

Red Hat OpenShift

Introduction and demo

Alfred Bach

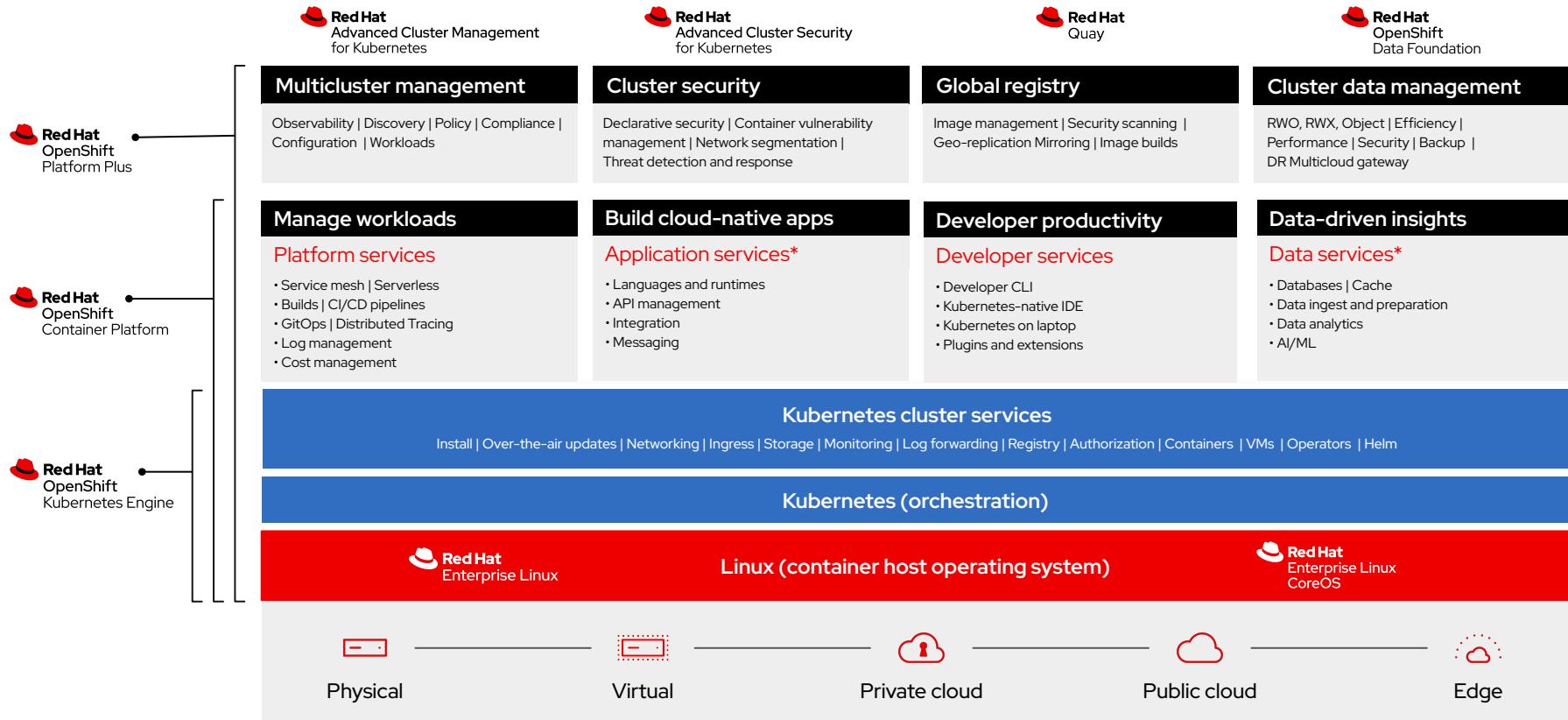
Principal Learning and Development Instructor

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

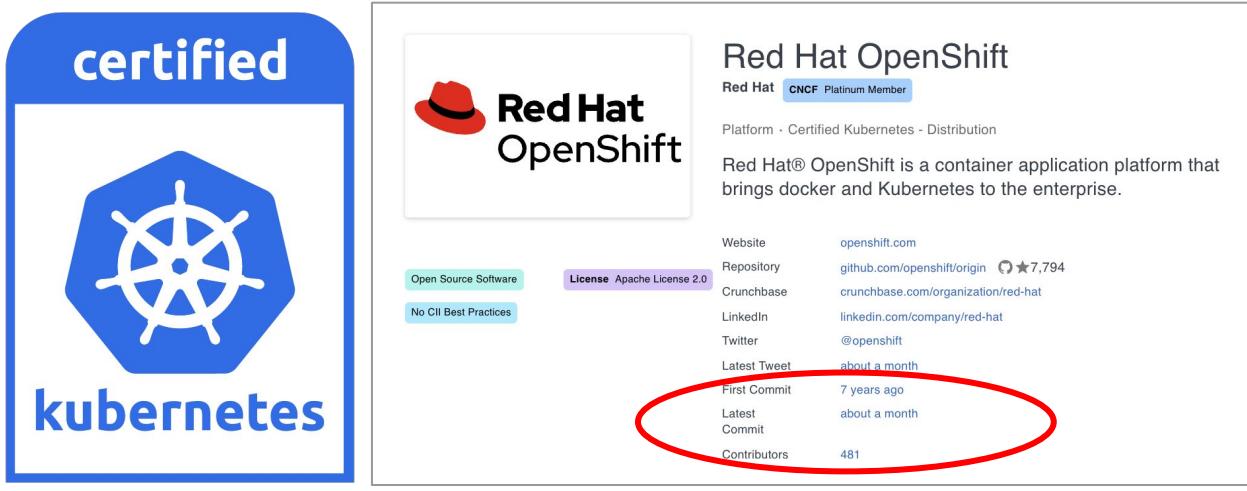


Public cloud



Edge

Kubernetes is the core of Red Hat OpenShift



Kubernetes (orchestration)

Linux (container host OS)



Physical



Virtual



Private cloud



Public cloud



Edge

Installation and Updates

Chapter 2 - Kubernetes Cluster Services



OpenShift Installation Experiences



Azure Stack Hub



Alibaba Cloud



Bare Metal



Google Cloud



vSphere*



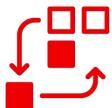
IBM Power Systems

IBM Z

NUTANIX

RED HAT[®]
OPENSTACK[®]
PLATFORM

RED HAT[®]
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



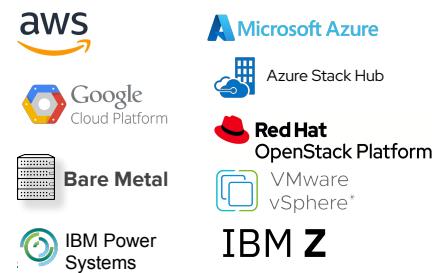
Simplifying and automating the installation process

	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: ec0dd01-dd94-45d7-ae83-73f193f04815

