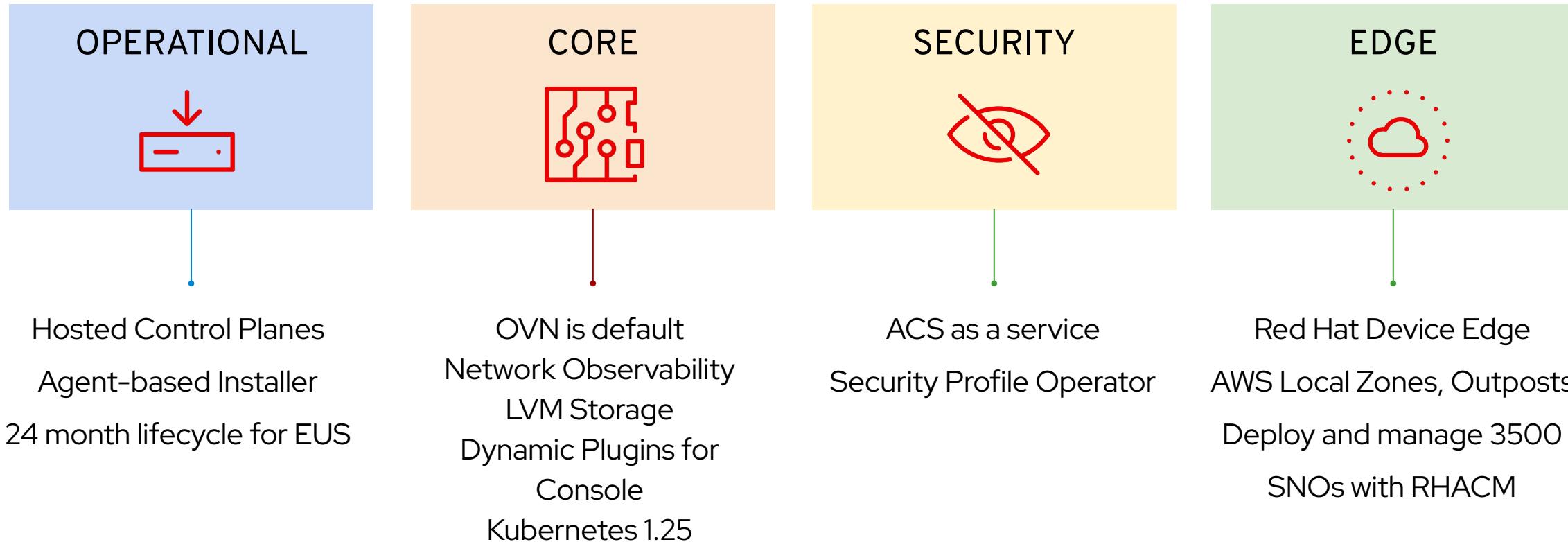




What's New in OpenShift 4.12

OpenShift Product Management

OpenShift 4.12



Kubernetes 1.25

Major Themes and Features

- ▶ Support for user namespaces
- ▶ Checkpoints for forensic analysis
- ▶ Retriable and non-retriable Pod failures for Jobs
- ▶ Server Side Unknown Field Validation (beta)
- ▶ KMS v2 alpha1 API to add performance, rotation, and observability improvements
- ▶ CRD validation expression language (beta)
- ▶ DaemonSet Upgrade Without Downtime
- ▶ Improved Windows support

Significant list of other graduations to stable:

- ▶ Pod security admission
- ▶ Ephemeral containers
- ▶ Local Ephemeral Storage Capacity Isolation
- ▶ Core CSI migration
- ▶ CSI migration for AWS and GCE
- ▶ CSI ephemeral volume
- ▶ cgroup v2
- ▶ endPort in Network Policy
- ▶ And more...!



Notable Top RFEs and Components

Top Requests for Enhancement (RFEs)

- ▶ Notification or banner over web-console for upgrade path blockage
 - ▶ When upgrading a console a banner is displayed showing the status and goes away when completed.
- ▶ Allow disabling DNS management for LoadBalancerService Ingress Controllers
 - ▶ Now have the ability to disable DNS management on Ingress Controllers
- ▶ Using/setting spec.loadbalancersourceranges - new API
 - ▶ Can limit access to the load balancer for IngressController to a specified list of IP ranges
- ▶ Adding CoreDNS configuring to the operator which will enable TTL to be set for both internal domains and Cache TTL
 - ▶ Max TTL for positive and negative responses configurable and is applied to upstream resolvers.

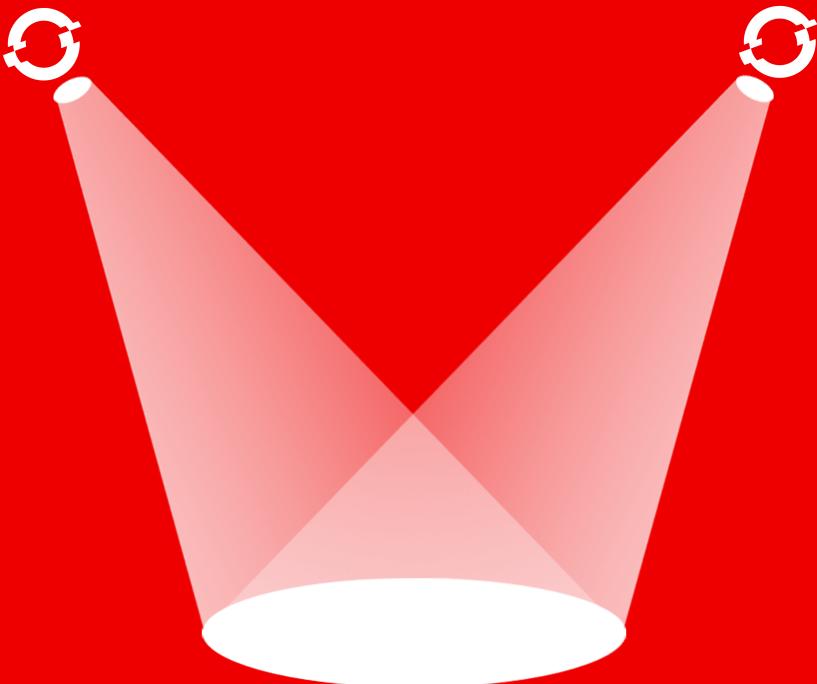
49 RFEs

shipped in
OpenShift 4.12
for customers

OpenShift 4.12+ Lifecycle Changes

- ▶ **What:** An additional 6 month of Extended Update Support (EUS) phase on **even numbered** OpenShift (OKE, OCP, OPP) releases and a subset of layered operators:
- ▶ **Who:** Those with **Premium subscriptions**, [or Standard subscriptions + an **add-on SKU**]
- ▶ **When:** Starting with **OpenShift 4.12** and applying to subsequent even numbered releases of OpenShift.
- ▶ **Why:**
 - Support customers and partners struggling to maintain pace with 4.y cadence
 - Align approach and offering rules of OCP EUS to RHEL's program rules
- ▶ **Note:**
 - EUS to EUS upgrades continue the same behaviour.
 - Layered operators/operands and products will continue to have their own lifecycle. Layered operator lifecycles are available on the OpenShift lifecycle page.

OpenShift 4.12 Spotlight Features



Introducing Red Hat Device Edge

Adding Kubernetes to small form factor, field deployed edge devices



What's the news?

We are productizing MicroShift, bundled with Red Hat Enterprise Linux for Edge



What will be available?

