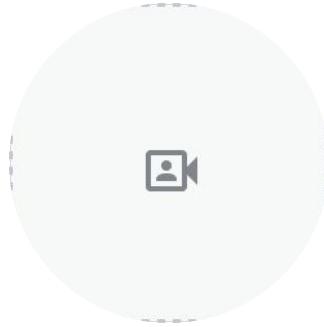


# Red Hat OpenShift

Introduction and demo

Alfred Bach

Principal Learning and Development Instructor



# AGENDA



## OpenShift Container Platform

- 09:30 - 09:45 Welcome and Introduction
- 09:45 - 11:30 OpenShift Overview, Architecture, Installation, Networking, and Observability
- 11:30 - 11:40 BREAK
- 11:40 - 12:00 Platform Services, KNative, CI/CD, GitOps, Application Services...
- 12:00 - 14:00 Lunch an Hands-On Lab, "OpenShift Overview and Development"

## OpenShift Virtualisation

- 14:00 - 14:15 Recap
- 14:15 - 15:00 OpenShift Virt Overview and Demo
- 15:00 - 15:10 BREAK
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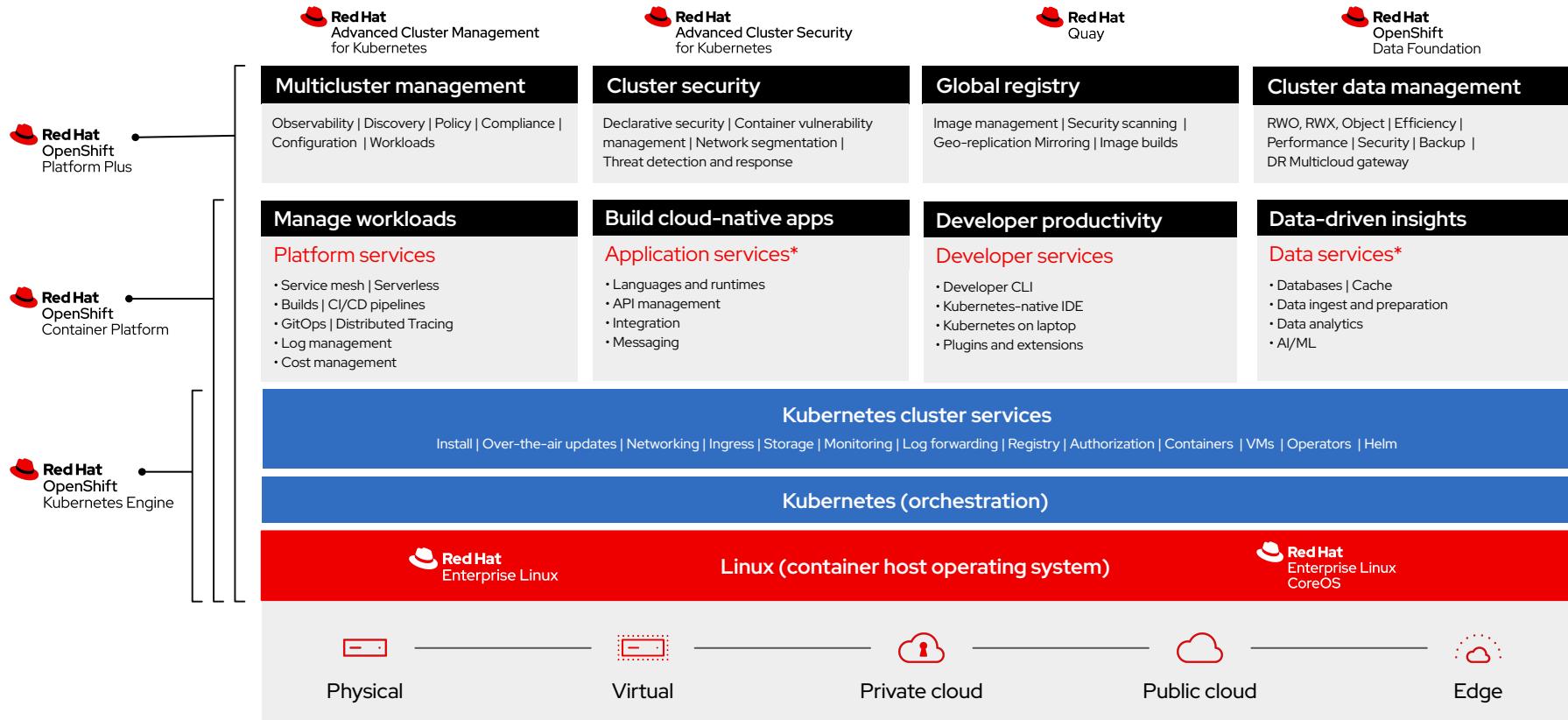


# Chapter 1

Purpose & Overview



# Red Hat OpenShift - Overview



\* Red Hat OpenShift® includes supported runtimes for popular languages/frameworks/databases. Additional capabilities listed are from the Red Hat Application Services and Red Hat Data Services portfolios.

\*\* Disaster recovery, volume and multicloud encryption, key management service, and support for multiple clusters and off-cluster workloads requires OpenShift Data Foundation Advanced



# Why Red Hat Enterprise Linux CoreOS?

- ▶ Automatic updates
  - No interaction for administrators
  - Staying up to date → security fixes applied
- ▶ Centrally configured infrastructure
  - Need a change? Update configs and re-provision.
- ▶ User software runs in containers
  - Host updates are more reliable



## RED HAT® ENTERPRISE LINUX CoreOS

### An operating system for containers

- ▶ Container based packaging
- ▶ Kubernetes cluster based management
- ▶ Delivered and updated with OpenShift
- ▶ Industry standard RHEL security & compliance
- ▶ Certified Red Hat Container ISV ecosystem

#### Linux (container host OS)



Physical



Virtual



Private cloud



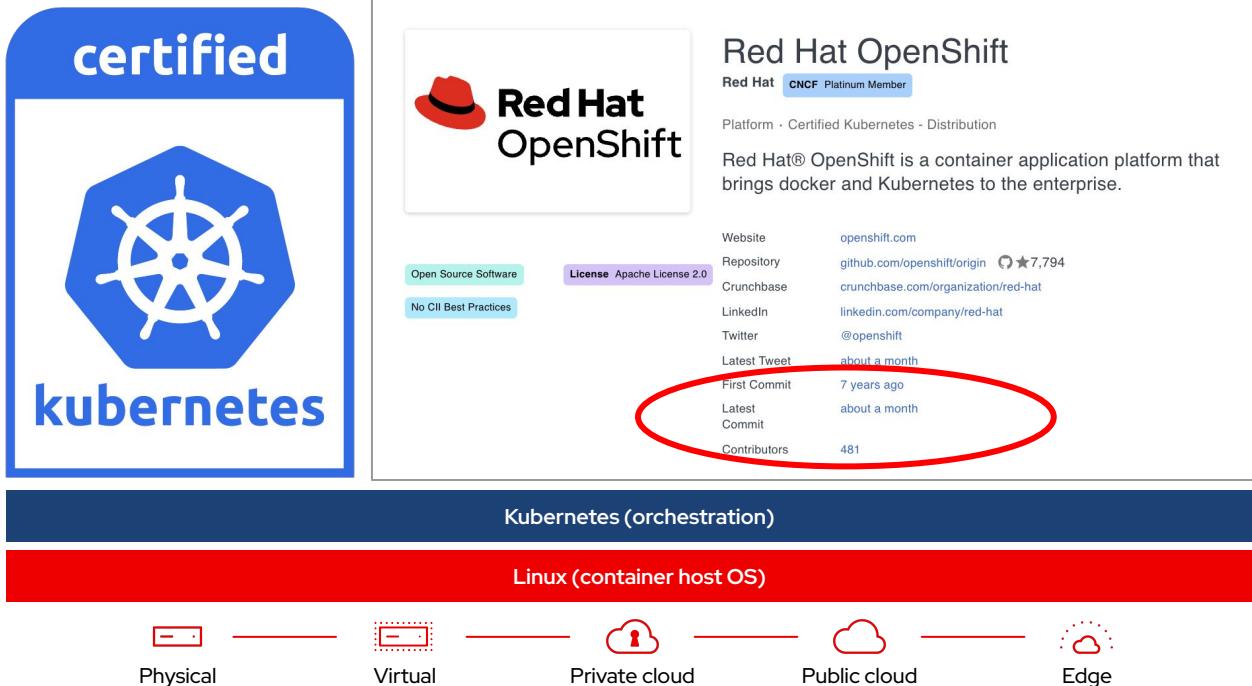
Public cloud



Edge



# Kubernetes is the core of Red Hat OpenShift





# Installation and Updates

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Chapter 2 - Kubernetes Cluster Services



# OpenShift Installation Experiences



Azure Stack Hub



Alibaba Cloud



Bare Metal



Google Cloud



vSphere\*



IBM Power Systems

IBM Z

NUTANIX

RED HAT<sup>®</sup>  
OPENSTACK<sup>®</sup>  
PLATFORM

RED HAT<sup>®</sup>  
VIRTUALIZATION



## Full Stack Automation

### Installer Provisioned Infrastructure

- ▶ Auto-provisions infrastructure
- ▶ \*KS like
- ▶ Enables self-service



## Pre-existing Infrastructure

- ### User Provisioned Infrastructure
- ▶ Bring your own hosts
  - ▶ You choose infrastructure automation
  - ▶ Full flexibility
  - ▶ Integrate ISV solutions