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

Cluster Version Configuration: CV version

Cluster Autoscaler: Create Autoscaler

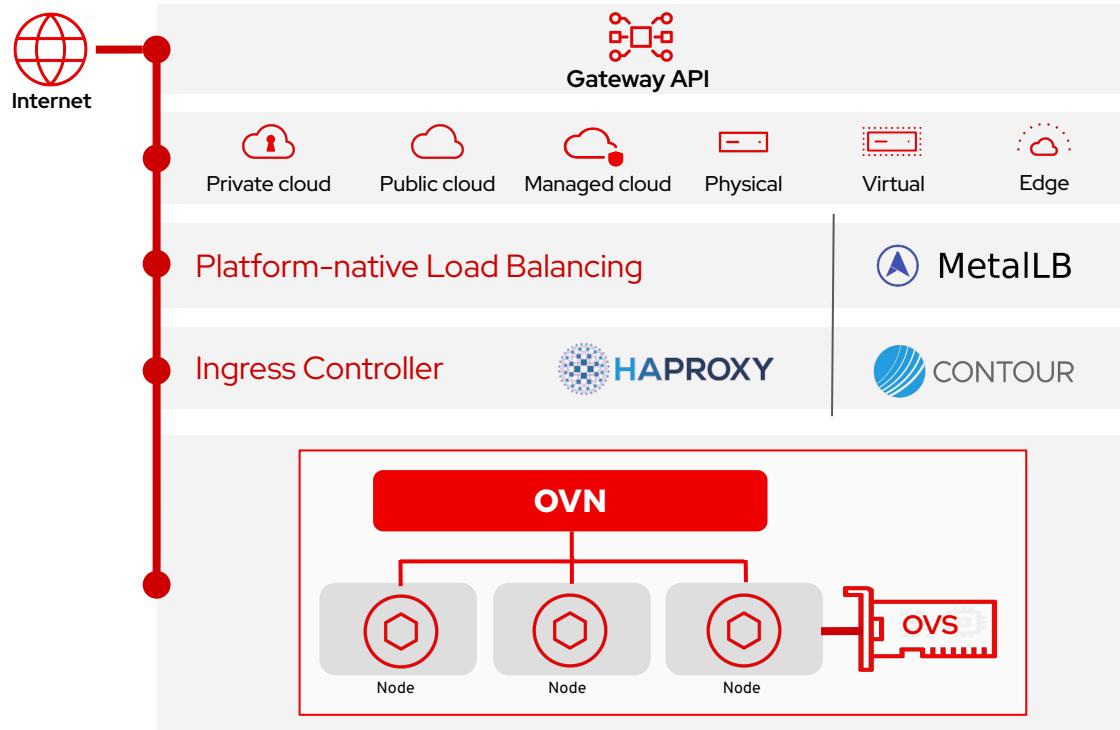
- Intelligent OpenShift cluster updates - automated via the Operator paradigm
- Single update mechanism for the operating system and container platform
- Patches/updates available weekly
- Keep systems updated with the latest patches and features
- No waiting - access to updates when you need them
-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

Networking





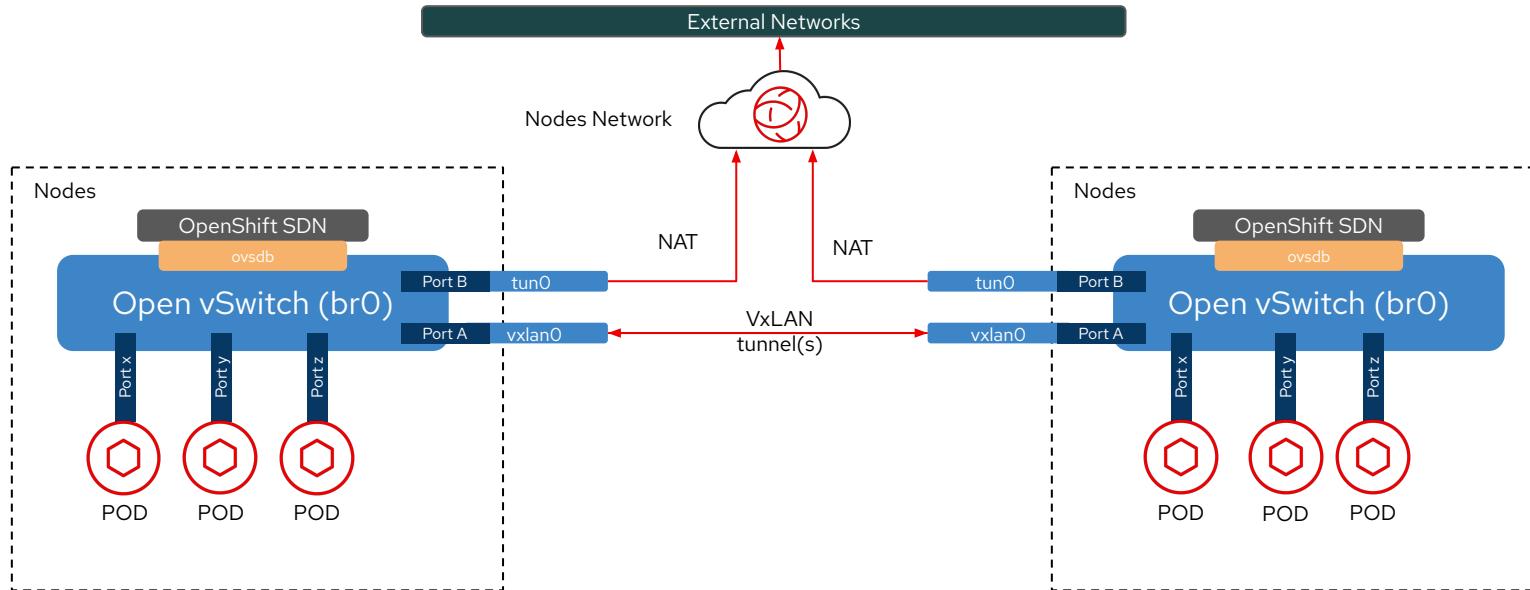
Integrated SDN (OVS/OVN), ingress & CNI plugin