A new product **Red Hat Device Edge** that contains support for MicroShift, a low footprint k8s distribution derived from OpenShift

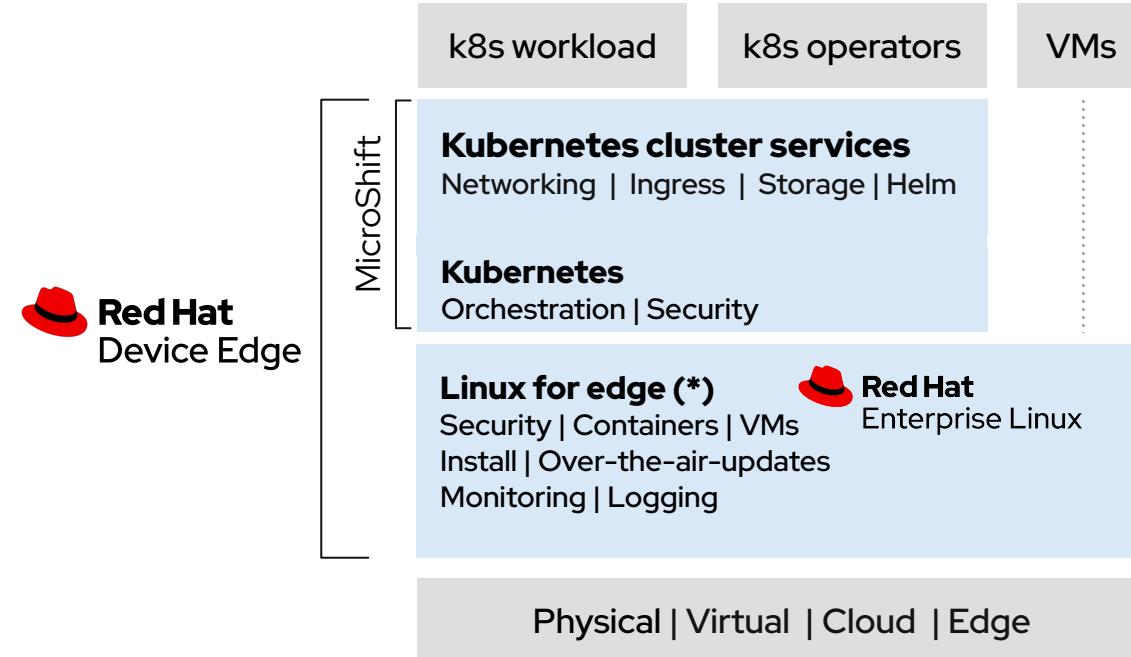


Why are we doing this?

To address the market demand for a consistent platform even on the smallest devices

Developer Preview with V4.12

Red Hat Device Edge Technical Overview



See the [announcement](#) for more details

* recommended for edge deployments: [Red Hat Enterprise Linux for Edge Images](#), rpm-ostree, immutable, atomic upgrade, over the air flavour of Red Hat Enterprise Linux.



Install OpenShift in AWS Edge Locations

Deliver latency sensitive applications closer to end users and on-premises installations



AWS Outposts
Technology Preview



AWS Local Zones
Generally Available

- ▶ For **customer managed** OpenShift in AWS
- ▶ Extends **workers** to run in Outposts
- ▶ Deploy using **Installer Provisioned infrastructure (IPI)**
- ▶ Use **Amazon Elastic Block Store (EBS) gp2** for storage on Outposts

- ▶ For **customer managed** OpenShift in AWS
- ▶ Extends **workers** to Local Zone subnets
- ▶ BYO Virtual Private Cloud (VPC) with Local Zones subnets
- ▶ Deploy using **Installer Provisioned infrastructure (IPI)**
- ▶ Use **AWS Application Load Balancer (ALB) Operator** for custom ingress

Agent-Based Installer for Disconnected OpenShift Deployments

- ▶ A bootable image creates first OpenShift cluster
- ▶ Integrated in the `openshift-install` binary
- ▶ For bare metal, vSphere, and platform agnostic
- ▶ Fully disconnected / air-gapped deployments
- ▶ Uses mirrored local registry
- ▶ In-place bootstrap, no extra node required
- ▶ Supports single node OpenShift (SNO)
- ▶ Supports compact clusters (schedulable masters)
- ▶ Allows user-provided automation tooling
- ▶ Uses Assisted Service (Assisted Installer engine)

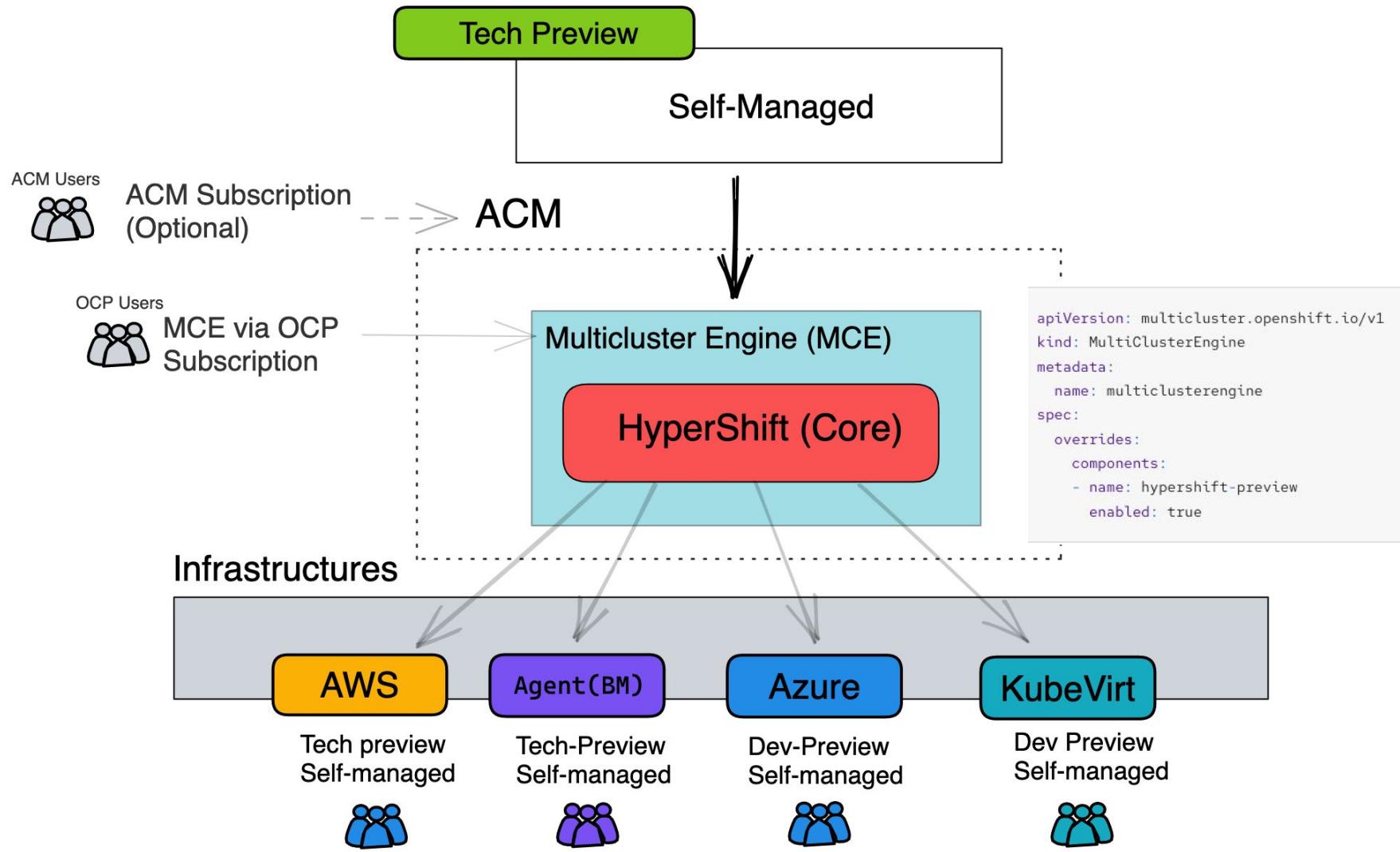
The screenshot shows the Red Hat Hybrid Cloud Console interface for creating an OpenShift cluster on bare metal. The URL is `console.redhat.com/openshift/install/metal`. The page title is "Create an OpenShift Cluster: Bare Metal". It says "Select the installation type that best fits your needs." There are four main options:

- Interactive** (Recommended, Web-based): Runs Assisted Installer with standard configuration settings to create your cluster. Features: Preflight validations, Smart defaults, For connected networks.
- Local Agent-based** (Developer preview, CLI-based): Runs Assisted Installer securely and locally to create your cluster. Features: Installable ISO, Preflight validations, For air-gapped/restricted networks. A red box highlights the "New!" label.
- Automated** (CLI-based): Auto-provision your infrastructure with minimal configuration to create your cluster. Features: Installer Provisioned Infrastructure, Hosts controlled with baseboard management controller (BMC), For air-gapped/restricted networks.
- Full control** (CLI-based): Make all of the decisions when you create your cluster. Features: User Provisioned Infrastructure, Highly customizable, For air-gapped/restricted networks.