## Interactive – Connected

### Assisted Installer

- ▶ Hosted web-based guided experience
- ▶ Agnostic, bare metal, and vSphere only
- ▶ ISO Driven



## Interactive – Disconnected

### Agent Installer (Dev Preview)

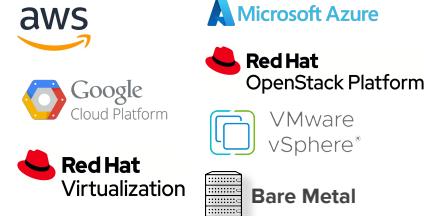
- ▶ Disconnected bare metal deployments
- ▶ Automated installations via CLI
- ▶ ISO driven



# Simplifying and automating the installation process

	Full Stack Automation	Pre-existing Infrastructure
Build Network	Installer	User
Setup Load Balancers	Installer	User
Configure DNS	Installer	User
Hardware/VM Provisioning	Installer	User
OS Installation	Installer	User
Generate Ignition Configs	Installer	Installer
OS Support	Installer: RHEL CoreOS User: RHEL Workers (on Day 2)	User: RHEL CoreOS User: RHEL Workers (on Day 2)
Node Provisioning / Autoscaling	Yes	Only for providers with OpenShift Machine API support
Customization & Provider Support	Best Practices: AWS, Azure, GCP, RHOSP, RHV, & vSphere	Yes: AWS, Azure, GCP, Bare Metal, RHOSP, & vSphere

## Full Stack Automation (IPI)



## Pre-existing Infrastructure (UPI)





# OpenShift “Over-The-Air” Cluster Updates

Red Hat OpenShift Container Platform

Administrator

Cluster Settings

Overview Cluster Operators Global Configuration

Channel: stable-4.3

Current Version: 4.3.8

Update Status: Update available

Update now

View this cluster and manage subscription settings in [OpenShift Cluster Manager](#)

Cluster ID: 6cc0dd01-dd04-45d7-ae83-73ff93f04815

Desired Release Image: quay.io/openshift-release-dev/ocp-release@sha256:a414f6308db72f88e9d2e95018f0cc4db71c6b12b2ec0f44587488f0a16efc42

Cluster Version Configuration: 4.3.8

Cluster Autoscaler: Create Autoscaler

- Intelligent OpenShift cluster updates - automated via the Operator paradigm
- Single update mechanism for the operating system and container platform
- Patches/updates available weekly
- Keep systems updated with the latest patches and features
- No waiting - access to updates when you need them
- Saves administrators significant time on cluster updates



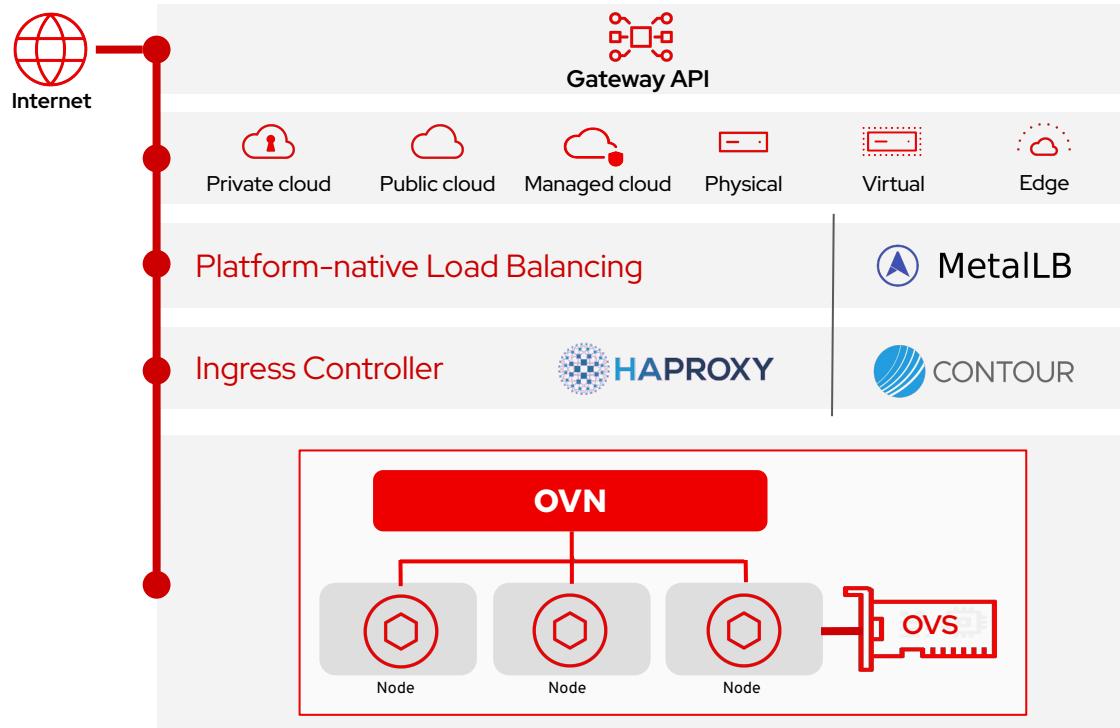
# Networking

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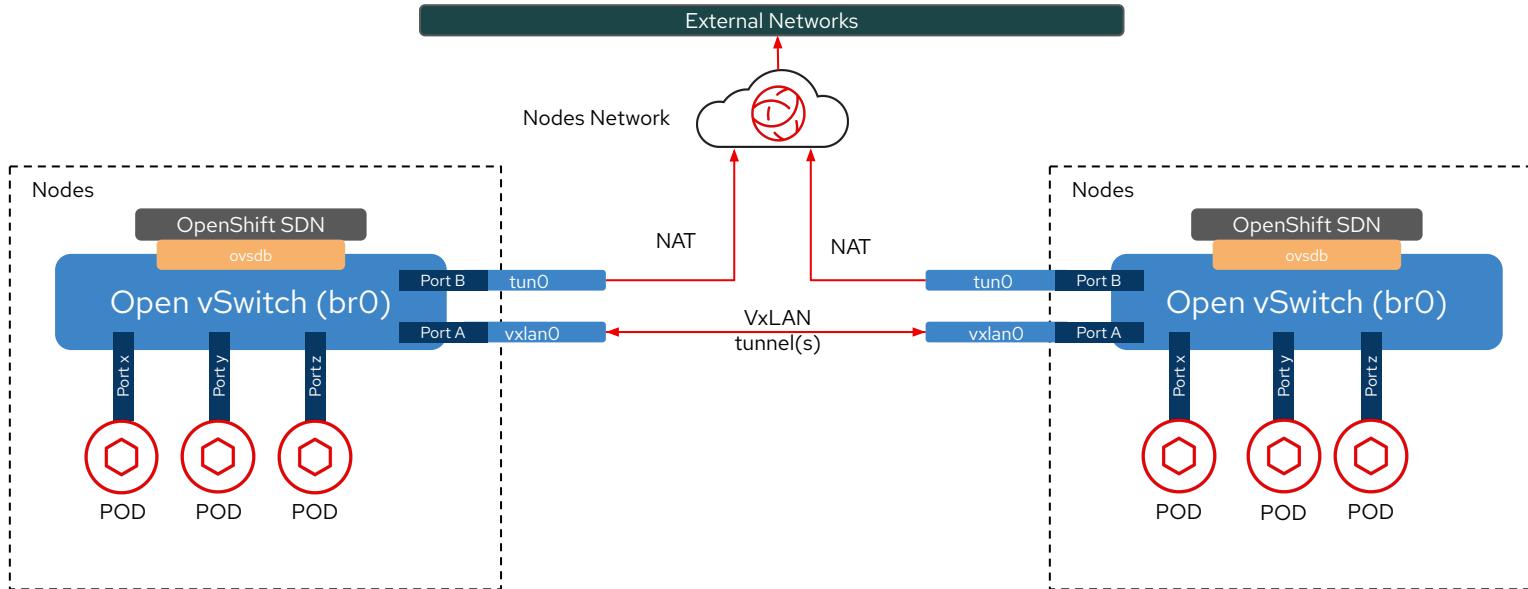
# Integrated SDN (OVS/OVN), ingress & CNI plugin



- ▶ Unified traffic handling so you configure all your traffic the same way
- ▶ Any supported platform – add or swap easily, hybrid scenarios
- ▶ Flexibility to use native traffic distribution for optimal performance