- ▶ 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

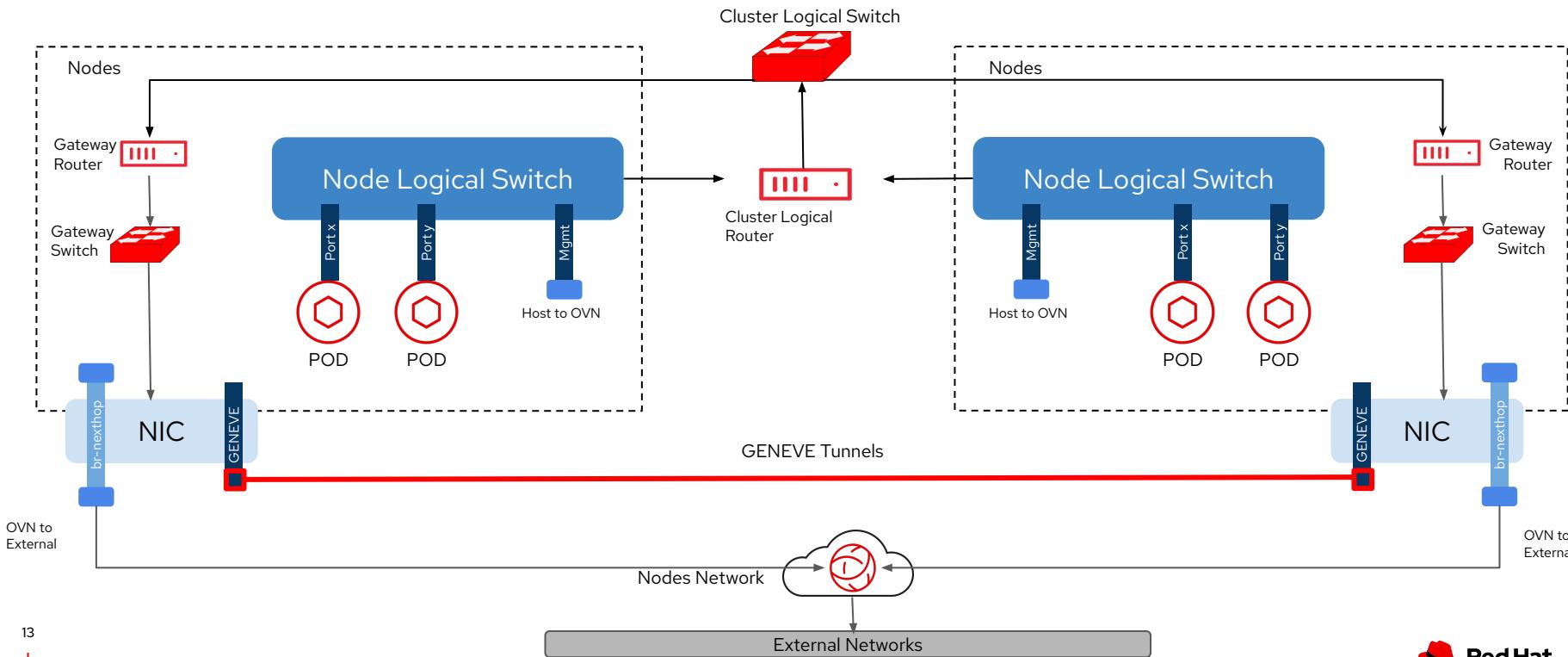


OpenShift SDN



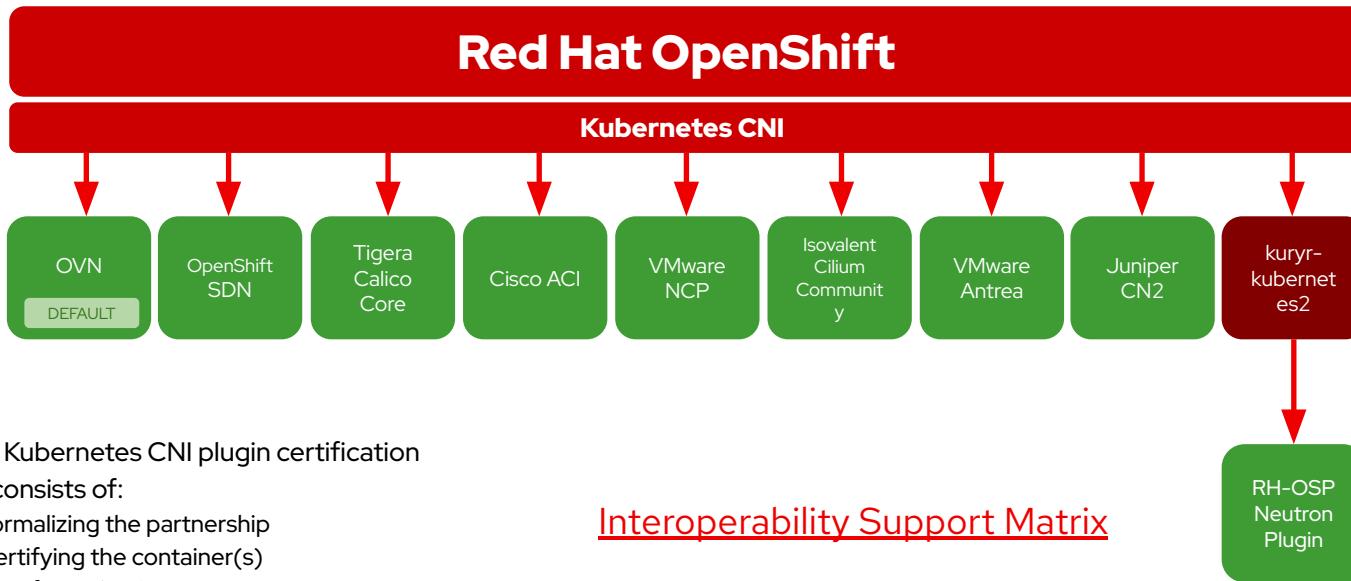


OVN Kubernetes (logical)





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

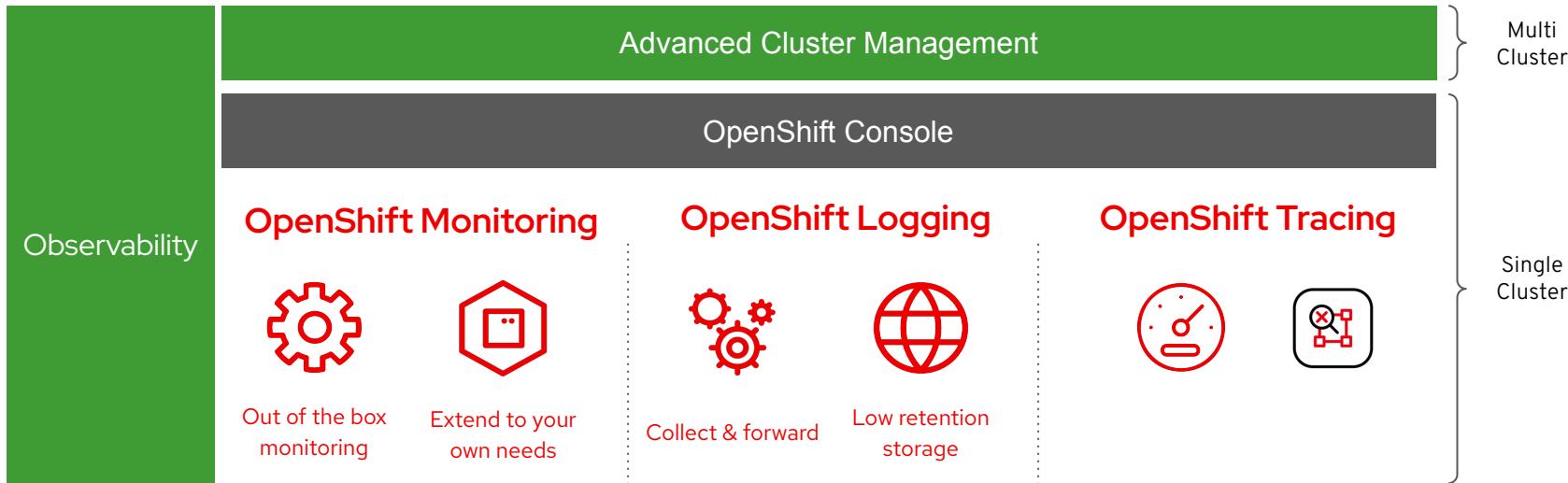


Observability





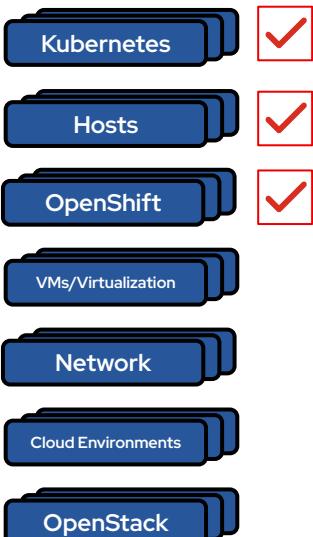
Log collection & Observability



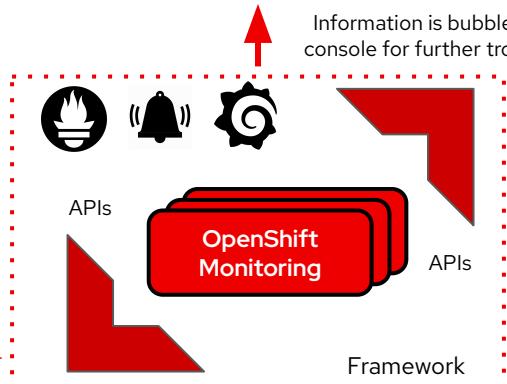
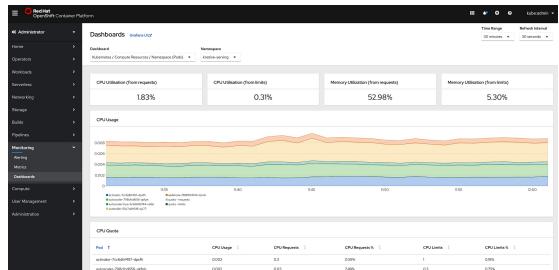


Monitor your clusters, infrastructure, and workloads

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 send by Prometheus.