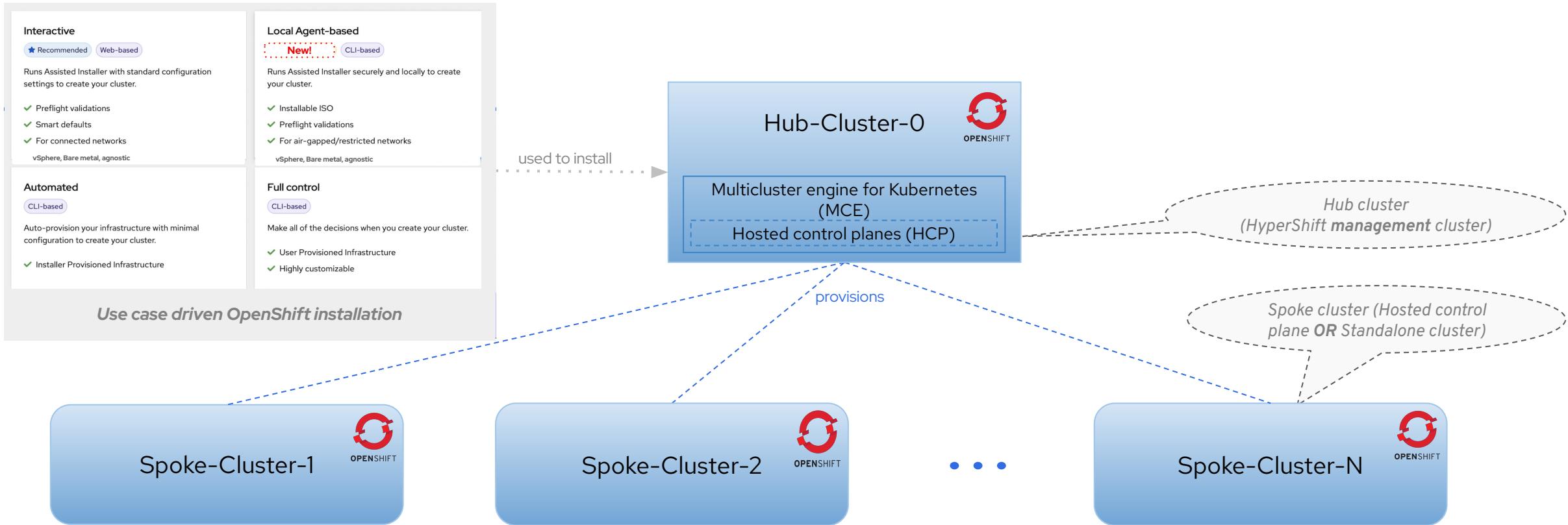
Generally Available



Hosted Control Planes (Tech Preview)



The Big Picture



- ▶ Create an OpenShift cluster using **Interactive | Automated | Full-control | local-agent (new)**
- ▶ Turn into a **hub cluster** with **Multicloud engine for Kubernetes (MCE)**
- ▶ **Create a spoke cluster** – OpenShift spoke clusters are either **standalone or hosted clusters (HyperShift)**
- ▶ Optionally, manage the fleet of clusters and **enforce policies at scale** with **Red Hat Advanced Cluster Management**

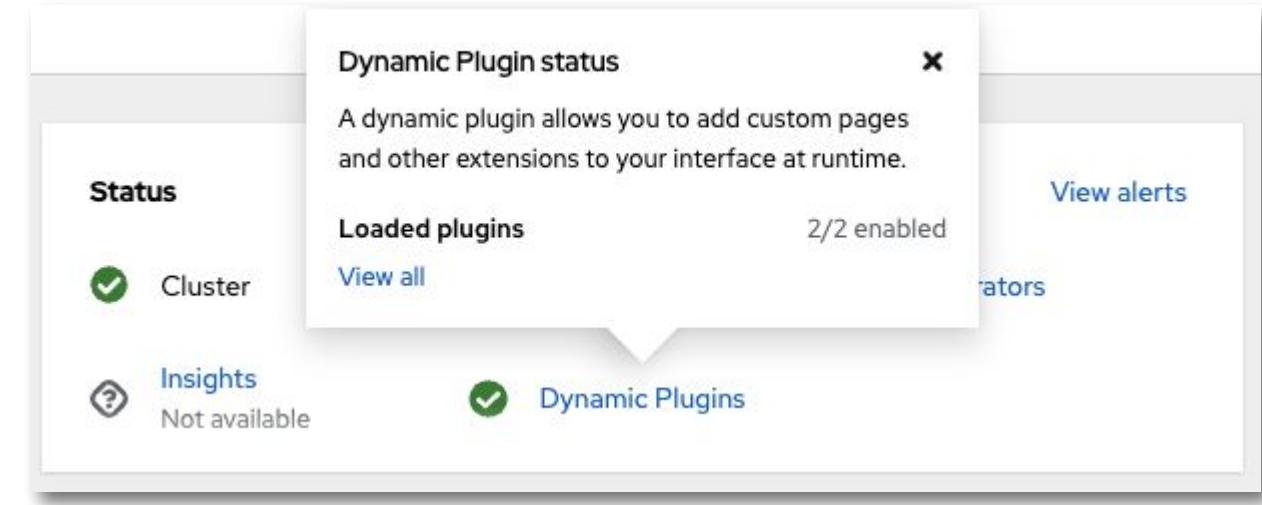
The sky's the limit



OCP Console Dynamic Plugins GA 4.12

Removing limits from Console Customization

- ▶ Dynamic Plugins enable partners & customers to build high quality, unique user experiences **natively** in the OCP Console
- ▶ Built with [React](#), [PatternFly 4](#), [Webpack](#)
- ▶ Supports [508 Compliance](#), [Localization](#)



Key features

- ▶ Add custom pages
- ▶ Add perspectives and update navigation items
- ▶ Add tabs and actions to resource pages
- ▶ Extend existing pages
- ▶ Plus more...

Important Links

- ▶ [Official Docs](#)
- ▶ [Template for New Plugins](#) (clone me!)

Red Hat OpenShift Networking's New Default CNI Plug-In: ovn-kubernetes

Based upon Open Virtual Network (OVN), the [ovn-kubernetes](#) CNI is now the default out-of-the-box networking plugin for new 4.12+ installations across all supported platforms¹ and topologies.

Supported since 4.6, it is already the default for some deployments:

- Hybrid Windows-Linux clusters
- Single Node OpenShift (SNO)
- Red Hat OpenShift Service on AWS (ROSA)
- Red Hat Device Edge (aka MicroShift)

Feature parity with the previous default CNI, [openshift-sdn](#), but [adds a wider array of features](#), including:

- IPv6 networking
- IPsec encryption for intra-cluster communication
- Hybrid networking
- Kubernetes Network Policy enhancements and logs
- Hardware offload (compatible NICs)

[Migrations from openshift-sdn to ovn-kubernetes are supported.](#)

- Live migrations targeting 4.13

What if I'm using the previously-default plug-in?

