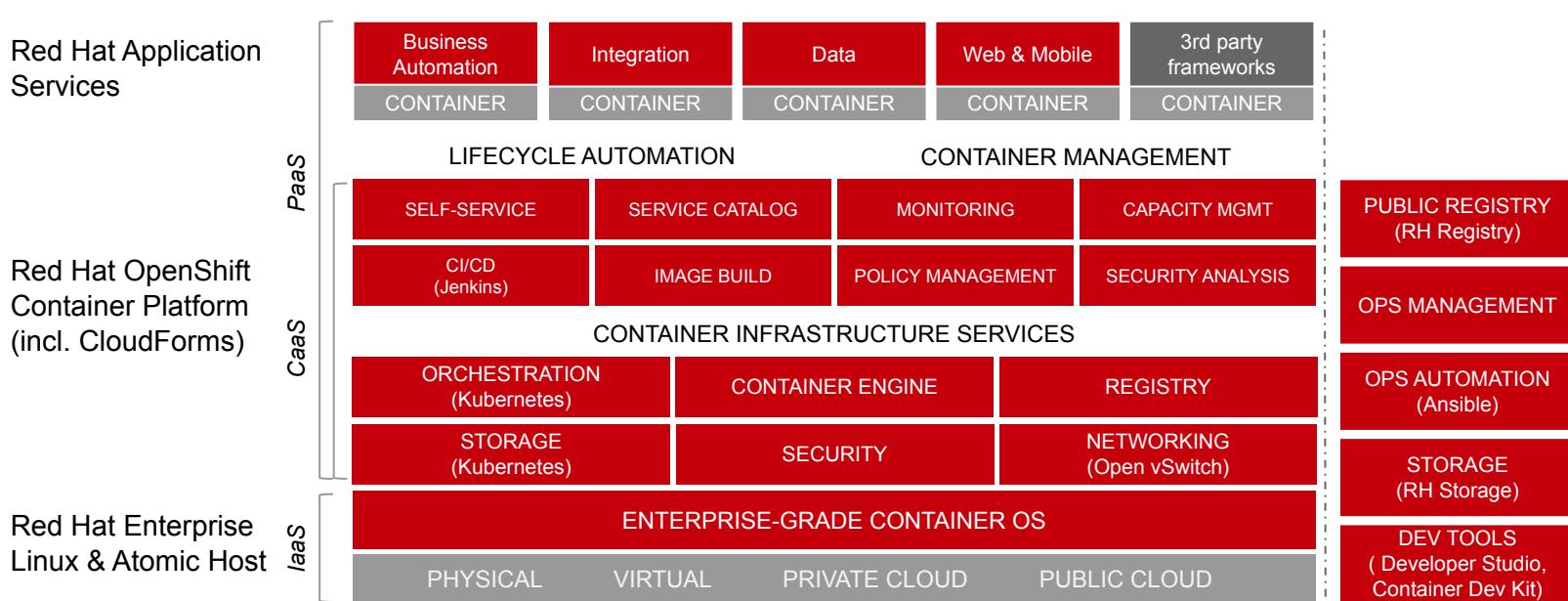
Source: The New Stack. *The State of the Kubernetes Ecosystem*, August 2017.

What is OpenShift?