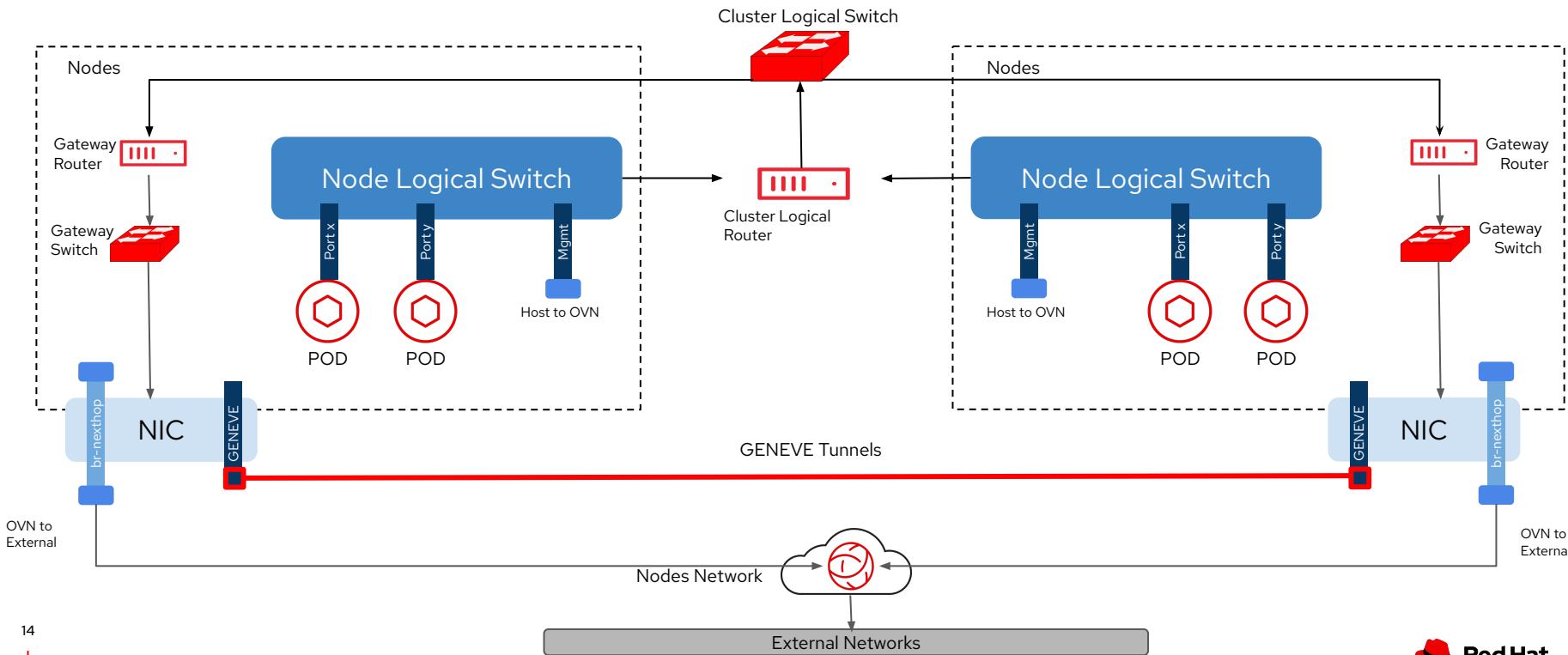


# OpenShift SDN



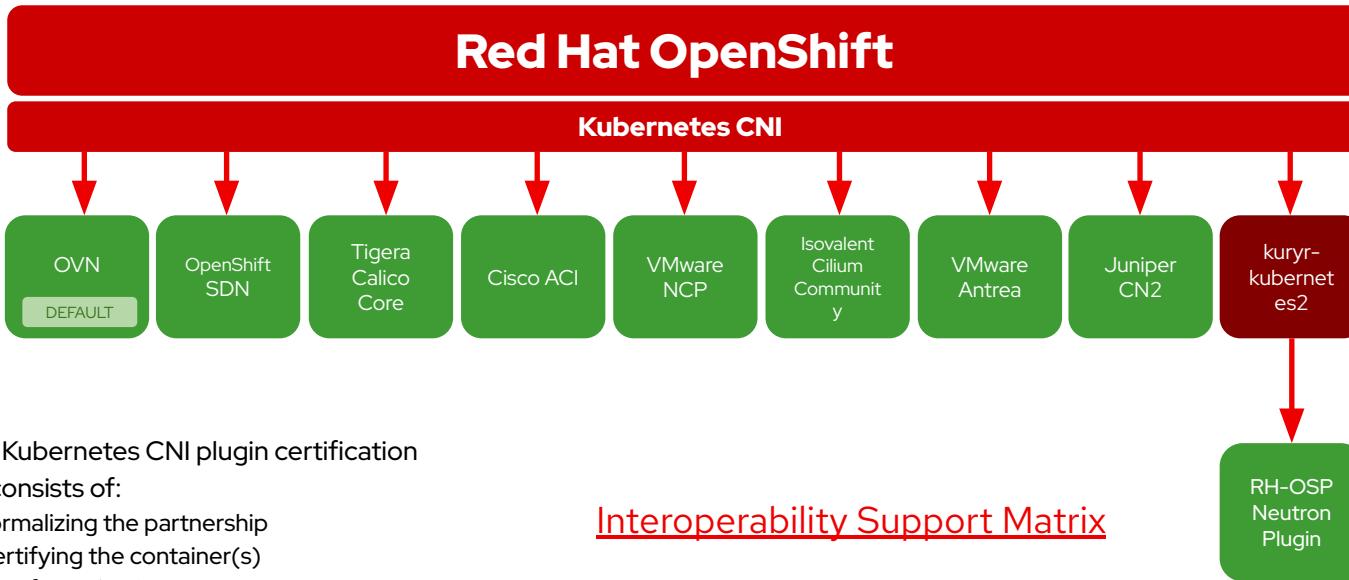


# OVN Kubernetes (logical)





# Red Hat OpenShift Networking Plug-ins



3rd-party Kubernetes CNI plugin certification primarily consists of:

1. Formalizing the partnership
2. Certifying the container(s)
3. Certifying the Operator
4. Successfully passing the same Kubernetes networking conformance tests that Red Hat OpenShift uses to validate its own SDN

## Interoperability Support Matrix





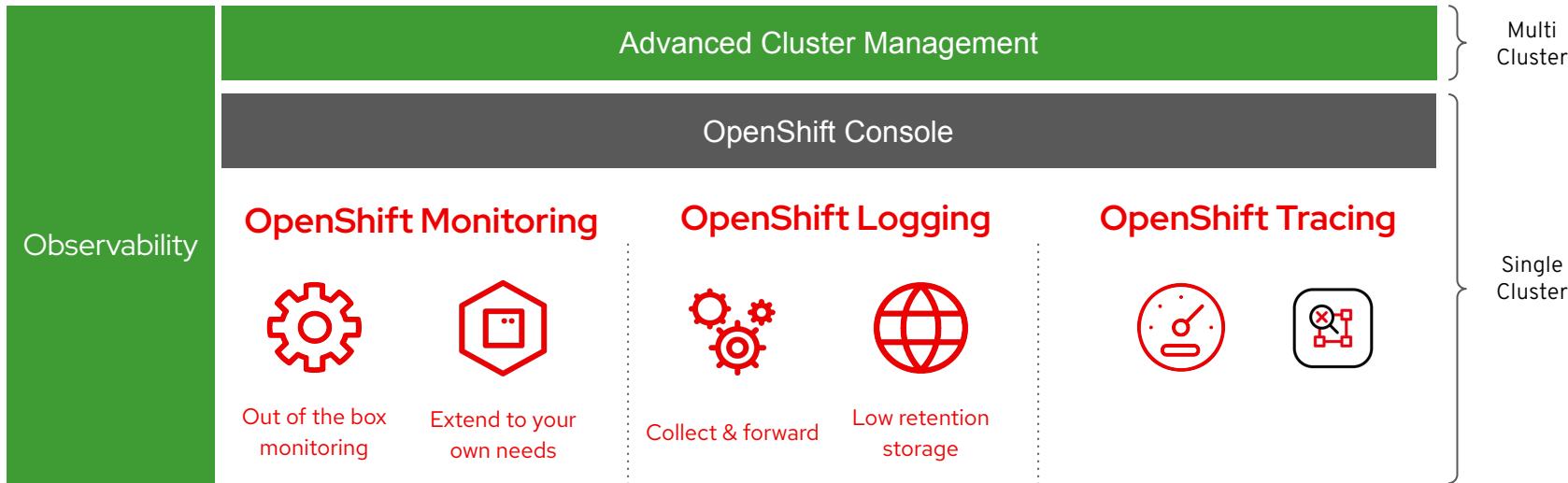
# Observability

---





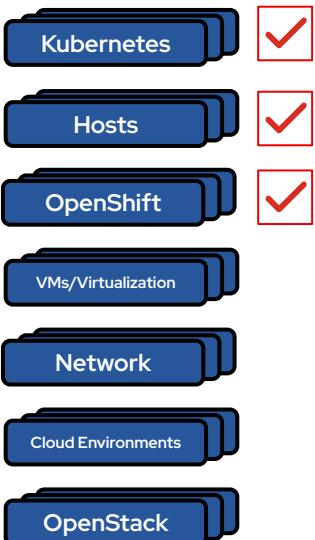
# Log collection & Observability



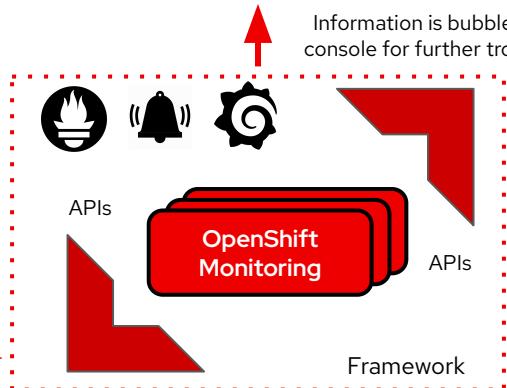
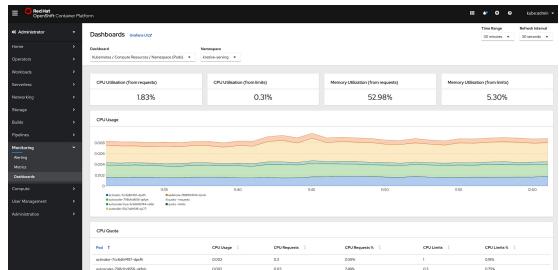


# Monitor your clusters, infrastructure, and workloads

## Low level infrastructure



All underlying infrastructure exposing metrics can easily integrate those into the OpenShift Monitoring framework.