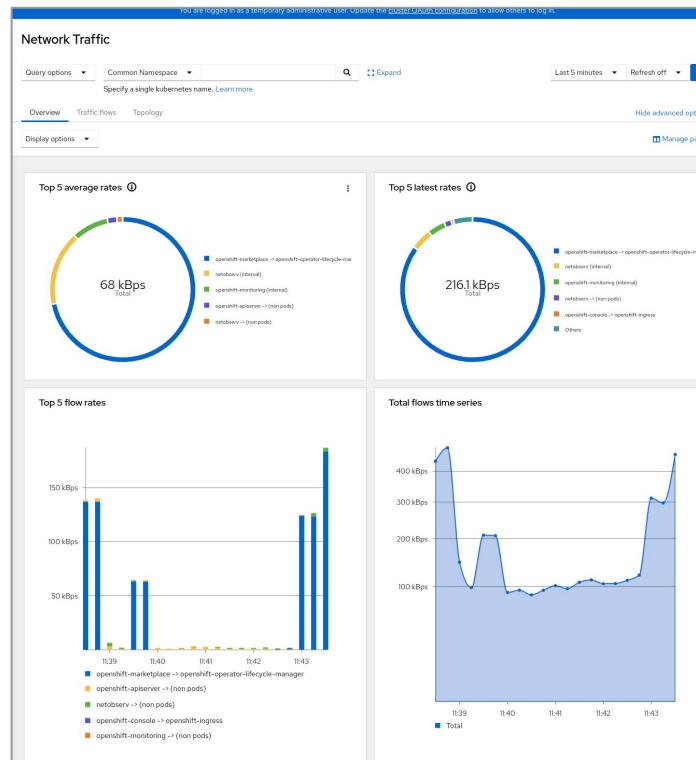
- Existing and future deployments using [openshift-sdn](#) will continue to be supported (no currently-planned deprecation)
- [openshift-sdn](#) remains the default on OpenShift versions earlier than 4.12
- At 4.12+ [openshift-sdn](#) will become a supported install-time **option**
- [openshift-sdn](#) remains feature frozen



Network Observability

Network Observability GAs at 4.12 for all supported versions of OpenShift at 4.10 or newer

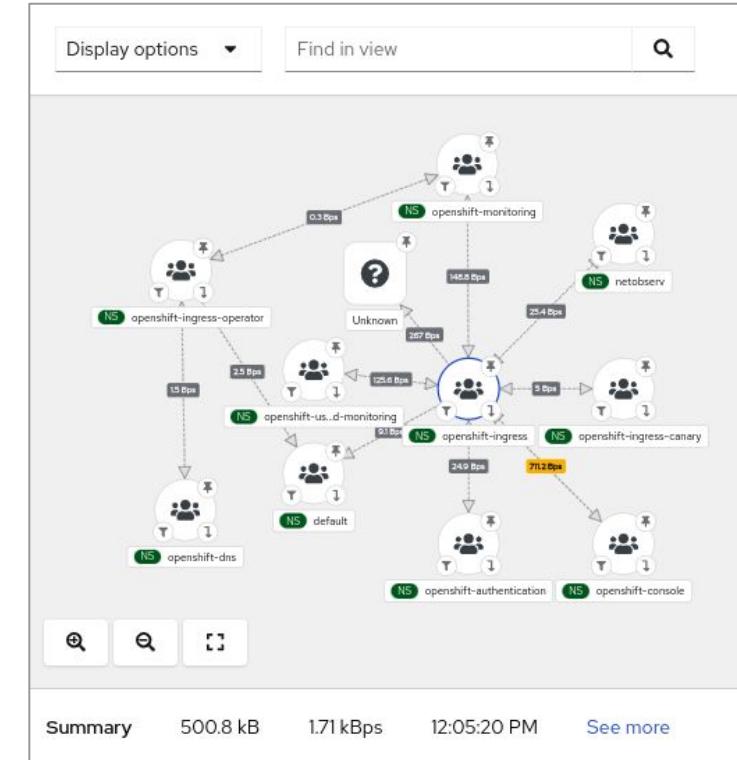
- Integrated with the larger Observability ecosystem, this optional Operator focuses on networking information for a single cluster
- Uses an **eBPF-based** agent on cluster nodes to collect metrics
- Provides observable network traffic metrics, flows, topology and tracing



Display options: Find in view

End Time	Source	Namespace	Port
Nov 22, 2022, 11:51:25.209 AM	P installer-5-ip-10-0-131-74.us-east-...	NS openshift-kube-scheduler	8443
Nov 22, 2022, 11:51:25.206 AM	N ip-10-0-131-74.us-east-...	n/a	39616
Nov 22, 2022, 11:51:25.206 AM	N ip-10-0-203-192.us-east-...	n/a	30377
Nov 22, 2022, 11:51:25.205 AM	P apiserver-7764cf65b-kkb4d	NS openshift-apiserver	8443
Nov 22, 2022, 11:51:25.205 AM	P apiserver-7764cf65b-r5lqg	NS openshift-apiserver	8443
Nov 22, 2022, 11:51:25.204 AM	N ip-10-0-203-192.us-east-...	n/a	53633
Nov 22, 2022, 11:51:25.203 AM	P apiserver-7764cf65b-r5lqg	NS openshift-apiserver	8443
Nov 22, 2022, 11:51:25.203 AM	N ip-10-0-131-74.us-east-...	n/a	22033
Nov 22, 2022, 11:51:25.202 AM	N ip-10-0-203-192.us-east-...	n/a	2380

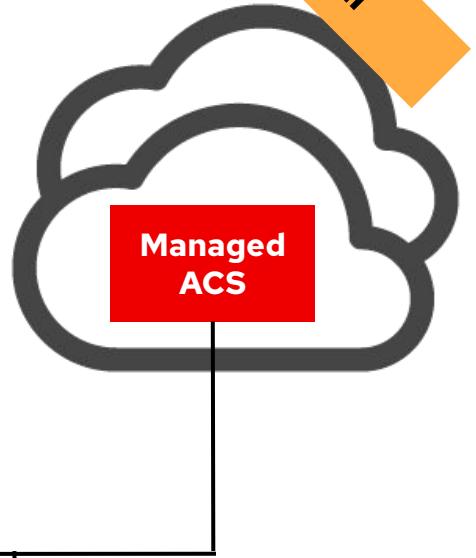
Summary: 100+ flows, 51+ kB, 245+ packets, 170.8+ Bps, 11:51:28 AM, See more



Advanced Cluster Security Cloud Service



Start securing Kubernetes deployments in minutes

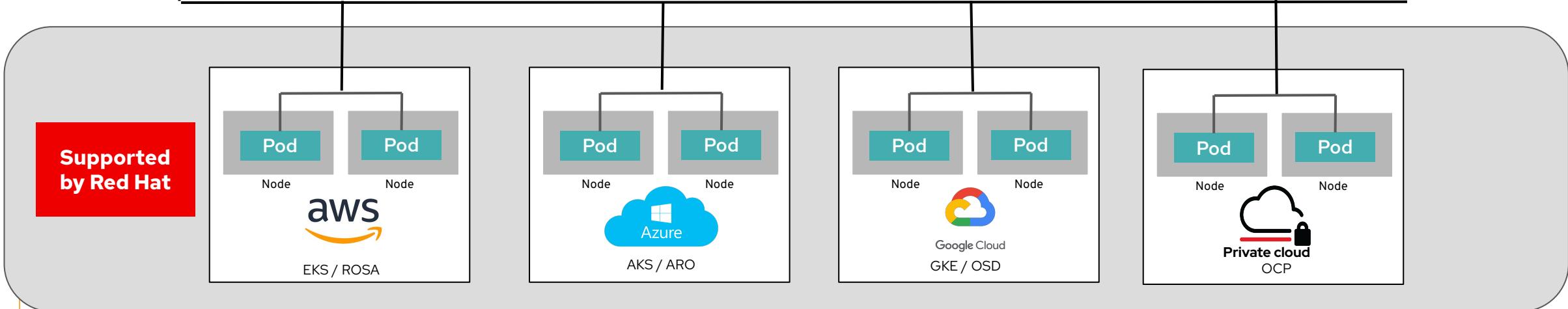


Secure any supported Kubernetes cluster across your hybrid cloud

Managed by Red Hat

Red Hat SLA, 24 x 7 support

Flexible consumption models



Console

Console Configuration

Form based methods to configuring the console

- ▶ Easily hide a Perspective!
 - Developer Catalog content
 - Features on the Add page for devs
 - Quick Starts!
- ▶ Configure the list of ClusterRoles roles shown in Project Access in the developer console

The screenshot shows the Red Hat OpenShift developer console interface. The top navigation bar includes the Red Hat logo, 'Red Hat OpenShift', a notification icon (3 notifications), and a user dropdown 'kube:admin'. The main content area is titled 'Configuration > Console details' under the 'cluster' perspective. It has tabs for 'Details', 'YAML', and 'Console plugins', with 'Details' selected. Below the tabs is a section titled 'Console details' with a 'Name' field. On the right side of the screen, there are 'Actions' and 'Customize' buttons.