Metrics visualization via OpenShift Console and Grafana.

Container Management and Security Essentials





Securely manage your container images

Red Hat OpenShift Container Platform

Namespaces > Namespace Details

openshift-image-registry Active

Namespace Details

Name: openshift-image-registry Status: Active

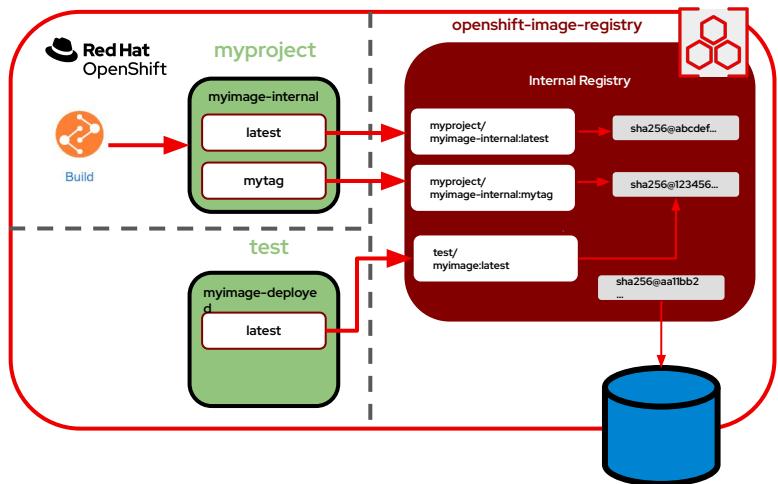
Labels: olm.operatorgroup.uid/e29fad31-4915-4984-8f2e-553e7c321527, openshift.io/cluster-monitoring=true

Annotations: 4 Annotations

Display Name: No display name

Description: No description

Created At: May 16, 1:42 pm



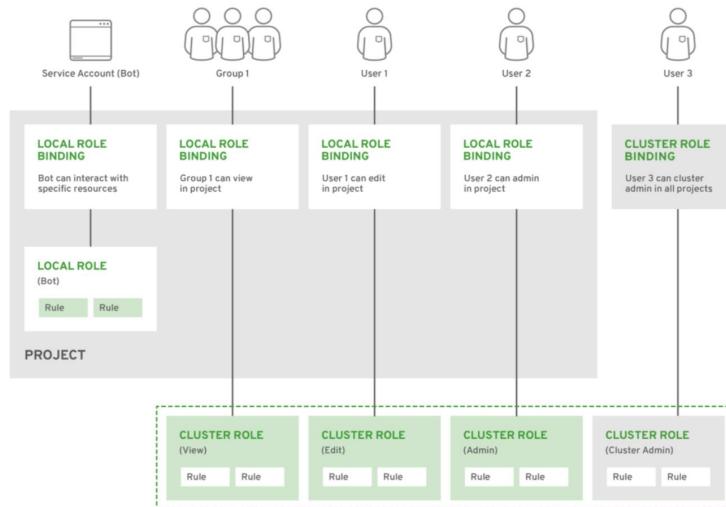
OpenShift provides a built-in container image registry managed by an infrastructure operator. The registry is typically used as a publication target for images built on the cluster, as well as being a source of images for workloads running on the cluster... for a more enterprise grade registry... i.e.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



Authentication, authorization & deployment policies

Authentication

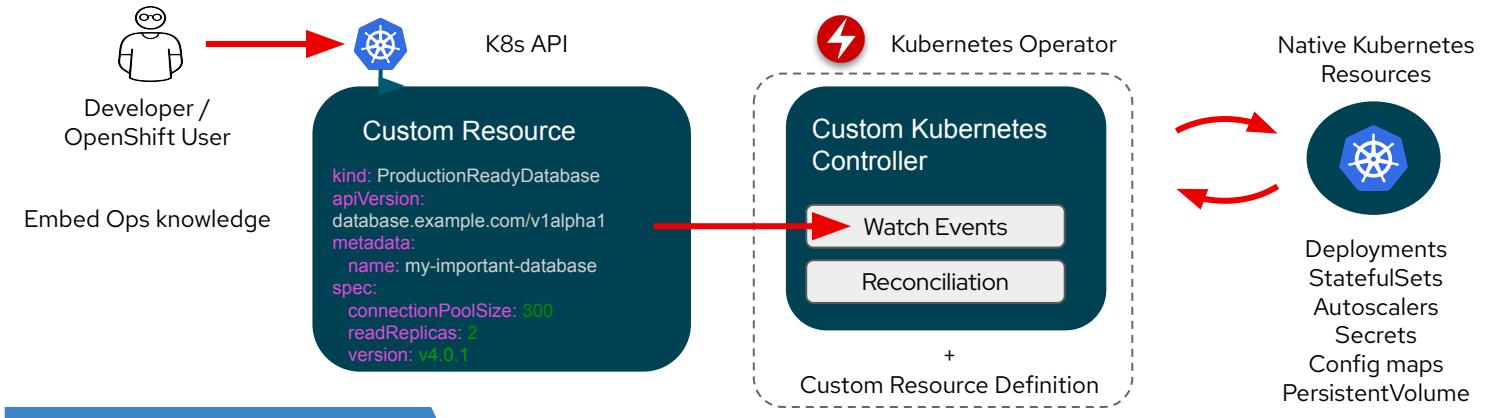
- ▶ Restrict user access through trusted identity providers
- ▶ Integrate with platform OAuth server to
- ▶ Connect to external identity provider -- 9 supported options



Role based authorization

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

Managing deployments



Basic Install

Automated application provisioning and configuration management

Seamless Upgrades

Patch and minor version upgrades supported

Full Lifecycle

App lifecycle, storage lifecycle (backup, failure recovery)

Deep Insights

Metrics, alerts, log processing and workload analysis

Auto Pilot

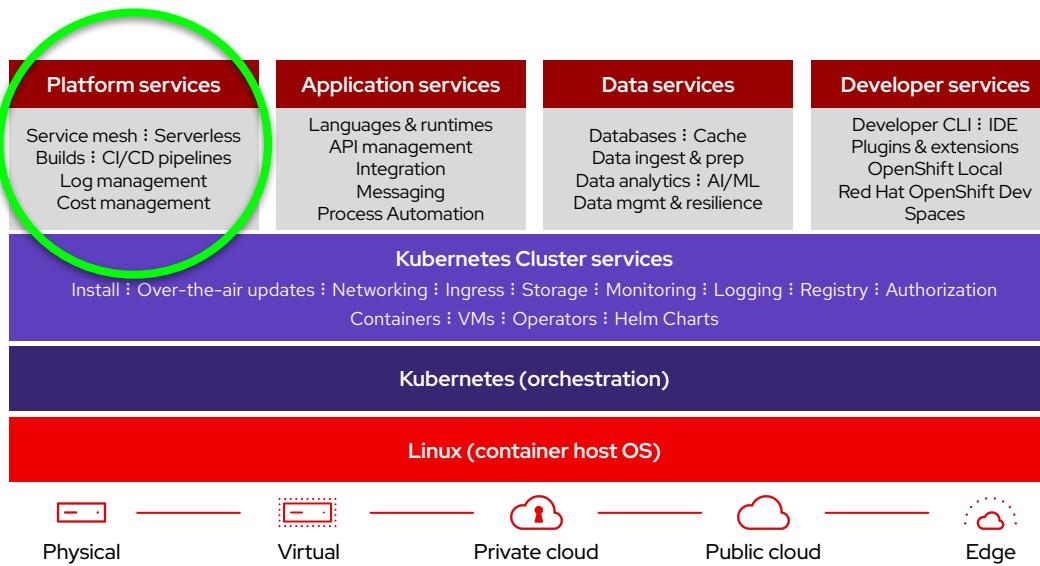
Horizontal/vertical scaling, auto config tuning, abnormal detection, scheduling tuning