Information is bubbled up into the console for further troubleshooting.

## Top level workload



All user workload running on OpenShift exposing metrics can easily integrate those into the OpenShift Monitoring framework.

[Customize monitoring](#)

**Metrics collection and storage** via Prometheus, an open-source monitoring system time series database.

**Alerting/notification** via Prometheus' Alertmanager, an open-source tool that handles alerts sent by Prometheus.

**Metrics visualization** via OpenShift Console and Grafana.

# Container Management and Security Essentials

---





# Securely manage your container images

Red Hat OpenShift Container Platform

OperatorHub

Installed Operators

Workloads

Networking

Storage

Builds

Monitoring

Compute

User Management

Administration

Cluster Settings

**Namespaces**

Resource Quotas

Limit Ranges

Custom Resource Definitions

Namespaces > Namespace Details

**openshift-image-registry** Active

Details YAML Role Bindings

Namespace Details

Name: openshift-image-registry Status: Active

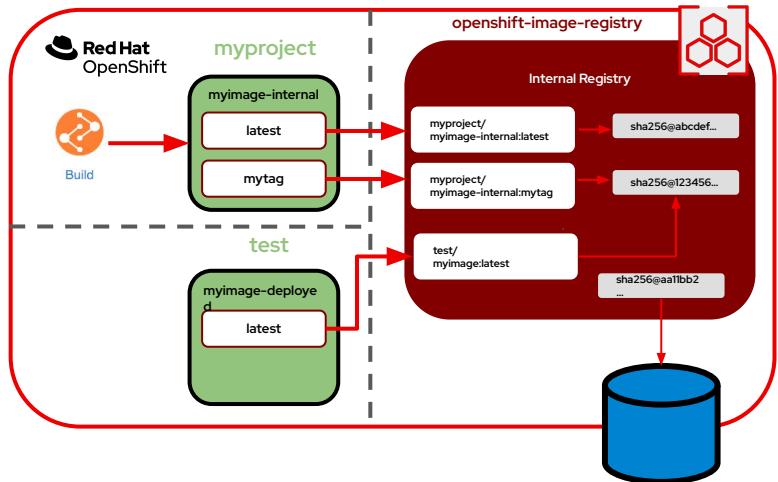
Labels: olm.operatorgroup.uid/e29fad31-4915-4984-8f2e-553e7c321527, openshift.io/cluster-monitoring=true

Annotations: 4 Annotations

Display Name: No display name

Description: No description

Created At: May 16, 1:42 pm



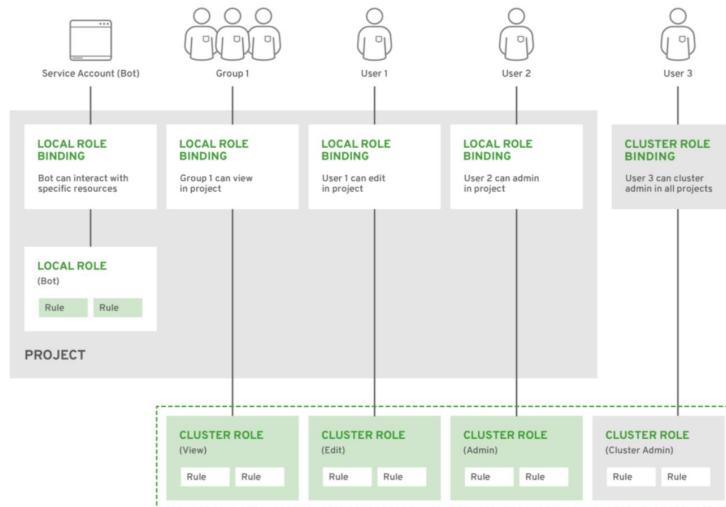
OpenShift provides a built-in container image registry managed by an infrastructure operator. The registry is typically used as a publication target for images built on the cluster, as well as being a source of images for workloads running on the cluster... for a more enterprise grade registry... i.e. Quay [go here](#)



# Authentication, authorization & deployment policies

## Authentication

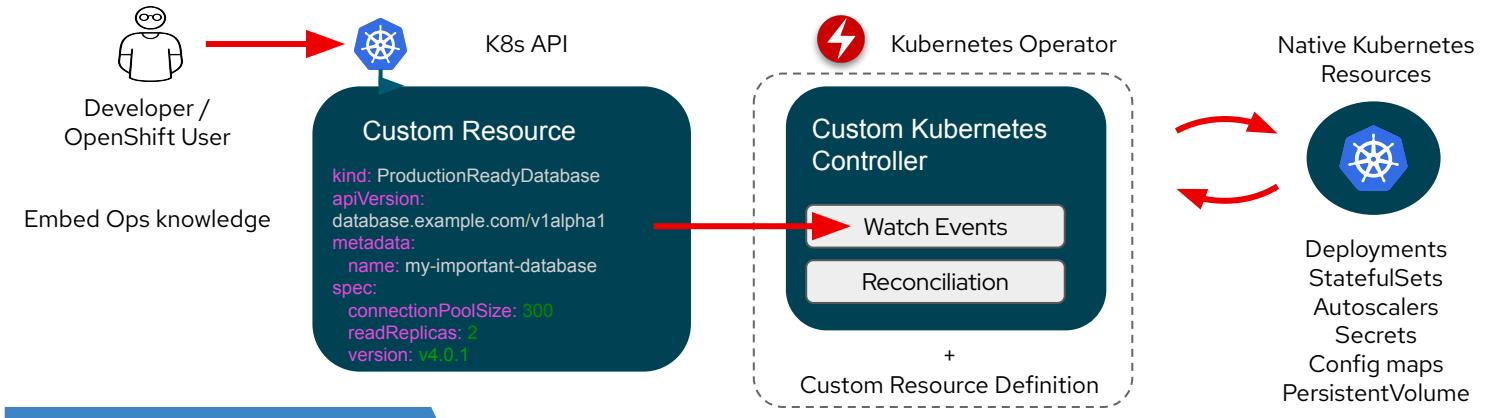
- ▶ Restrict user access through trusted identity providers
- ▶ Integrate with platform OAuth server to
- ▶ Connect to external identity provider -- 9 supported options



## Role based authorization

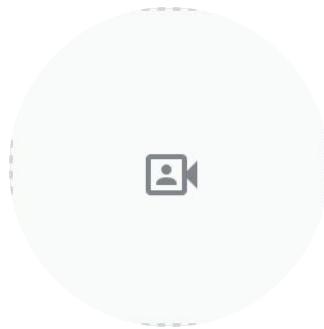
- ▶ Project scope & cluster scope available
- ▶ Operator- and user-level roles are defined by default
- ▶ Custom roles are supported

# Managing deployments



Phase I	Phase II	Phase III	Phase IV	Phase V
Basic Install	Seamless Upgrades	Full Lifecycle	Deep Insights	Auto Pilot
Automated application provisioning and configuration management	Patch and minor version upgrades supported	App lifecycle, storage lifecycle (backup, failure recovery)	Metrics, alerts, log processing and workload analysis	Horizontal/vertical scaling, auto config tuning, abnormal detection, scheduling tuning

# AGENDA



## Day 1 - OpenShift Container Platform

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Break till 14:40

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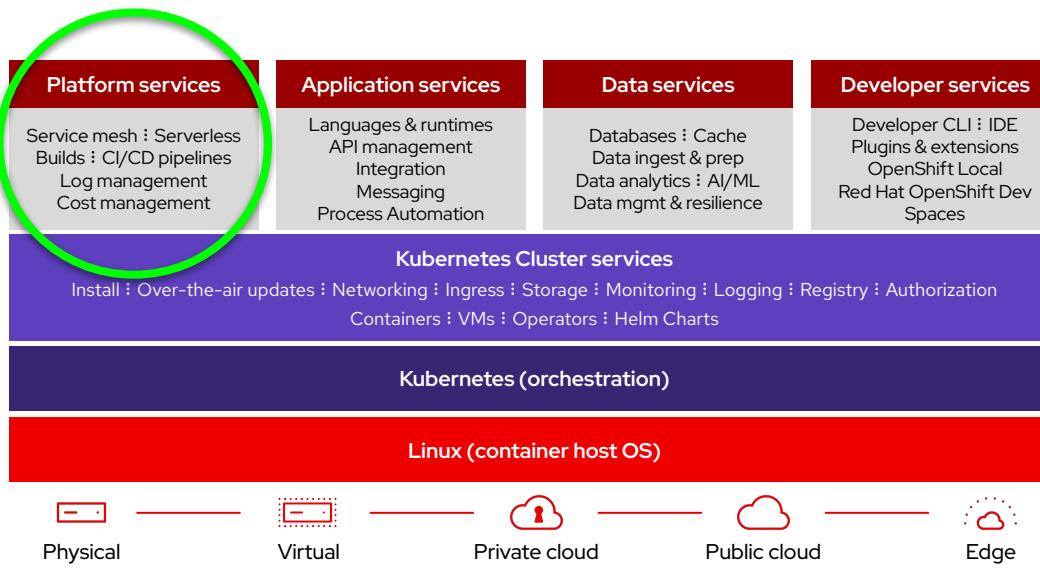
# Platform Services

---



# Platform Services: Portfolio

OpenShift's Platform Services provide a unified solution for modern development. With Service Mesh and Serverless, streamline application delivery through efficient Builds, CI/CD pipelines, and effective Log Management. Ensure cost-effectiveness with integrated tools for precise Cost Management.