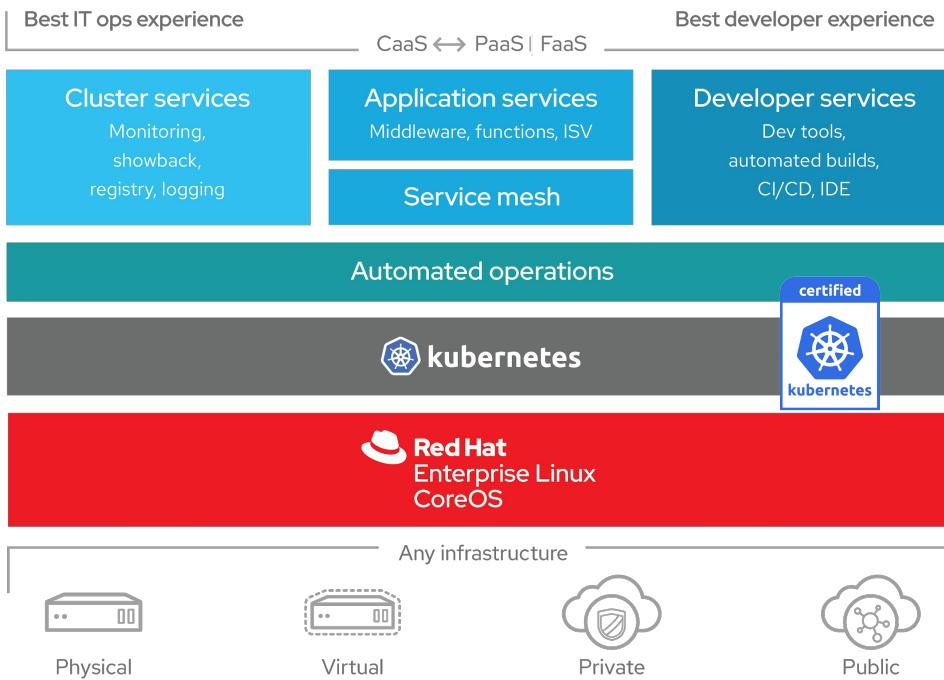


OPENSHIFT IS ENTERPRISE KUBERNETES

Red Hat makes building application with containers easy



OpenShift 4 - A smarter Kubernetes platform



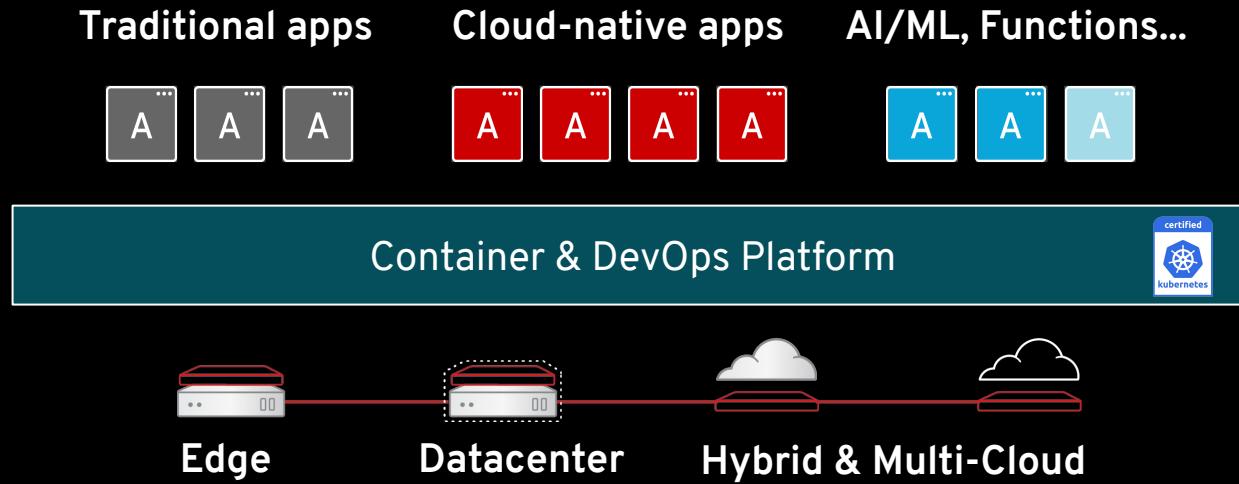
Automated, full-stack installation from the container host to application services

Seamless Kubernetes deployment to any cloud or on-premises environment

Autoscaling of cloud resources

One-click updates for platform, services, and applications

With OpenShift you can deliver all your applications in a whole new way



Over the Air (OTA) Updates

- OpenShift retrieves the list of available updates
- Admin selects the target version
- OpenShift is updated over the air
- Auto-update support