The screenshot shows the 'Cluster configuration' page with the 'General' tab selected. Under the 'Perspectives' section, 'Administrator' is set to 'Enabled' and 'Developer' is also set to 'Enabled'. In the 'Quick starts' section, the 'Enabled' tab is selected, showing 13 items, while the 'Disabled' tab shows 0 items. A list of quick start options is provided, each with a 'COS' icon and a brief description. Buttons for moving items between tabs are at the bottom.

The screenshot shows the 'Cluster configuration' page with the 'General' tab selected. Under the 'Add page' section, the 'Projects' tab is selected, showing a list of actions: Container images, Database, Helm Chart repositories, Import from Git, Import YAML, Operator Backed, Samples, Sharing, and Upload JAR file. The 'Enabled actions' section shows 10 items selected, and the 'Disabled actions' section shows 0 items selected. Under the 'Developer catalog' section, the 'Enabled types' tab is selected, showing 'Builder Images', and the 'Disabled types' tab shows 'Helm Charts'. The 'Enabled types' section shows 5 items selected, and the 'Disabled types' section shows 1 item selected.

Console Customer Happiness

OCP Console Requested Feature Enhancements

- ▶ RFE-3260 - Cluster Notification for Cluster Upgrade
- ▶ RFE-2643 - Trim whitespace from when creating image pull Secret
- ▶ RFE-2900 - Configure default behavior for "Wrap lines" in log viewers
- ▶ RFE-3014 - Make status.HostIP for Pods visible in the OCP Web Console
- ▶ RFE-2145 - Adding Rollout Restart function to the OpenShift Console
- ▶ RFE-2724 - Allow removal of default devfiles from developer catalog
- ▶ RFE-2671 - Disable developer catalog in OpenShift web console for specific users
- ▶ RFE-1881 - Disable Developer Web Console and Developer Application Catalog in OpenShift 4.X
- ▶ RFE-1758 - To disable access to admin console based on users and groups in OCP 4

Developer Experience

Developer Experience

Video & slides provide a deep dive

HIGHLIGHTS

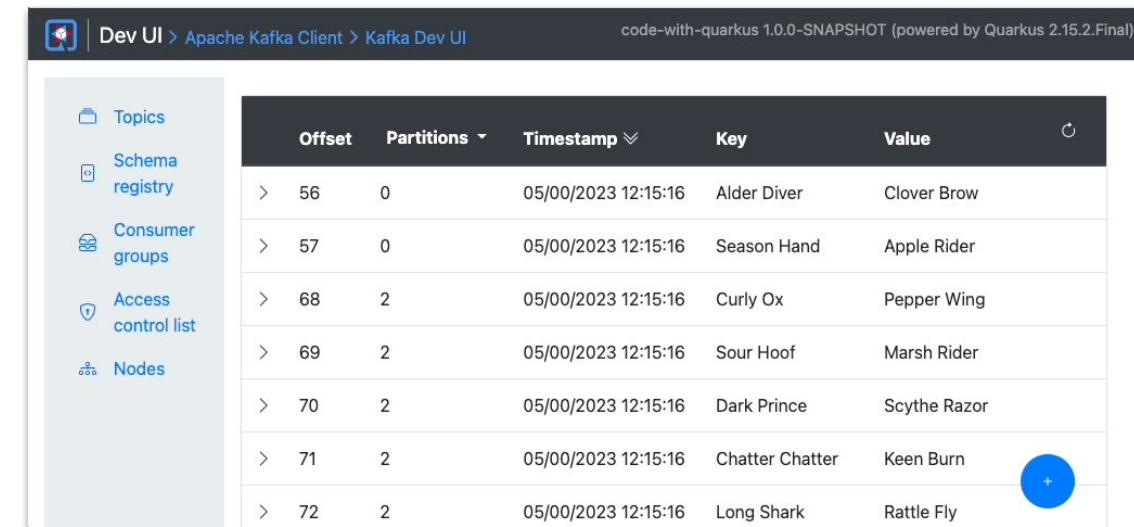
- ▶ The **Developer Perspective** in **OpenShift Console** includes so many new features and improvements ... from RFEs including the ability for admins to easily disable the Developer Catalog, or one or more its sub-catalogs, to improving awareness of resource/project limits and quotas issues for developers within the console.
- ▶ **Podman Desktop** adds new capabilities to help developers to go from containers, to pods and to OpenShift. Air Gapped installation is becoming available.
- ▶ **odo** is now GA! With odo 3.5, you can now use odo dev to run your application on Podman!
- ▶ **Dev Spaces** now supports VS Code as default editor and support for Git Hub enterprise server.

Runtimes

Kube Native Java with Quarkus

Key Features & Updates (Quarkus 2.13)

- ▶ **Java 17** support for JVM apps and native executables (**GA**)
- ▶ **Apache Kafka Dev UI**
 - ▶ Very useful when developing Kafka apps
 - ▶ List and create Topics, visualize and publish records
 - ▶ Inspect consumer groups and their consumption logs
- ▶ Improved **Dev Services**
 - ▶ New: **ElasticSearch**
 - No longer need to setup local ElasticSearch service
 - Integrated with Hibernate Search extension (automatic schema initialization)
 - ▶ Enhanced: **Infinispan** (upstream of **Red Hat Data Grid**)
 - Initialize cache from clients, generate cache keys
- ▶ **OpenID Connect** preconfigured providers
 - ▶ Simplified integration with Apple, Facebook, GitHub, Google, Microsoft, Spotify, and Twitter authentication.
- ▶ **Kubernetes Service Binding** support for Reactive SQL Clients
 - ▶ Workload projection for MariaDB, MySQL, SQL Server, Postgres, Mongo (TP), Kafka, reactive clients



The screenshot shows the Apache Kafka Dev UI interface. At the top, there are navigation links: Dev UI > Apache Kafka Client > Kafka Dev UI. To the right, it says "code-with-quarkus 1.0.0-SNAPSHOT (powered by Quarkus 2.15.2.Final)". On the left, there is a sidebar with icons and labels: Topics, Schema registry, Consumer groups, Access control list, and Nodes. The main area is a table with columns: Offset, Partitions, Timestamp, Key, and Value. The table contains the following data:

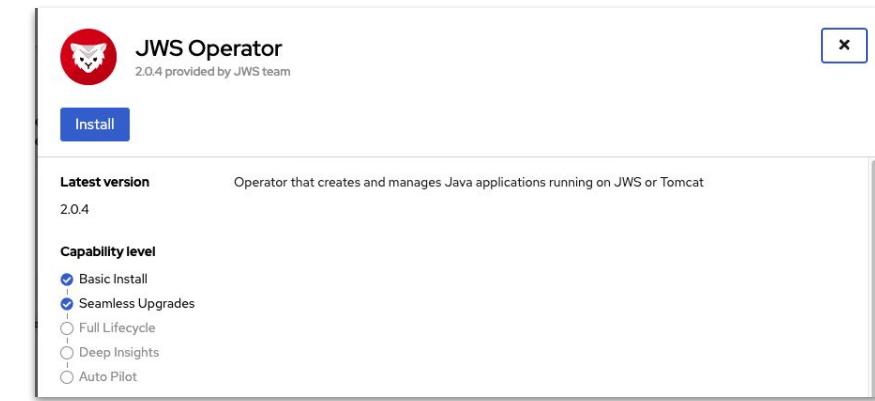
	Offset	Partitions	Timestamp	Key	Value
>	56	0	05/00/2023 12:15:16	Alder Diver	Clover Brow
>	57	0	05/00/2023 12:15:16	Season Hand	Apple Rider
>	68	2	05/00/2023 12:15:16	Curly Ox	Pepper Wing
>	69	2	05/00/2023 12:15:16	Sour Hoof	Marsh Rider
>	70	2	05/00/2023 12:15:16	Dark Prince	Scythe Razor
>	71	2	05/00/2023 12:15:16	Chatter Chatter	Keen Burn
>	72	2	05/00/2023 12:15:16	Long Shark	Rattle Fly

Kafka in the [Dev UI](#)

JBoss Web Server

Key Features & Updates (JWS 5.7)

- ▶ Upgrades to Tomcat 9.0.62, Tomcat-Native 1.2.31, Apache HTTPD 2.4.51
- ▶ **RHEL 9** full support
- ▶ Also includes minor updates to:
 - ▶ **tomcat-vault**: an extension used for securely storing passwords and other sensitive information used by JBoss Web Server.
 - ▶ **mod_cluster** – enables communication between JBoss Web Server and the Apache HTTP Server for load balancing
 - ▶ **Apache portable runtime** – enables access to advanced IO functionality; functionality at the operating system level; and native process handling such as shared memory, Unix sockets.
 - ▶ **OpenSSL** = a software library that implements SSL/TLS protocols and includes a basic cryptographic library.
- ▶ **JWS Operator** – Support for JWS 5.7 and enables seamless upgrades (Level II)



JWS Operator as seen in in OperatorHub

OpenJDK on OpenShift with Eclipse Adoptium

Key Features & Updates

- ▶ [Adoptium](#) is a community project to protect availability of free and open source Java SE distributions across multiple platforms
- ▶ Adoptium's *Temurin* distribution of OpenJDK has 400M+ downloads (200k/day)
- ▶ **Temurin is fully supported on OpenShift** for Java 8, 11, 17 applications
- ▶ Also includes:
 - ▶ **Production** support for Linux x64, win32, win64
 - ▶ **Developer** support for macOS x64 & aarch64, installation via zip, rpm, sdkman, homebrew, winget
 - ▶ **Container images** - [published](#) on DockerHub as official Docker images
 - ▶ **GitHub Actions** support

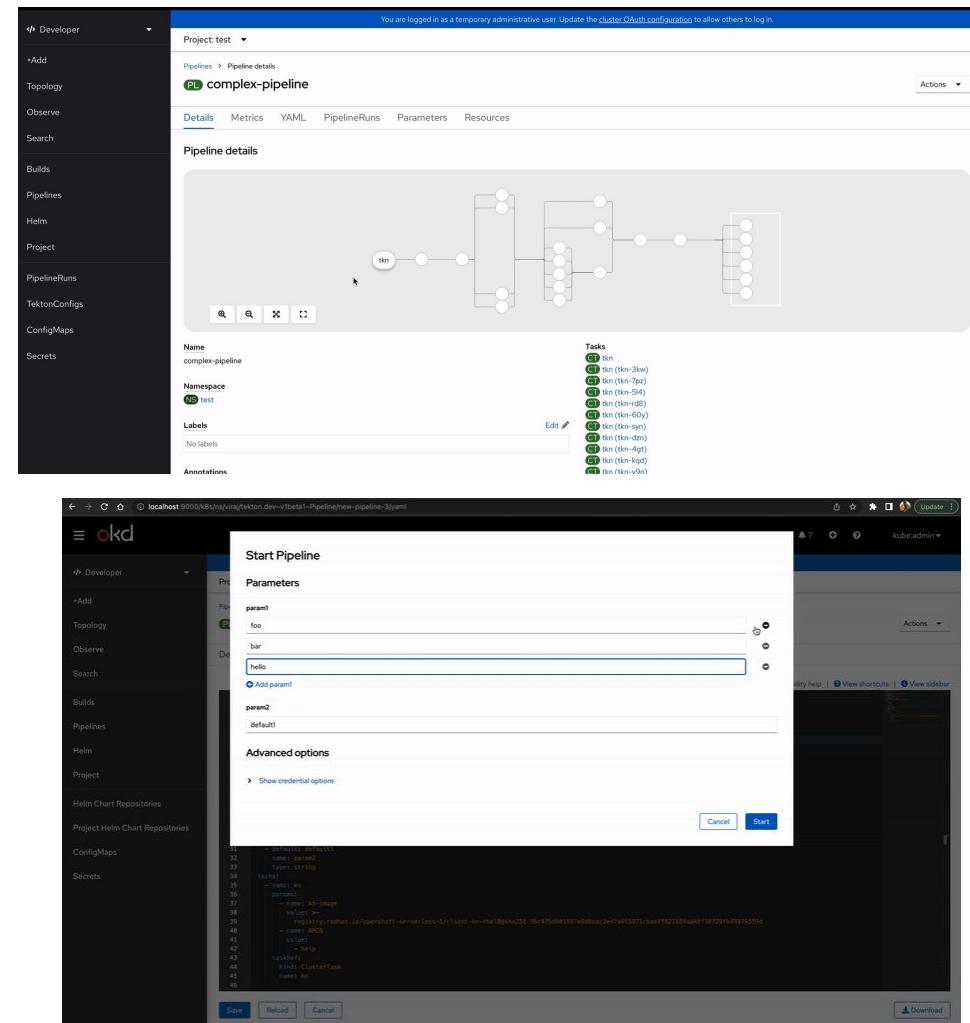
```
steps:  
- uses: actions/checkout@v3  
- uses: actions/setup-java@v3  
  with:  
    distribution: 'temurin' # See 'Supported distributions' for available options  
    java-version: '17'  
- run: java HelloWorldApp.java
```