# OpenShift: Empowering Applications with a Comprehensive Platform

## Platform services

Service mesh  
Builds : CI/CD pipelines  
Log management  
Cost management



OpenShift Service Mesh with Istio to connect, secure and observe services



OpenShift Serverless with Knative to enable hybrid Serverless, FaaS & Event Driven Architectures



OpenShift Builds with Shipwright to build images from code using S2I + other & integrate with Github Actions



OpenShift Pipelines with Tekton to provide Kubernetes-Native CI/CD pipelines



OpenShift GitOps with ArgoCD to enable declarative GitOps based continuous delivery



Application level observability for developers to build and manage their apps



Log management of infrastructure, application, and audit logs + forwarding capabilities



Cost management visibility, mapping, and modeling across hybrid infrastructure in order to stay on budget

## Kubernetes Cluster services

## Kubernetes

## Linux



Physical



Virtual



Private cloud



Public cloud



Edge

# Advanced Kubernetes Orchestration

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# OpenShift Service Mesh with Istio

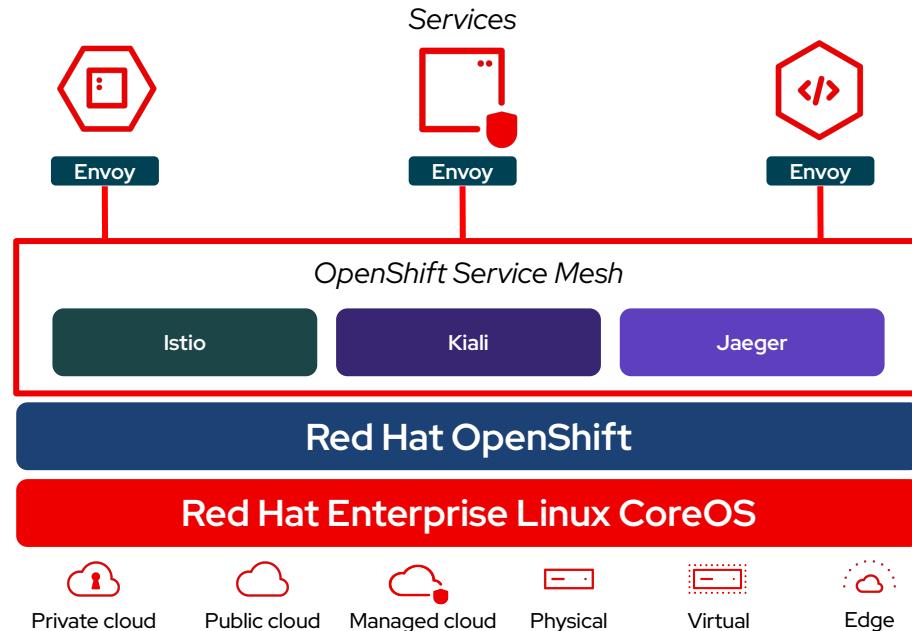
## Connect, Secure, Control & Observe

### Services

- Connect services securely with zero-trust network policies.
- Automatically secure your services with managed authentication, authorization and encryption.
- Control traffic to safely manage deployments, A/B testing, chaos engineering and more.
- See what's happening with out of the box distributed tracing, metrics and logging.
- Manage OpenShift Service Mesh with the **Kiali** web console.



### Product Briefing Deck



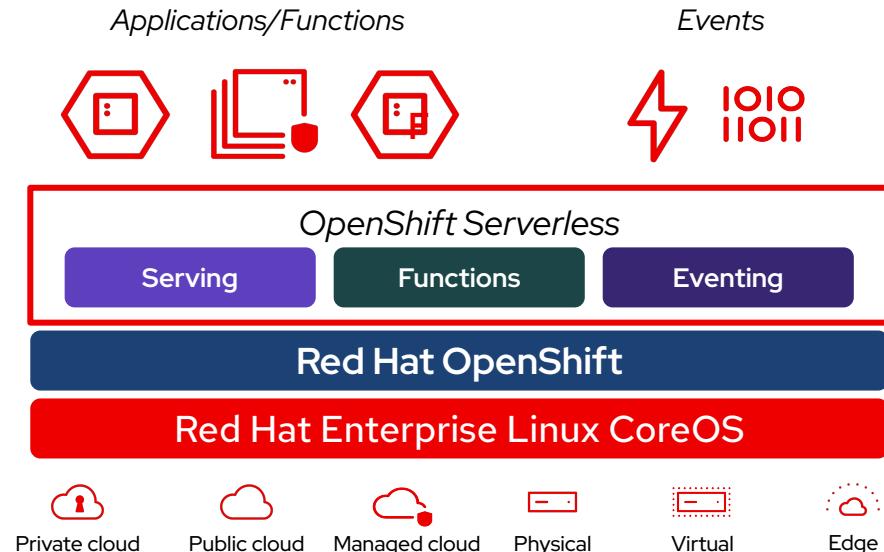
\* Eventing is currently in Technology Preview

\*\* Functions are currently a work in progress initiative

# Red Hat OpenShift Serverless with Knative

## Connect, Secure, Control & Observe Services

- Deploy and run **serverless containers**
- Use any programming language or runtime
- Modernize existing applications to run serverless
- Powered by a rich ecosystem of event sources
- Manage serverless apps natively in Kubernetes
- Based on open source project **Knative**
- Run anywhere OpenShift runs



# CI/CD Tooling for Containerized Applications

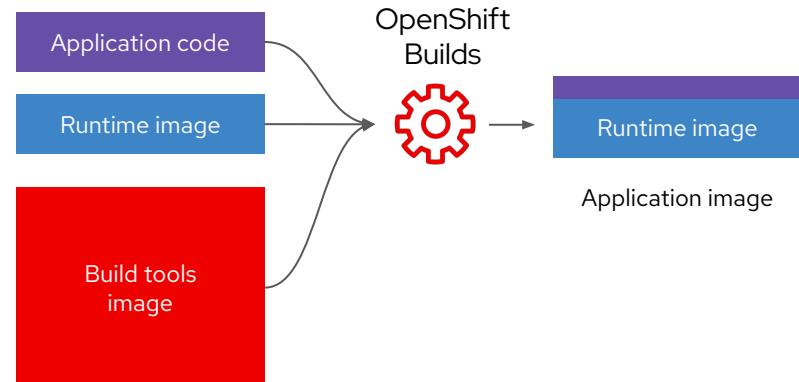
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# Build images from code using S2I + other & integrate with Github Actions

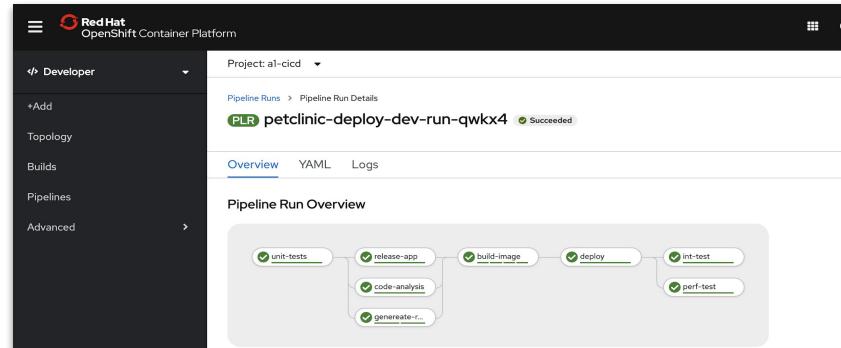
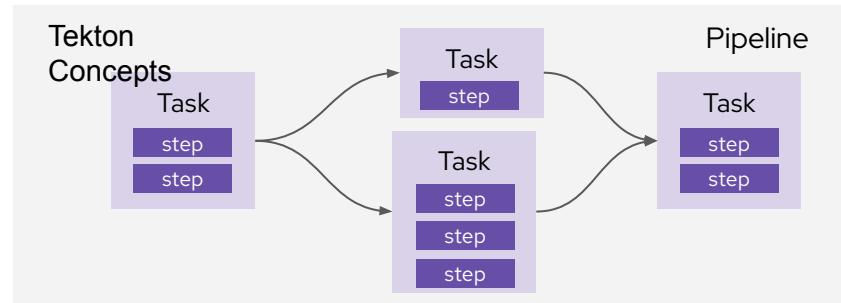
- Build images on OpenShift and Kubernetes
- Use Kubernetes build tools
  - Source-to-Image
  - Buildpacks
  - Buildah
  - Kaniko
  - ...more
- Create lean application images
- Extend with your own build tools
- Based on Shipwright open-source project