The screenshot shows the 'Cluster Settings' page in the Red Hat OpenShift web interface. The left sidebar has a dark theme with white text and includes links for Home, Catalog, Workloads, Networking, Storage, Builds, Monitoring, Administration (with sub-links for Cluster Settings, Namespaces, and Nodes), and a user dropdown for 'kube:admin'. The main content area is titled 'Cluster Settings' and has tabs for Overview, Global Configuration, and Cluster Operators. Under the Overview tab, there is a table with three columns: CHANNEL (set to 'fast'), UPDATE STATUS (4.1.0-0.2), and CURRENT VERSION (4.0.0-0.2). Below the table, it shows the CLUSTER ID (784ce289-02aa-4d32-8796-cd4a0619499c) and CURRENT PAYLOAD (empty). It also shows the CLUSTER AUTOSCALER section with a 'Create Autoscaler' button and a blue 'Update' button.

Comprehensive container security



CONTROL

Application
security

Container content

CI/CD pipeline

Container registry

Deployment policies



DEFEND

Infrastructure

Container platform

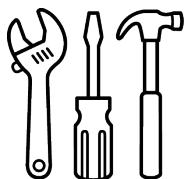
Container host multi-tenancy

Network isolation

Storage

Audit & logging

API management



EXTEND

Security ecosystem

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

Kubernetes adoption phases

1. Stateless apps

ReplicaSets

Deployments

2. Stateful apps

StatefulSets

Storage/CSI

3. Distributed systems

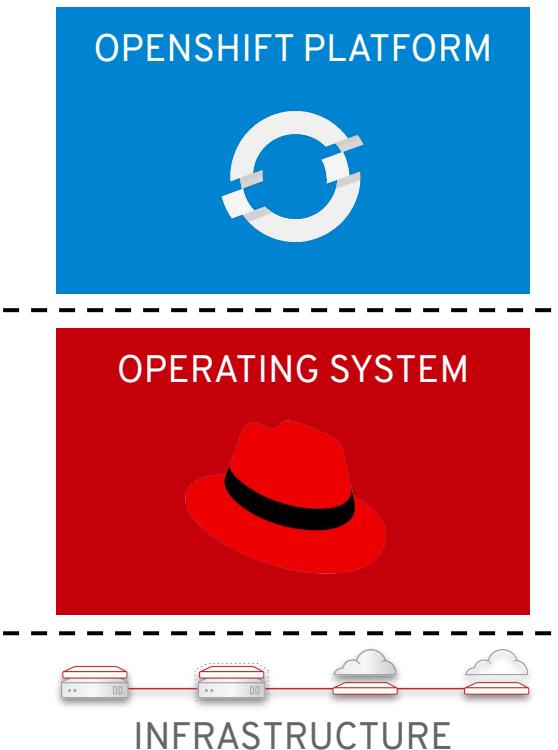
Data rebalancing

Autoscaling

Seamless upgrades

Full-stack automated install

OPENSHIFT 3 & 4



OPENSHIFT 4 (only)