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





OpenShift Service Mesh with Istio

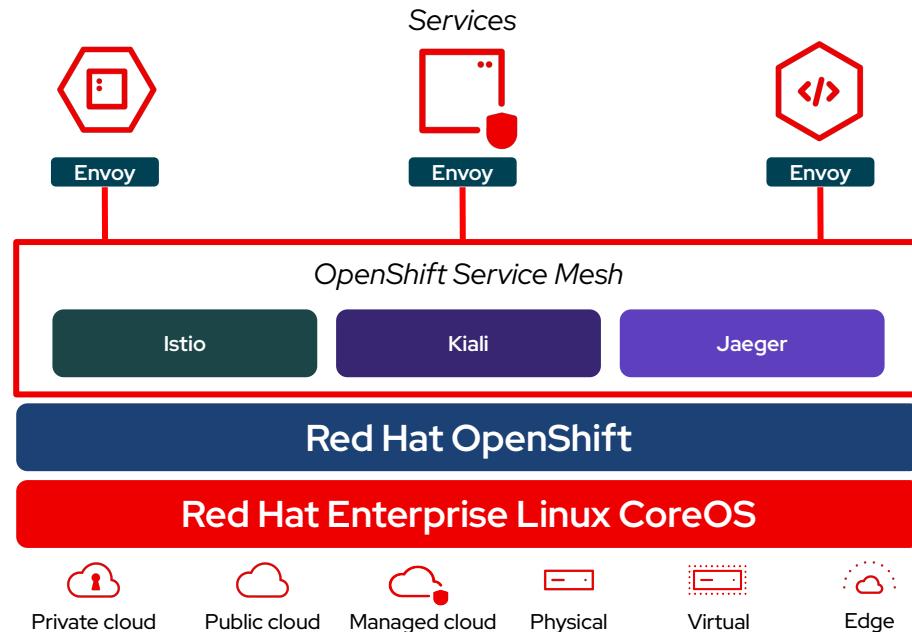
Connect, Secure, Control & Observe

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



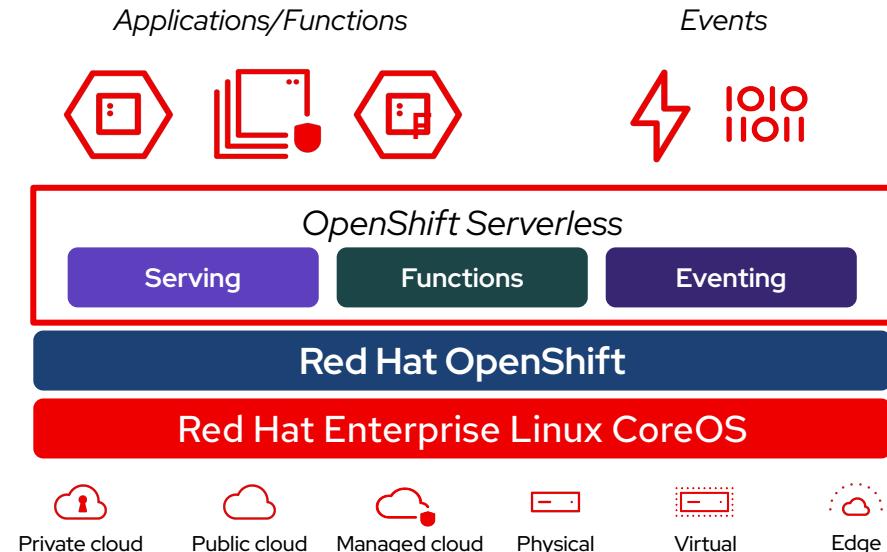
* Eventing is currently in Technology Preview

** 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



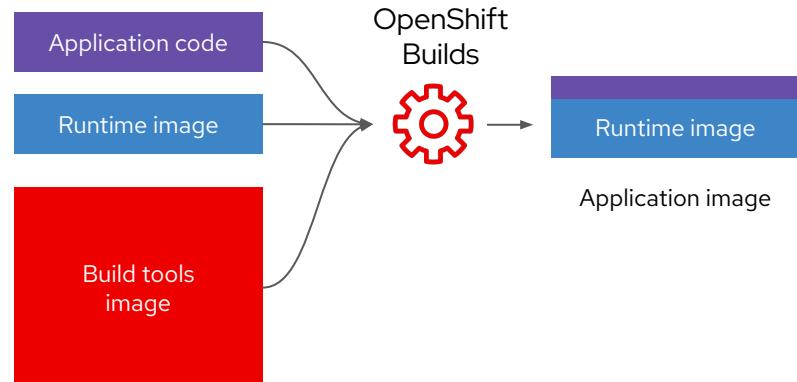
CI/CD Tooling for Containerized Applications





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

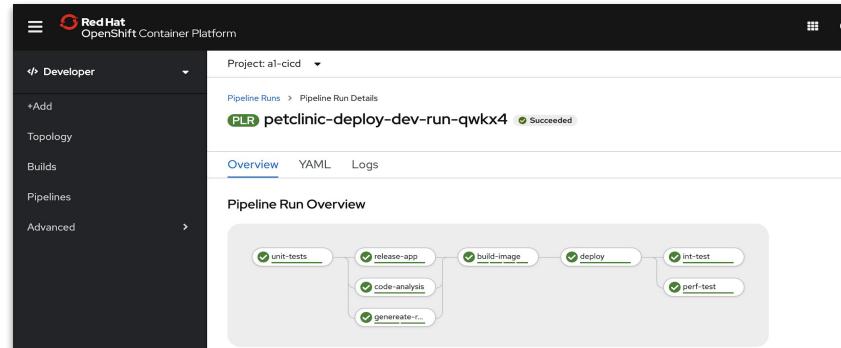
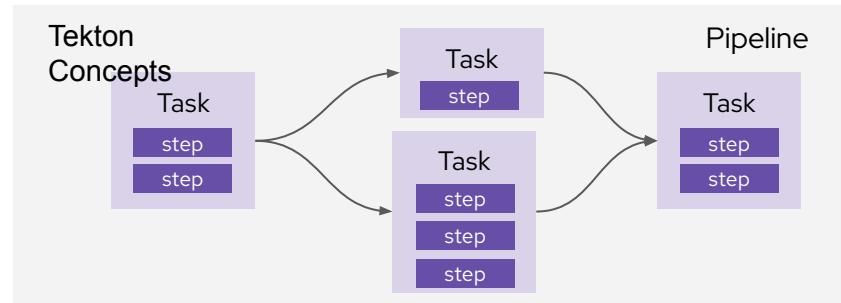
- Build images on OpenShift and Kubernetes
- Use Kubernetes build tools
 - Source-to-Image
 - Buildpacks
 - Buildah
 - Kaniko
 - ...more
- Create lean application images
- Extend with your own build tools
- Based on Shipwright open-source project