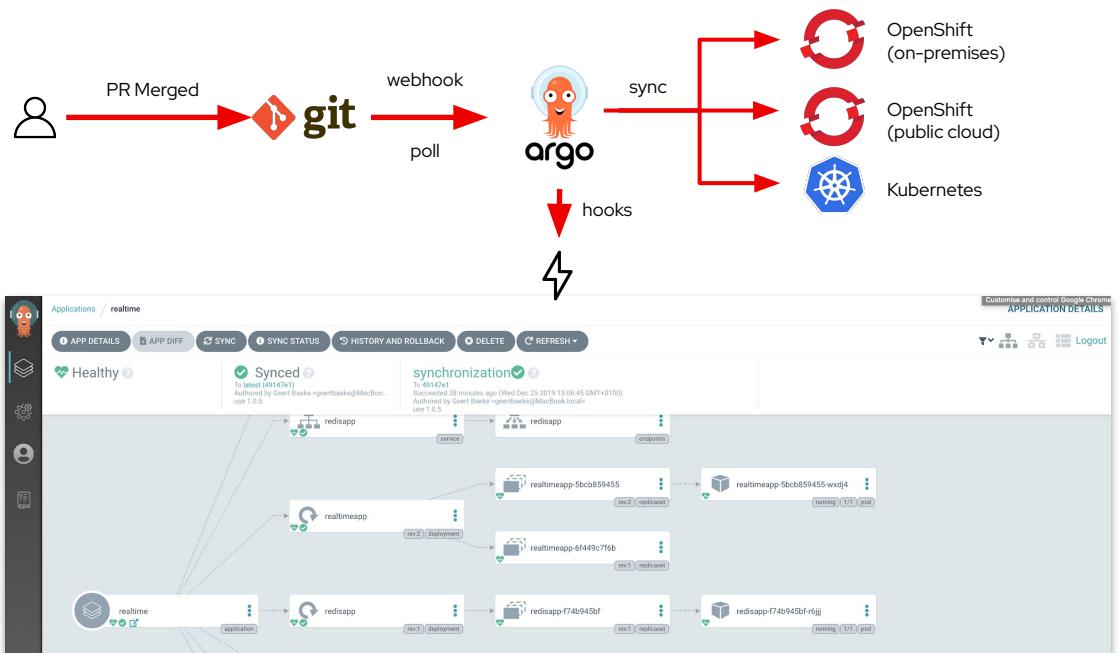


# Tekton provides Kubernetes-Native CI/CD pipelines

- Based on Tekton Pipelines
- Kubernetes-native declarative CI/CD
- Pipelines run on-demand in isolated containers
- No central server to maintain! No plugin conflicts!
- Task library and integration with Tekton Hub
- Secure pipelines aligned with Kubernetes RBAC
- Visual and IDE-based pipeline authoring
- Pipeline templates when importing apps
- Automated install and upgrades via OperatorHub
- CLI, Web, VS Code and IntelliJ plugins



# Argo CD for declarative GitOps continuous delivery



- Configurations versioned in Git
- Automatically syncs configuration from Git
- Drift detection, visualization and correction
- Granular control over sync order
- Rollback and rollforward to any Git commit
- Manifest templating support (Helm, Kustomize, etc)
- Visual insight into sync status

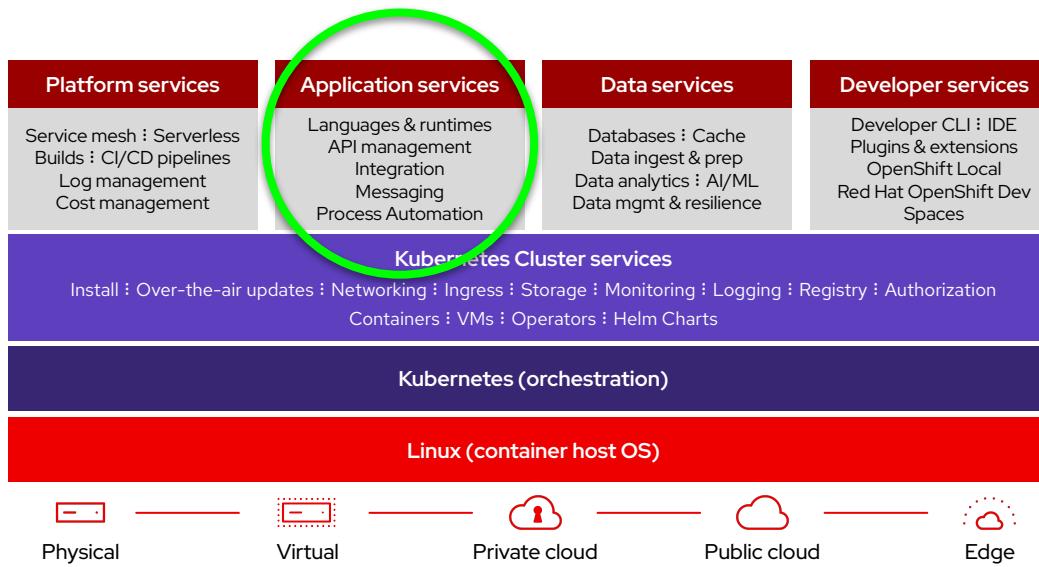
# Application Services

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# Application Services: Portfolio

Create a unified environment for application development, delivery, integration, and automation. It is comprised of comprehensive frameworks, integration solutions, process automation, runtimes, and programming languages



# RHOAM - Red Hat OpenShift API Management

- Centralized control of API program
- Enable API lifecycle management
- Ensure API quality and usability
- Report and monitor APIs
- Control access and usage of APIs