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

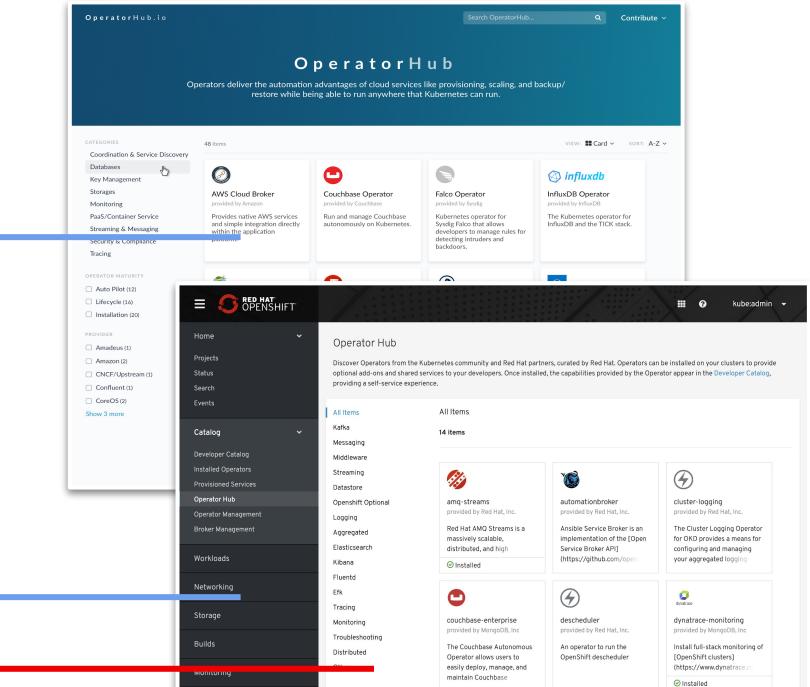
Zero-downtime upgrades

Vulnerability scanning

OperatorHub and certified Operators

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

COMMUNITY OPERATORS
OPENSHIFT CERTIFIED OPERATORS



Full control for administrators

The screenshot shows the Red Hat OpenShift Container Platform interface. On the left, the navigation sidebar includes sections for Home, Catalog (with OperatorHub selected), Workloads, and other administrative tools like Operator Management. The main content area displays the OperatorHub, listing various operators such as AMQ Streams, AppDynamics Cluster, Automation Broker Operator, and Camel-K Operator. A modal window titled "Create Operator Subscription" is open, prompting the user to select an installation mode (All namespaces on the cluster, default selected), update channel (preview selected), and approval strategy (Automatic selected). The modal also features "Subscribe" and "Cancel" buttons.

Project: all projects ▾

OperatorHub

All Items

AI/Machine Learning

Application Monitoring

Big Data

Database

Developer Tools

Integration & Delivery

Logging & Tracing

Monitoring

Networking

OpenShift Optional

Security

Storage

Streaming & Messaging

Other

AMQ Streams
provided by Red Hat, Inc.

AppDynamics Cluster/
provided by AppDynamics

Automation Broker
Operator
provided by Red Hat, Inc.

Camel-K Operator
provided by The Apache
Software Foundation

Create Operator Subscription

Keep your service up to date by selecting a channel and approval

Installation Mode *

All namespaces on the cluster (default)
Operator will be available in all namespaces.

A specific namespace on the cluster
Operator will be available in a single namespace only.

Update Channel *

preview

Approval Strategy *

Automatic

Manual

Subscribe Cancel

Self-service for developers

The screenshot shows the Red Hat OpenShift web interface. On the left, the sidebar includes sections for Home, Projects, Status, Search, Events, Catalog (with sub-options like Developer Catalog, Installed Operators, OperatorHub, and Operator Management), and Workloads (with sub-options like Pods, Deployments, Deployment Configs, Stateful Sets, Secrets, Config Maps, Cron Jobs, Jobs, Daemon Sets, and Replica Sets). A modal window is open for a MongoDB Replica Set named "production-api-kafka". The modal header says "MongoDB Replica Set" and "Provided by MongoDB, Inc". It has a "Create" button and a detailed description: "MongoDB Replica Set Deployment", "This resource is provided by MongoDB, a Kubernetes Operator enable", and a link to "Documentation". It also shows the "CREATED AT" timestamp as "Apr 29, 2:50 pm". Below the modal, the main content area shows a table of resources under the "Resources" tab. The table has columns for NAME, TYPE, and STATUS. The resources listed are:

NAME	TYPE	STATUS
production-api-kafka-clients-ca	Secret	Created
production-api-kafka-clients-ca-cert	Secret	Created
production-api-kafka-cluster-ca	Secret	Created
production-api-kafka-cluster-ca-cert	Secret	Created
production-api-kafka-cluster-operator-certs	Secret	Created
production-api-kafka-entity-operator	Deployment	Created
production-api-kafka-entity-operator-6d499d47db	ReplicaSet	Created
production-api-kafka-entity-operator-6d499d47db-82xll	Pod	Running