Platform Services

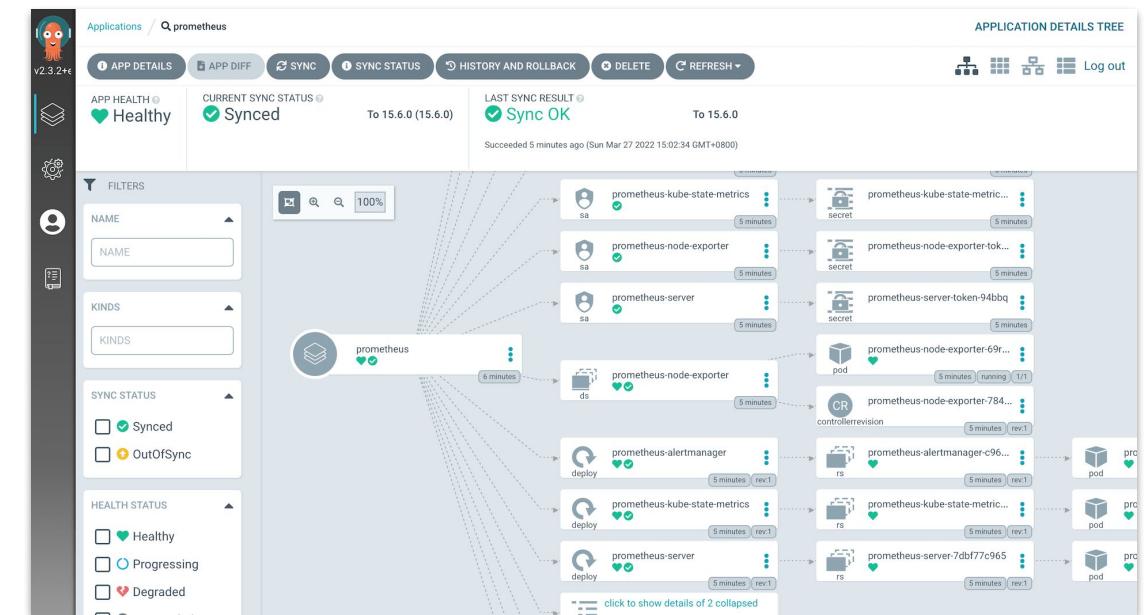
OpenShift Pipelines

- ▶ OpenShift Pipelines 1.9
- ▶ Reference pipelines/tasks in Git, TektonHub, ArtifactHub, etc (Tech Preview)
- ▶ Pipelines as code GA
 - ▶ PAC concurrency control
 - ▶ Support for advanced event matching on filepath/PR title
 - ▶ Ability to enable pac for all [new] repos in a GitHub org
 - ▶ Better errors tooling in Pipelines as Code CLI
 - ▶ Rich PipelineRun details in GitHub Checks UI
- ▶ Support for CSI and projected volume for workspace
- ▶ New CLI: Openshift Pipelines CLI (opc) - Tech Preview
- ▶ Pipelines on Dev Sandbox
- ▶ Dev Console UX improvements : Pipeline topology view, Support of array in Param



OpenShift GitOps

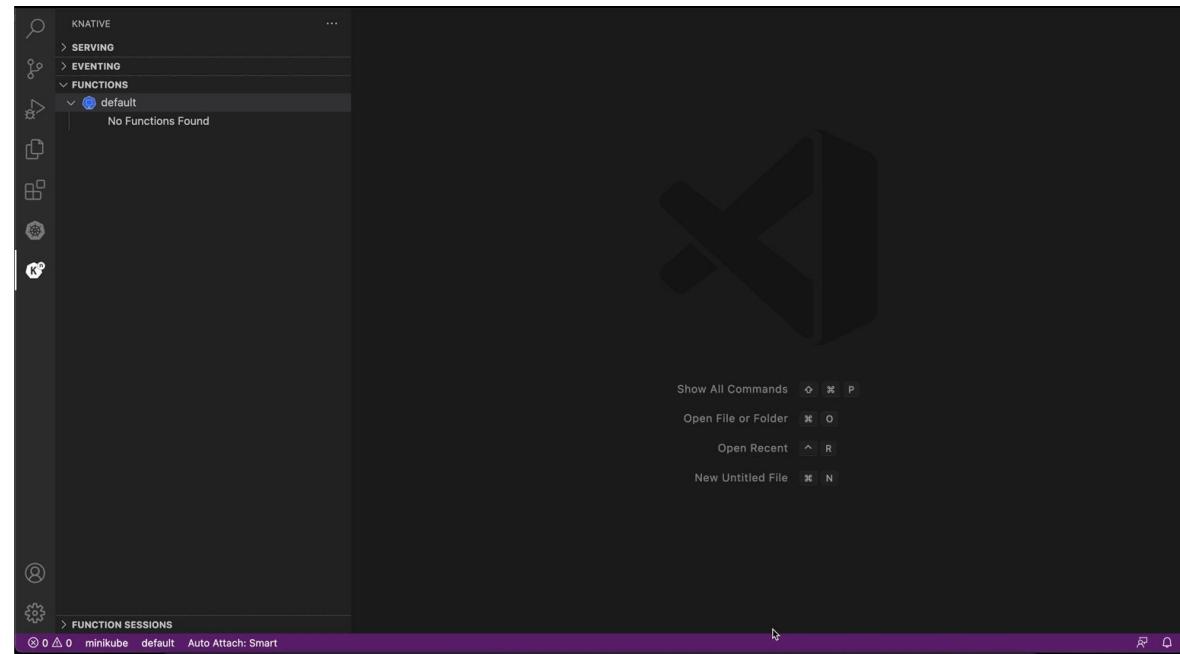
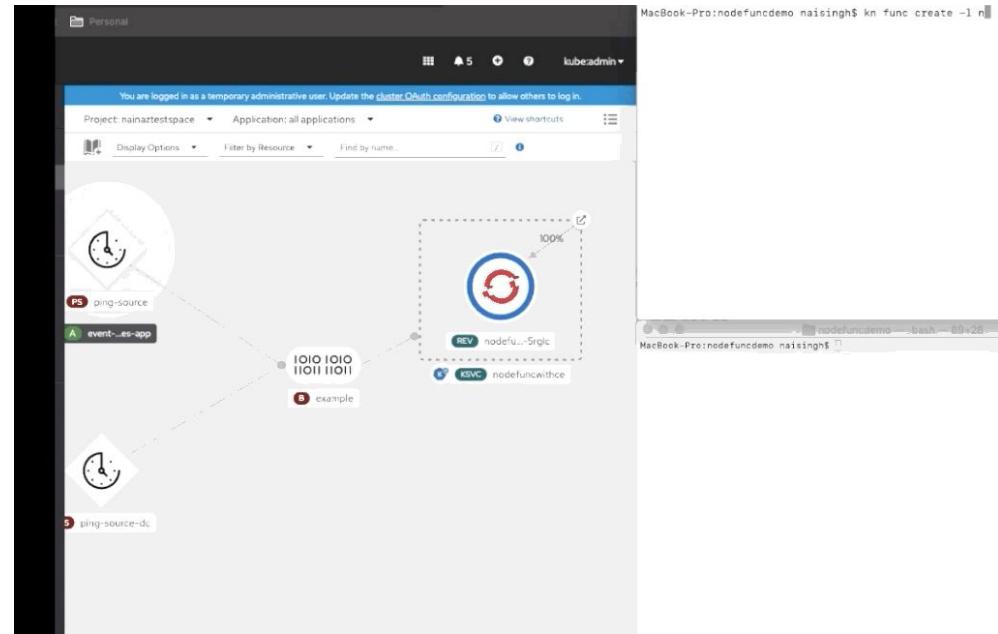
- ▶ OpenShift GitOps 1.7
- ▶ Includes Argo CD 2.6
- ▶ Patching existing resources with Server Side Apply
- ▶ Applications in non-control plane namespaces (TP)
- ▶ Operator improvements:
 - ▶ Custom node selectors
 - ▶ RBAC match mode 'regex'
 - ▶ Sub-keys for resource customizations
 - ▶ Enable/Disable cluster Argo CD console link