Customer ISV software  
ISV Cloud Services

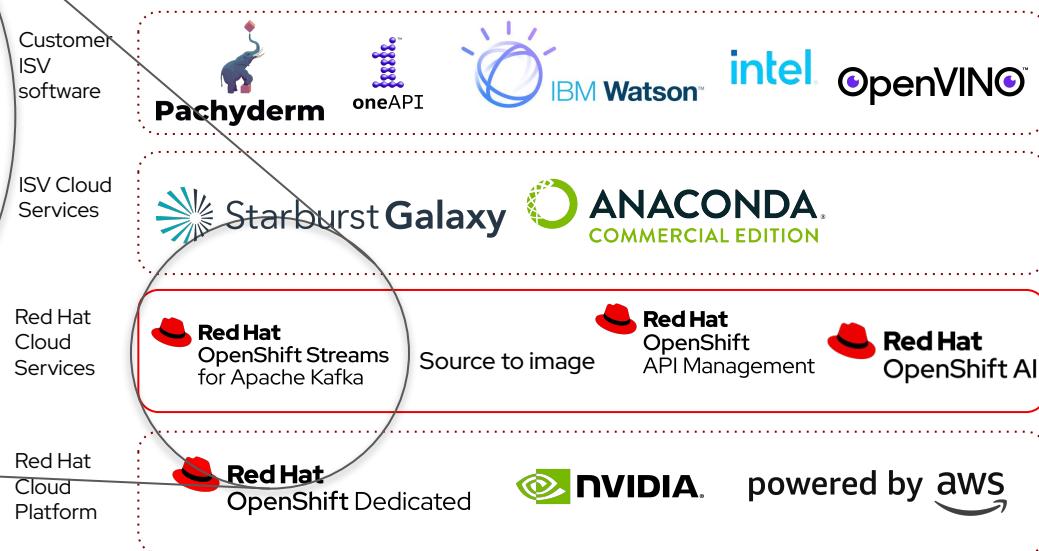
Red Hat Cloud Services

Red Hat Cloud Platform

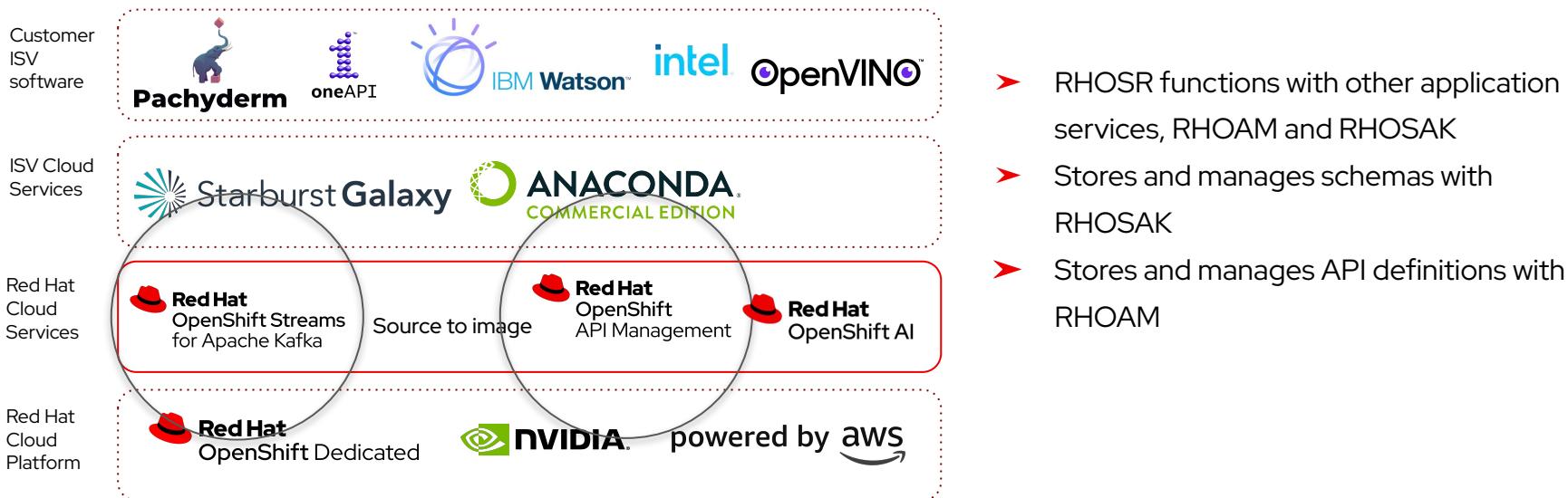


# RHOSAK - Red Hat OpenShift Streams for Apache Kafka

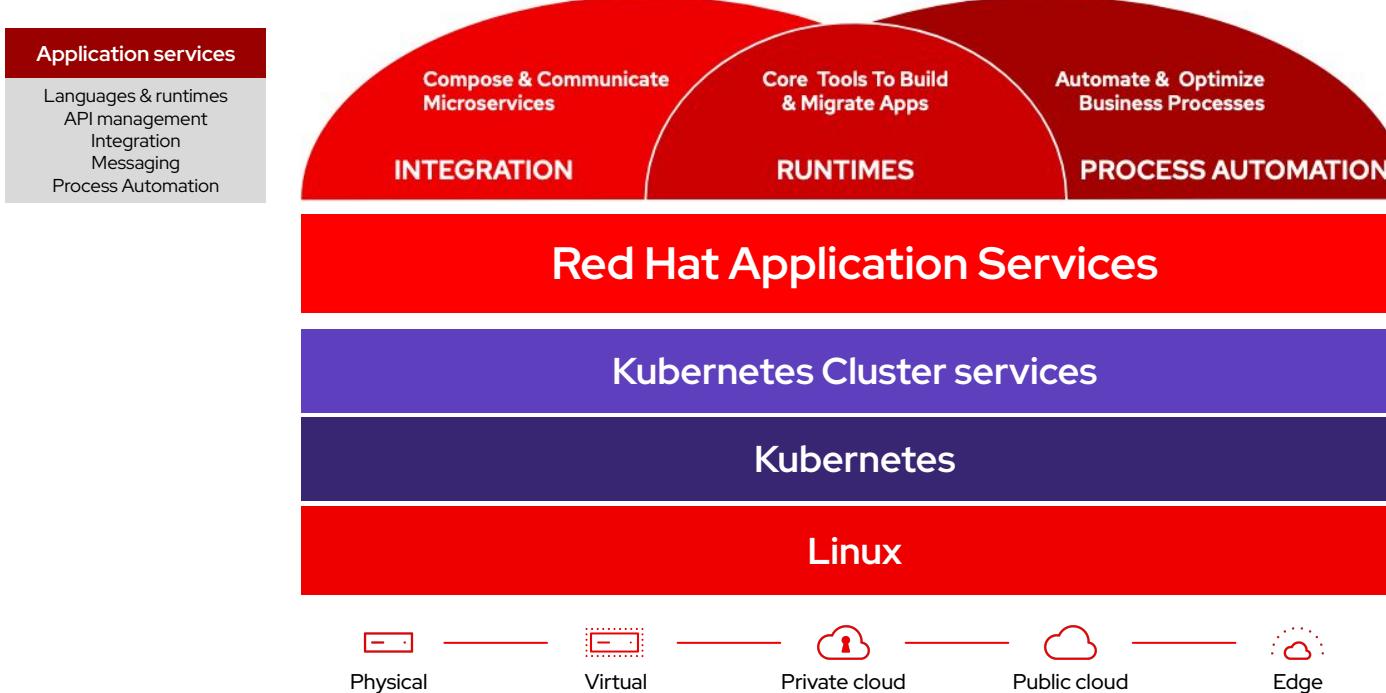
- Fully hosted + managed Kafka service for stream-based applications
- Reduces operational cost and complexity of application delivery
- Connects applications across clouds, both private and public



# RHOSR - Red Hat OpenShift Service Registry



# Develop and Connect Cloud Native Applications



Create, run and maintain traditional and cloud-native apps for on-premise, cloud or hybrid architectures

# Developer Services

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# Developer Services: Portfolio



OpenShift Developer Console & CLI enhancements to improve dev experience



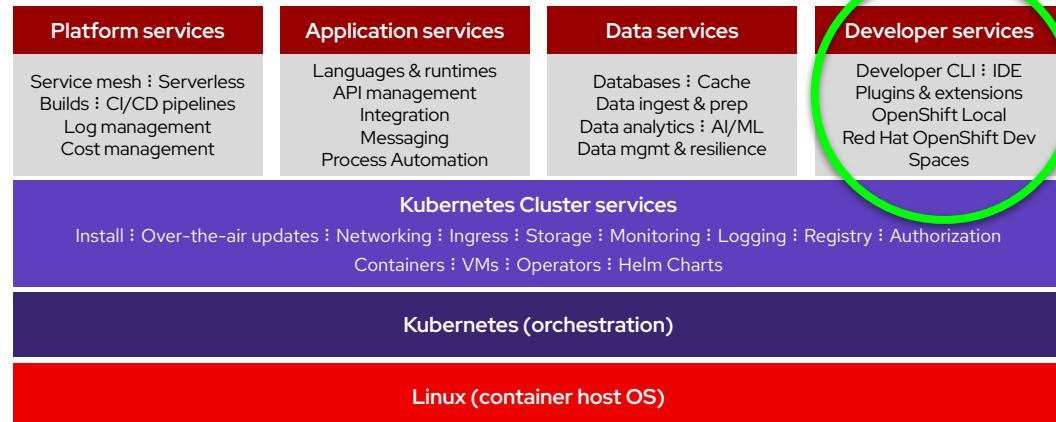
OpenShift IDE plugin integrations to meet the developer where they are



Red Hat OpenShift Dev Spaces: cloud dev environments on OpenShift with web-based IDEs.



OpenShift developer sandbox and local cluster enhancements to improve access



Physical



Virtual



Private cloud



Public cloud



Edge

# Red Hat Application Services: Overview

## Red Hat Integration

**Red Hat Fuse** **Red Hat AMQ**

**Red Hat 3scale API Management**

 Red Hat OpenShift Application Runtimes  
 Red Hat Data Grid  
 Red Hat AMQ  
 OpenJDK

## Red Hat Runtimes



**Red Hat Runtimes**

## Red Hat Runtimes

 Red Hat JBoss Enterprise Application Platform

 OpenJDK™

 RED HAT® SSO

 VERT.X  Open Liberty  MICROPROFILE™  \* node.js  THORNTAIL

## Red Hat Process Automation

**Red Hat Process Automation Manager**

 Red Hat Decision Manager

 Red Hat OpenShift Application Runtimes  
 Red Hat Data Grid  
 Red Hat AMQ  
 OpenJDK

## Red Hat Runtimes



**Red Hat Runtimes**

# Red Hat Application Services: Quarkus, APIs, and Integration Features

## Red Hat Runtimes

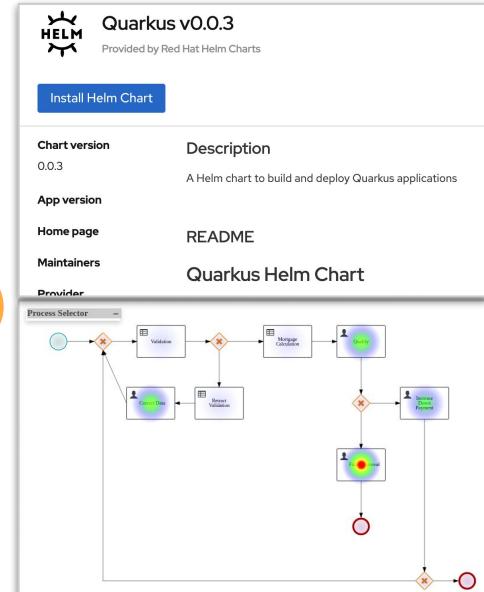
- **Quarkus** - Quick Starts, Example Helm Chart, Integration with Serverless Functions (DP)
- **EAP** - Azure App Service (GA), Azure Marketplace, EAP XP 2.0 (Runnable JARs)
- **Spring Boot 2.3** - Support for UBI for Java 8 and 11, Security Starter, Dekorate Build Hooks (TP)

## Red Hat Integration

- **APIs** - OSD Add-On: Managed API Service (GA), 3scale Manageability Enhancements
- **Messaging** - AMQ Broker/Online, Interconnect LTS, AMQ Interconnect 2.0 (DP)
- **Streaming** - Kafka 2.7 support in AMQ Streams, Service Registry 2.0 (TP)

## Red Hat Process Automation

- **Dashboard Builder** - Heat Map component





# Overview: OpenShift Developer Console

Project: mschmitt-redhat-dev Application: all applications

Add

Select a way to create an Application, component or service from one of the options.