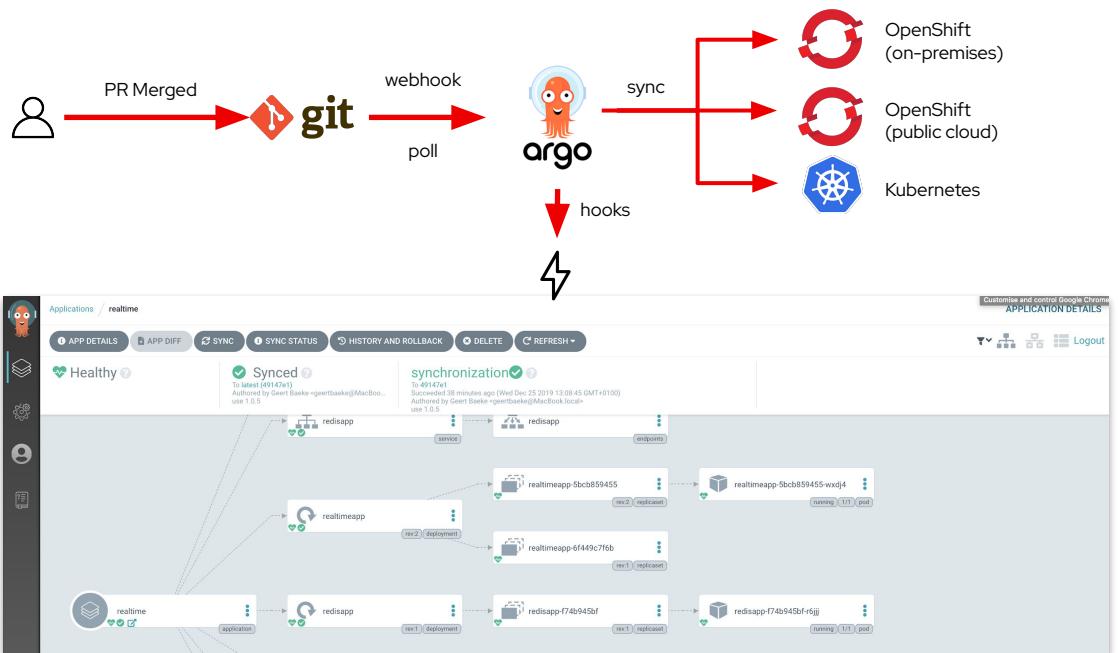


Tekton provides Kubernetes-Native CI/CD pipelines

- 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



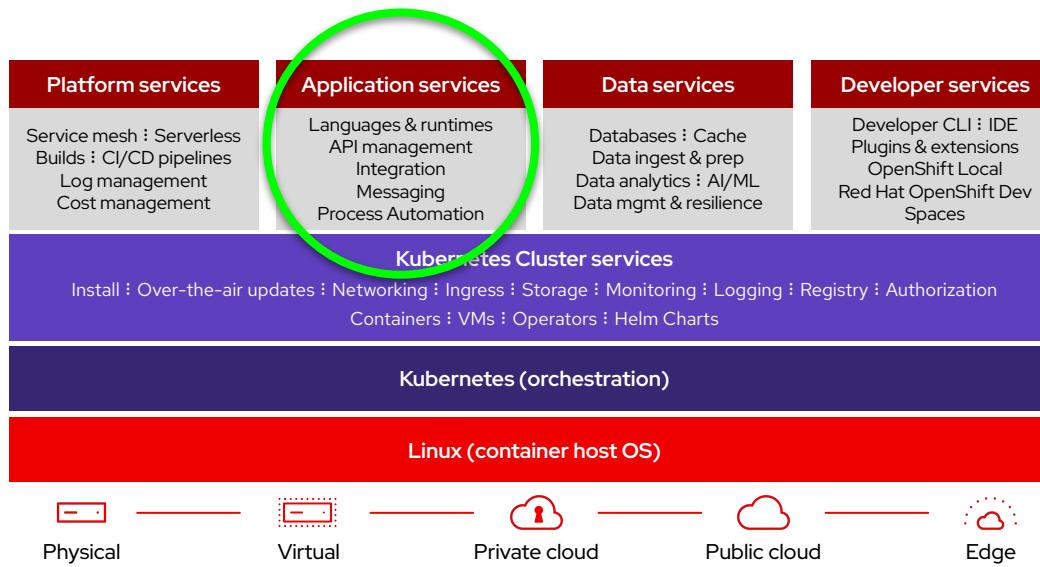
- Configurations versioned in Git
- Automatically syncs configuration from Git
- Drift detection, visualization and correction
- Granular control over sync order
- Rollback and rollforward to any Git commit
- Manifest templating support (Helm, Kustomize, etc)
- Visual insight into sync status