Below the table, a large black box displays the configuration YAML for the MongoDB Replica Set:

```
apiVersion: mongodb.com/v1
kind: MongoDBReplicaSet
metadata:
  name: example
  namespace: production
spec:
  members: 3
  version: 4.0.2
  persistent: false
  project: example
  credentials: my-secret
```

Training at Red Hat

DO180	Red Hat OpenShift I: Containers & Kubernetes	
-------	--	--

Administrator Track

DO280	Red Hat OpenShift Administration II: Operating a Production Kubernetes Cluster	
EX280	Red Hat Certified Specialist in OpenShift Administration	
DO322	Red Hat OpenShift Installation Lab	
DO380	Red Hat OpenShift Administration III: Scaling Kubernetes Deployments in the Enterprise	

DevSecOps Track

DO425	Red Hat Security: Securing Containers and OpenShift	
EX425	Red Hat Certified Specialist in Security: Containers and OpenShift Container Platform	

Developer Track

DO288	Red Hat OpenShift Development II: Containerizing Applications	
EX288	Red Hat Certified Specialist in OpenShift Application Development	
DO378	Red Hat Cloud-native Microservices Development with Quarkus	
DO328	Building Resilient Microservices with Istio and Red Hat Service Mesh	
AD421	Camel Integration and Development with Red Hat Fuse on OpenShift	

Pre-Req

Overview

Required Course

Suggested Exam

Complementary



Introduction to containers, Kubernetes, and OpenShift (DO180)

Learn to build and manage containers for deployment on a Kubernetes and Red Hat OpenShift cluster

Introduction to Containers, Kubernetes, and Red Hat OpenShift (DO180) helps you build core knowledge in managing containers through hands-on experience with containers, Kubernetes, and the Red Hat® OpenShift® Container Platform. These skills are needed for multiple roles, including developers, administrators, and site reliability engineers.

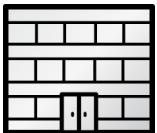
Topics covered include understanding container and OpenShift architecture, creating containerized services, and deploying applications on Kubernetes and Red Hat OpenShift.

Audience:

- Developers who wish to containerize software applications
- Administrators who are new to container technology and container orchestration
- Architects who are considering using container technologies in software architectures
- Site reliability engineers who are considering using Kubernetes and Red Hat OpenShift

Prerequisites: Be able to use a Linux terminal session, issue operating system commands, and be familiar with shell scripting. Experience with web application architectures and their corresponding technologies is recommended, but not required.

WAYS TO TRAIN



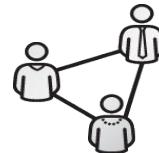
Onsite Training

Private On-site training and exams delivered at your location or at one of our training centers



Classroom Training

Training and test in a professional classroom environment led by Red Hat Certified Instructors



Virtual Training

Live instructor-led online training with the same high-quality, hands-on labs you'd find in our classrooms



Online Learning

90 days of access to course content and up to 80 hours of hands on labs – all available online, at your pace, and your schedule.

Red Hat Learning Subscription Evolution

Introducing a Premium subscription tier



STANDARD



MODULARIZED VIRTUAL
TRAINING



PREMIUM



Red Hat classroom exams

Classroom exams are scheduled exams that are publicly available and delivered in an IT classroom, typically to multiple examinees and monitored by an in-person proctor.



Red Hat onsite exams

Onsite exams are classroom exams delivered privately to an organization at its location or a location of its choosing.



Red Hat individual exams

Individual exams are exams for which examinees choose the date, time and place. Two different options exist, though not necessarily for all exams:



Red Hat testing center exams

Testing center exams are delivered in locations with a specially-configured exam system and for which candidates are observed by a remote proctor.



NEW: Red Hat remote exams

Remote exams are delivered online at your home, office or other location of your choice and observed by a remote proctor.

Questions



Have questions? Ask us anytime.

Twitter: @GlobalKnowledge

Facebook: @GKTraining

Instagram: @globalknowledgeinc

LinkedIn: Global Knowledge Training

Learning More

For additional on-demand and live webinars, white papers, courses, special offers and more, visit us at...



GlobalKnowledge.com



Global Knowledge®

Building Skills to
Enable Success