Category	Option	Description
Quick Starts	Samples	Create an Application from a code sample
	From Git	Import code from your Git repository to be built and deployed
From Devfile	From Devfile	Import your Devfile from your Git repository to be built and deployed
	Container Image	Deploy an existing Image from an Image registry or Image stream tag
From Dockerfile	From Dockerfile	Import your Dockerfile from your Git repository to be built and deployed
	YAML	Create resources from their YAML or JSON definitions
From Catalog	From Catalog	Browse the catalog to discover, deploy and connect to services
	Database	Browse the catalog to discover database services to add to your Application
Helm Chart	Operator Backed	Browse the catalog to discover and deploy operator managed services
	Helm Chart	Browse the catalog to discover and install Helm Charts



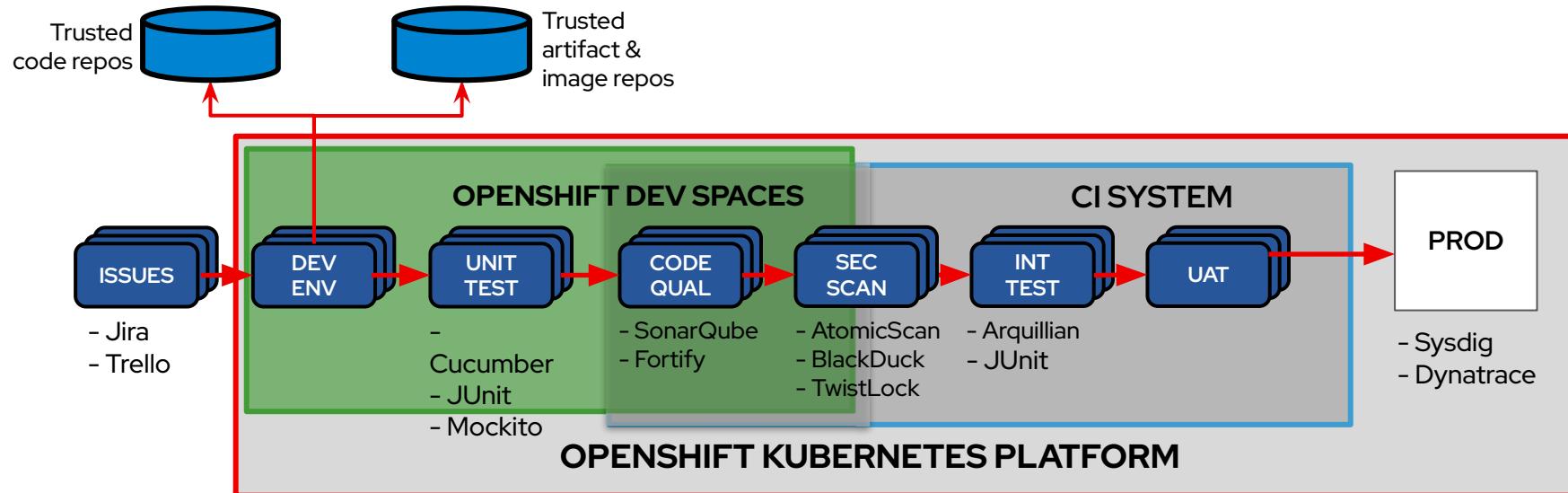
# Overview: OpenShift Developer Console

The screenshot shows the OpenShift Developer Console interface for the project `mschmitt-redhat-dev`. The left sidebar navigation includes options like Developer, Topology, Monitoring, Search, Builds, Helm, Project (selected), ConfigMaps, and Secrets. The main content area displays the Project Overview for `mschmitt-redhat-dev`, which is Active. It includes sections for Details (Name: `mschmitt-redhat-dev`, Requester: `mschmitt-redhat`, Labels: `name:mschmitt-redhat-dev`, `toolchain.dev.openshift.com/owner=mschmitt-redhat`, `toolchain.dev.openshift.com/provider=codeready-toolchain`), Status (Active), Utilization (CPU usage: 47.39m, Memory usage: 179.4 MiB, Filesystem usage: 40 KB, Network transfer: 399.4 Kbps in, 103.3 Kbps out, Pod count: 5), and ResourceQuotas (No resource quotas). The Activity section shows a list of recent events, all of which occurred at 12:44 PM, including creating a container, pulling an image, starting containers, adding an interface, creating a container, and more.

Event	Details
Created container nginx-sample	12:44 PM
Started container nginx-sample	12:44 PM
Pulling image "image-registry.openshift-l...	12:44 PM
Successfully pulled image "image-registry...	12:44 PM
Started container sti-build	12:44 PM
Add eth0 [10.129.6.194/23]	12:44 PM
Created container sti-build	12:44 PM
Container image "quay.io/openshift-releas...	12:44 PM
Created pod: nginx-sample-776f6b8f08...	12:44 PM
Scaled up replica set nginx-sample-776f6...	12:44 PM
Successfully assigned mschmitt-redhat-d...	12:44 PM
Created container manage-dockerfile	12:44 PM
Started container manage-dockerfile	12:44 PM
Container image "quay.io/openshift-releas...	12:44 PM
Build mschmitt-redhat-dev/nginx-sample...	12:44 PM
Started container git-clone	12:44 PM
Created container git-clone	12:44 PM
Container image "quay.io/openshift-releas...	12:44 PM



# Red Hat OpenShift Dev Spaces





# Devfile Open Format



Use your  
favorite IDE



## OpenShift integration



## Inject dev configs



# Git Services integration



## Air Gap Support

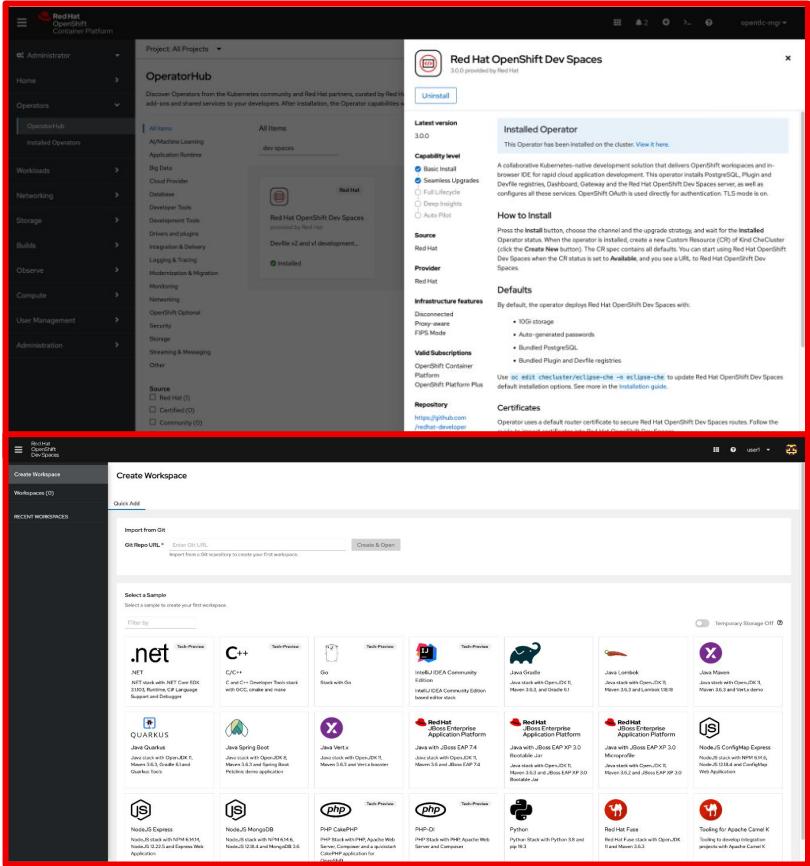


For more  
detailed slides  
on Dev Spaces  
please see  
[here](#).

# Pair Programming



Try Dev Spaces  
Workspaces for  
free on the  
Developer  
Sandbox [here](#)





# OpenShift IDE plugins and other tooling

## OpenShift Connector

### OpenShift/Kubernetes extension for IDEs

- Enables rapid development and deployment of code
- Provides local OpenShift cluster creation using Red Hat OpenShift Local in VS Code extension
- Easily view projects, applications and more



odo

### Developer CLI for OpenShift & Kubernetes

- Easily start with project from runtime sample
- Quickly iterate on code changes without full container rebuilds
- Consistency on experience regardless of language

```
$ odo create nodejs --starter
```

## Red Hat OpenShift Dev Spaces

### Cloud Development Platform

- Accelerates projects and onboarding; from 0 to coding in 2 minutes
- Familiar VSCode-like experience in the browser, with plugin extensibility
- Reproducible and consistent developer environments defined in a file in git

## Dependency Analytics

### Shift Left Security

- Find & remedy issues faster from within an editor
- Scans for vulnerabilities, licenses & more
- Powered by industry-leading vulnerability database - Snyk Intel

# AGENDA

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# Hands-On

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# Thank you

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