Application Services



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

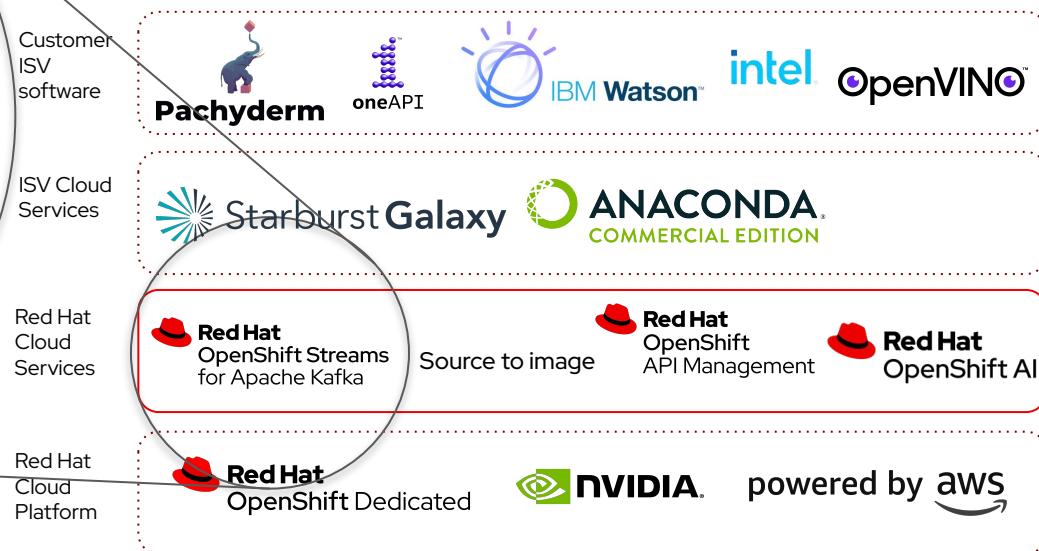


powered by AWS

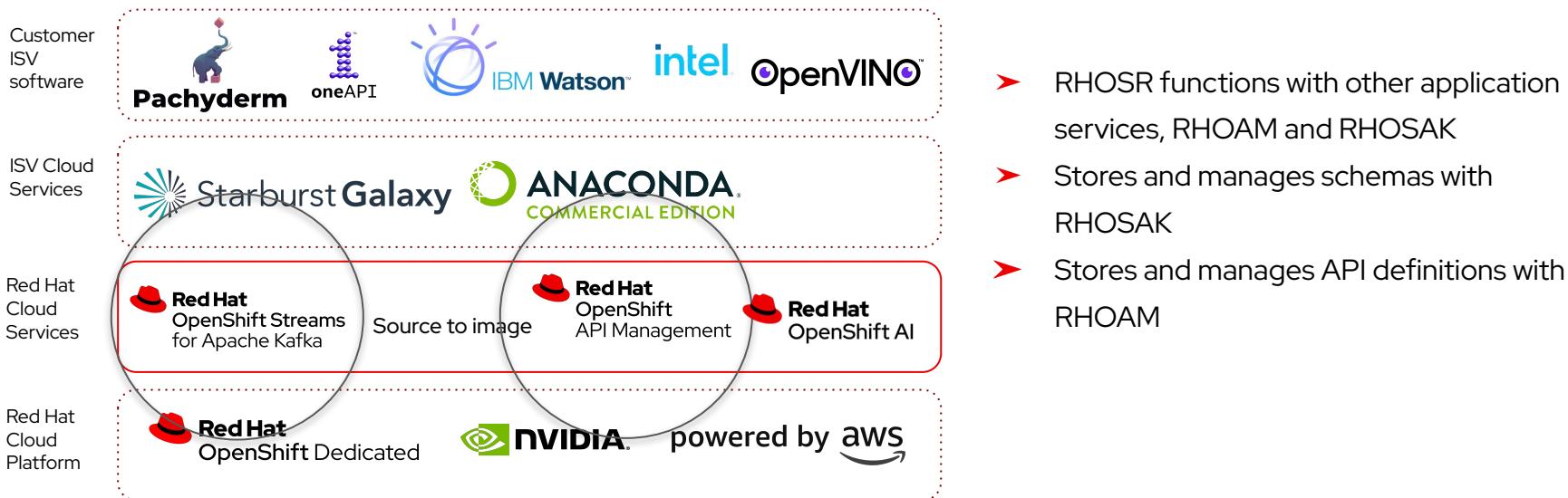


RHOSAK - Red Hat OpenShift Streams for Apache Kafka

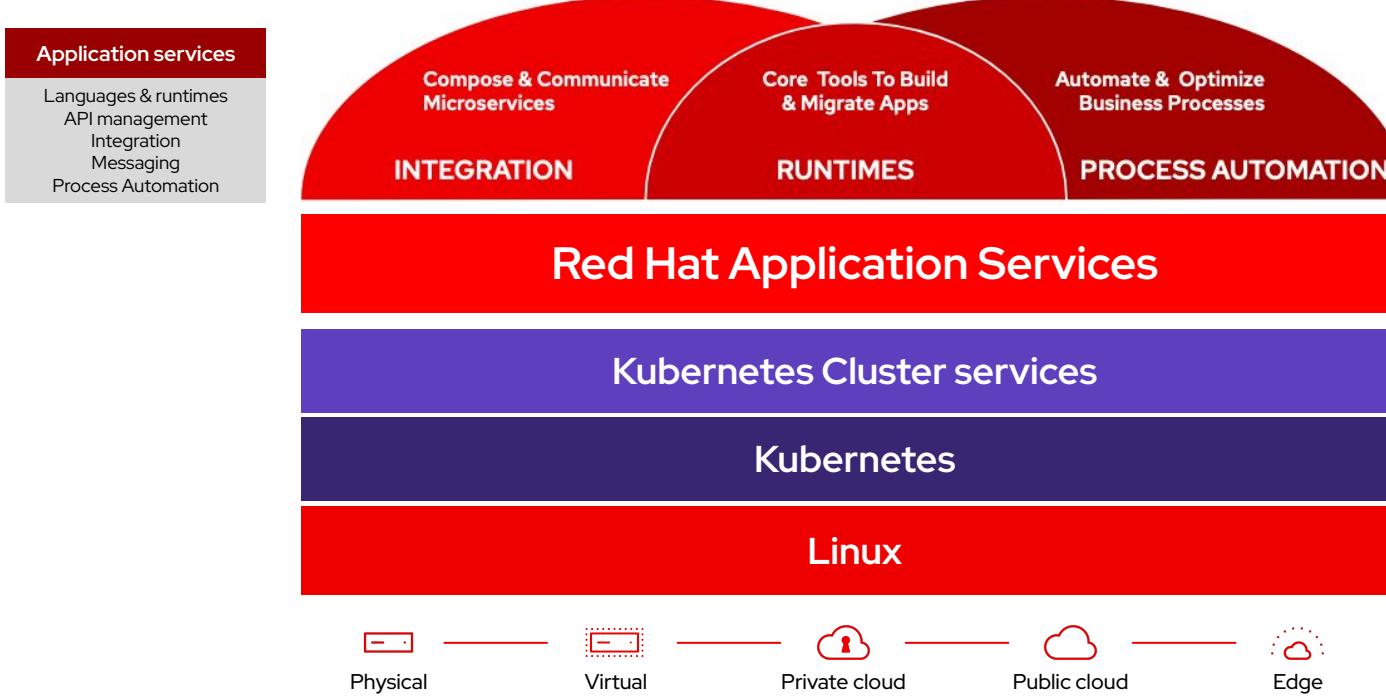
- Fully hosted + managed Kafka service for stream-based applications
- Reduces operational cost and complexity of application delivery
- Connects applications across clouds, both private and public



RHOSR - Red Hat OpenShift Service Registry



Develop and Connect Cloud Native Applications



Developer Services



Developer Services: Portfolio



OpenShift Developer Console & CLI enhancements to improve dev experience



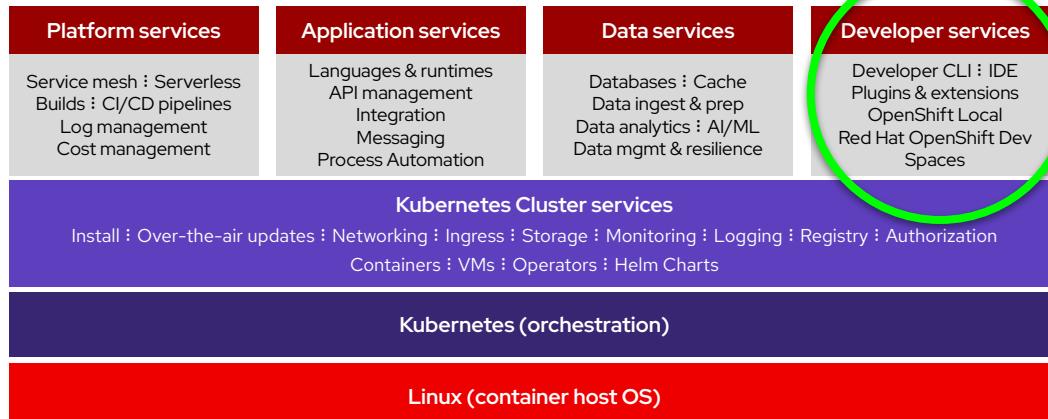
OpenShift IDE plugin integrations to meet the developer where they are



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 Runtimes

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

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 Runtimes

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

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

Red Hat Runtimes

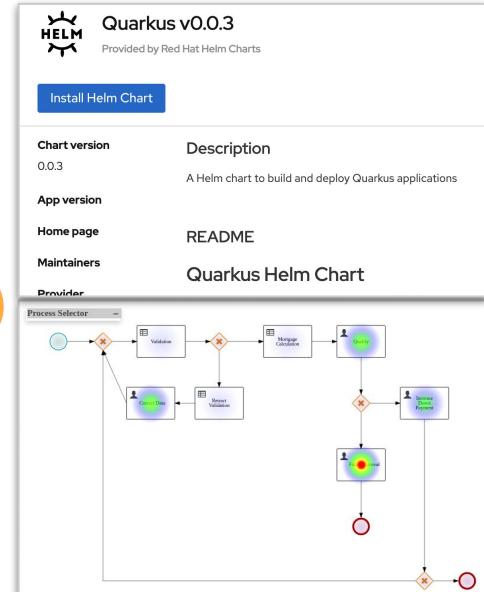
- **Quarkus** - Quick Starts, Example Helm Chart, Integration with Serverless Functions (DP)
- **EAP** - Azure App Service (GA), Azure Marketplace, EAP XP 2.0 (Runnable JARs)
- **Spring Boot 2.3** - Support for UBI for Java 8 and 11, Security Starter, Dekorate Build Hooks (TP)

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.

Quick Starts Get started with Spring Monitor your sample application Binding your Quarkus application to Streams for Apache Kafka View all 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 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 Import your Dockerfile from your Git repository to be built and deployed	YAML Create resources from their YAML or JSON definitions	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	Operator Backed Browse the catalog to discover and deploy operator managed services
Helm Chart Browse the catalog to discover and install Helm Charts				

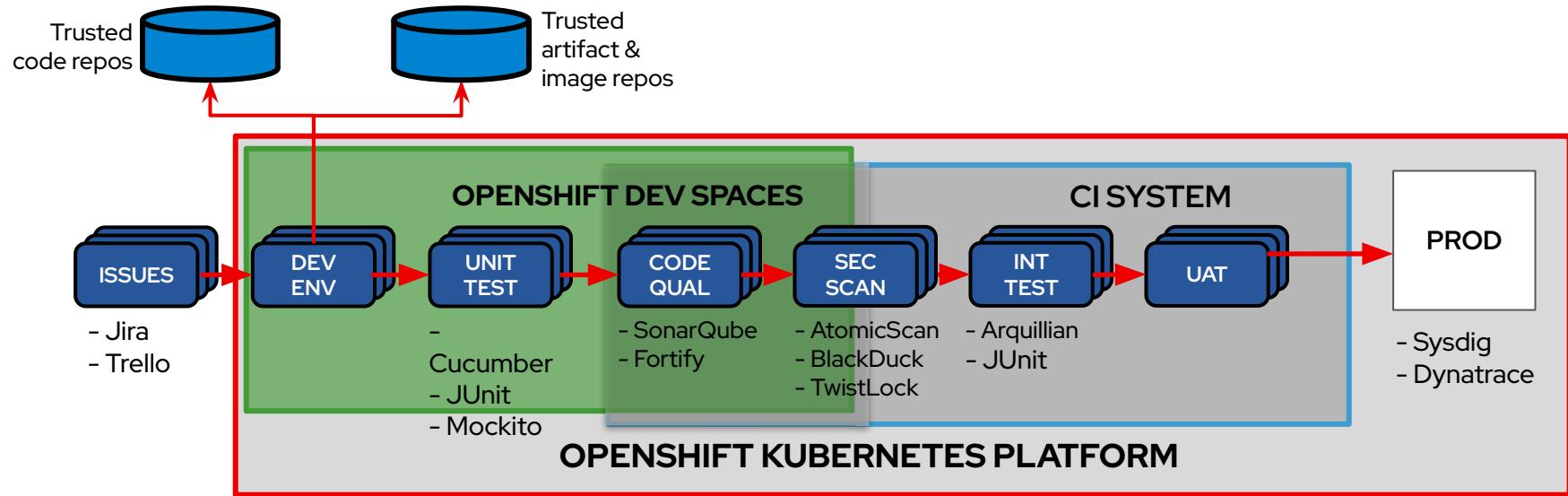


Overview: OpenShift Developer Console

The screenshot shows the OpenShift Developer Console interface for the project `mschmitt-redhat-dev`. The left sidebar contains navigation links for Developer, Topology, Monitoring, Search, Builds, Helm, Project (selected), ConfigMaps, and Secrets. The main content area is divided into several sections: **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, View all), **Status** (Active), **Utilization** (CPU: 47.39m, Memory: 179.4 MiB, Filesystem: 40 KB, Network transfer: 399.4 Kbps in, 103.3 Kbps out, Pod count: 5), **ResourceQuotas** (No resource quotas), and **Activity** (Recent events: 12:44 PM (5) Created container nginx-sample, 12:44 PM (5) Started container nginx-sample, 12:44 PM (5) Pulling image image-registry.openshift-l..., 12:44 PM (5) Successfully pulled image image-registry..., 12:44 PM (5) Started container sti-build, 12:44 PM (5) Add eth0 [10.129.6.194/23], 12:44 PM (5) Created container sti-build, 12:44 PM (5) Container image quay.io/openshift-releas..., 12:44 PM (5) Created pod nginx-sample-776f6b8f08..., 12:44 PM (5) Scaled up replica set nginx-sample-776f6..., 12:44 PM (5) Successfully assigned mschmitt-redhat-d..., 12:44 PM (5) Created container manage-dockerfile, 12:44 PM (5) Started container manage-dockerfile, 12:44 PM (5) Container image quay.io/openshift-releas..., 12:44 PM (5) Build mschmitt-redhat-dev/nginx-sample..., 12:44 PM (5) Started container git-clone, 12:44 PM (5) Created container git-clone, 12:44 PM (5) Container image quay.io/openshift-releas...).



Red Hat OpenShift Dev Spaces





Red Hat OpenShift Dev Spaces

Devfile Open
Format



Use your
favorite IDE



OpenShift
integration



Inject dev
configs



Git Services
integration



Air Gap
Support

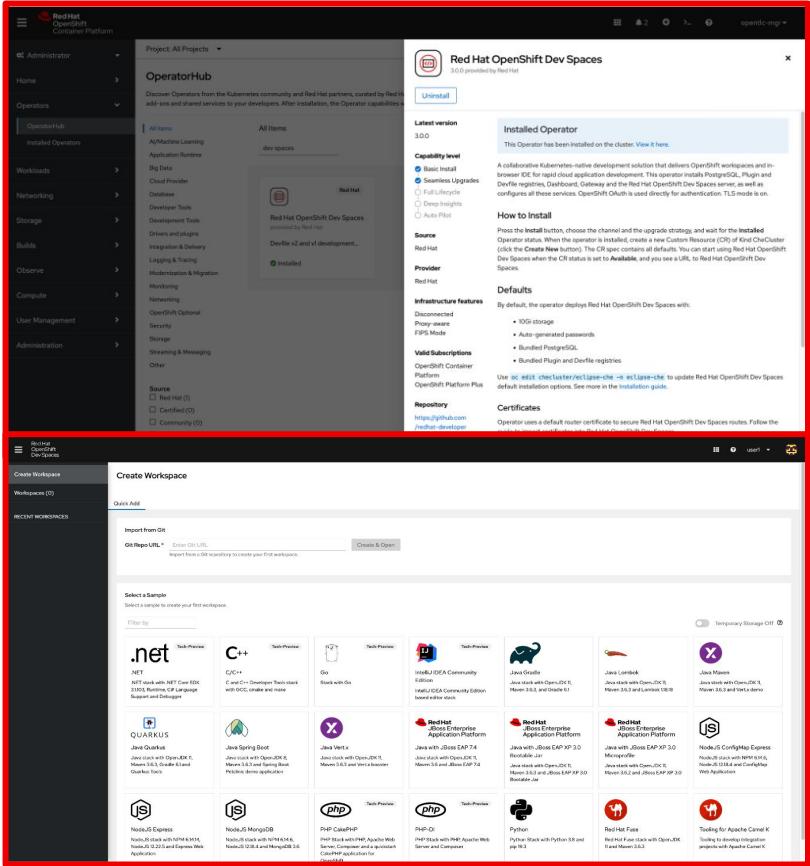


For more
detailed slides
on Dev Spaces
please see
[here](#).

Pair
Programming



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



The screenshot shows the Red Hat OpenShift Dev Spaces OperatorHub interface. The left sidebar lists various operators like Application Catalog, Application Routes, and Red Hat Dev Spaces. The main area shows the 'Red Hat OpenShift Dev Spaces' operator is installed. It provides options to 'Create New Cluster' (with 'Available' status), 'View a URL', and 'Edit Dev Spaces'. The 'Create Workspace' section allows importing a Git Repo URL to start a workspace. Below this, a 'Select a Sample' section shows a grid of workspace templates categorized by language and technology, such as .NET, C++, Java, Go, and various PHP, Python, and Node.js options.



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



Thank you

Red Hat is the world's leading provider of enterprise open source software solutions. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500.



[linkedin.com/company/red-hat](https://www.linkedin.com/company/red-hat)



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