OpenShift Serverless

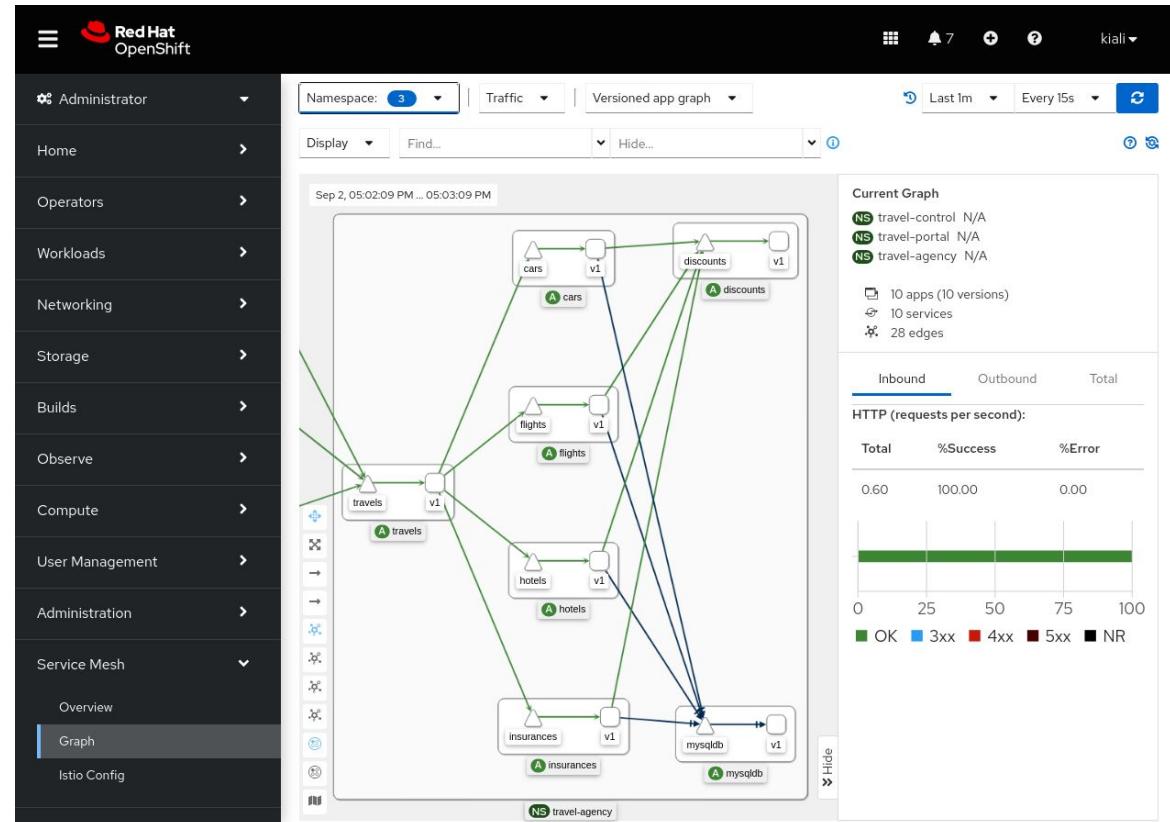
Key Features & Updates

- ▶ Update to Knative 1.6
- ▶ Serverless functions with Quarkus (GA)
 - ▶ In Cluster build using OpenShift Pipelines
 - ▶ Local experience with CLI and IDE (VScode and IntelliJ)
- ▶ Knative Kafka Broker & Knative Kafka Sink (GA)
- ▶ Support for Init Containers and PVC (GA)
- ▶ mTLS natively in Serverless (Tech Preview)
- ▶ Serverless Logic (Dev Preview)
 - ▶ Orchestration for Functions and Services
 - ▶ CLI and Workflow Editor(UX)



OpenShift Service Mesh

- ▶ OpenShift Service Mesh 2.3 is now available
- ▶ Based on **Istio 1.14** and **Kiali 1.57**
- ▶ Introduces GA support for **Gateway Injection**
- ▶ New Technology Preview features:
 - ▶ OpenShift **Console Service Mesh Plugin**
 - ▶ **Cluster-wide mesh** installation option
 - ▶ Kubernetes **Gateway API** (Kiali support added)
- ▶ Service Mesh federation is now supported on Azure Red Hat OpenShift (ARO)



Installer Flexibility

OpenShift 4.12 Supported Providers

Installation Experiences



Outposts



AWS Local Zones



Azure Stack Hub



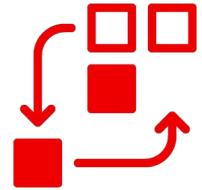
IBM Power Systems



Bare Metal



Google Cloud



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, vSphere and Nutanix only
- ISO Driven



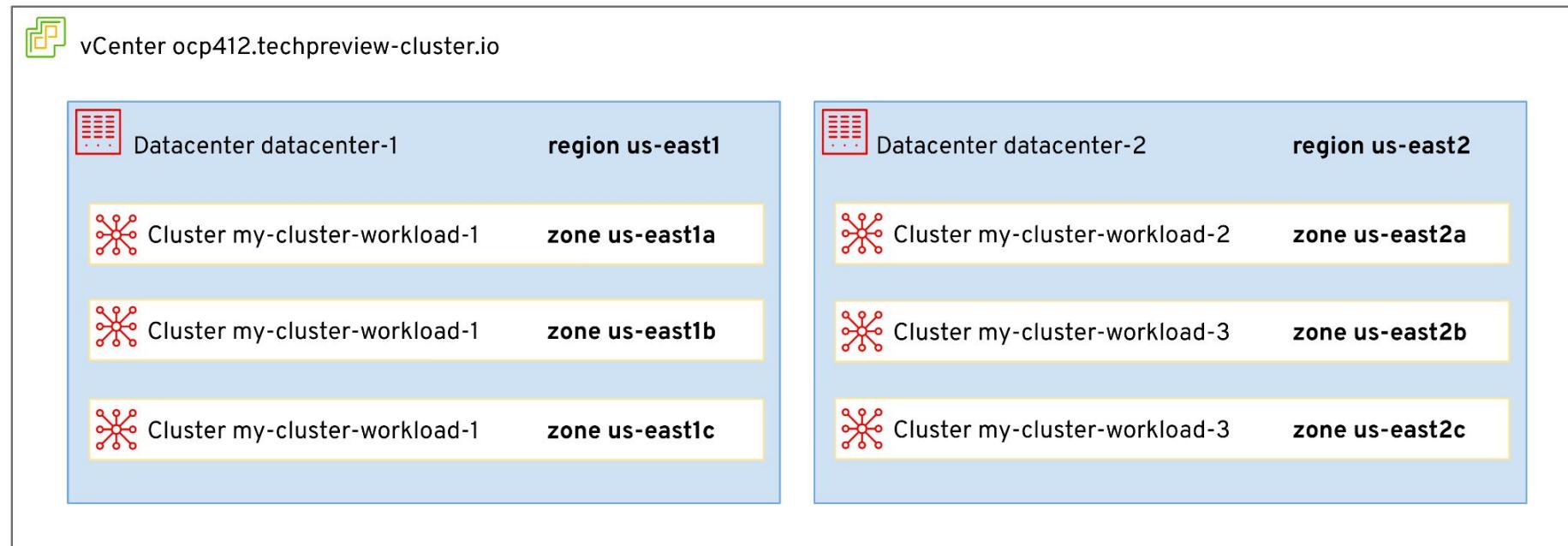
Local – Disconnected

Agent-based Installer

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

OpenShift in vSphere is Zone Aware

- ▶ Create highly-available OpenShift clusters in vSphere with installer provisioned infrastructure (IPI)
- ▶ Applies zonal tags (regions and zones) to multiple vCenter datacenters and clusters in a single vCenter
- ▶ Excludes User Provisioned infrastructure (UPI) deployments



vSphere Notable Changes OpenShift 4.12

Component	Feature	OpenShift 4.12	Guidance
Install and Update	VMware vSphere 6.7 Update 2 or earlier	Removed	Use VMware vSphere 7.0 Update 2 or later
Install and Update	VMware vSphere 7.0 Update 1 or earlier	Deprecated	Use VMware vSphere 7.0 Update 2 or later
Install and Update	VMware virtual hardware version 13	Removed	Use VMware virtual hardware version 15 or later

Deprecated: Deprecated functionality is still included in OpenShift Container Platform and continues to be supported; however, it will be removed in a future release of this product and is not recommended for new deployments.

Removed: Removed functionality is no longer supported.

Additional details and guidance at OpenShift 4.12 Release Notes.



Before upgrading OpenShift 4.12 to OpenShift 4.13, you must upgrade **vSphere to v7.0.2 or later**; otherwise, the OpenShift 4.12 cluster will be **marked unupgradable**.

Flexible OpenShift Installation

Disable/enable operators from installation

- ▶ Exclude one or more optional operators during installation
- ▶ Option to enable a previously excluded operator after cluster is installed
- ▶ Optional operators you can exclude:
 - console operator
 - Insights operator
 - storage operator
 - csi-snapshot-controller operator
 - (in addition to baremetal operator, marketplace operator, and openshift-samples operator)
- ▶ Disable by setting **baselineCapabilitySet** and **additionalEnabledCapabilities** parameters in the **install-config.yaml** configuration file prior to installation

Deploy OpenShift on IBM Cloud



Installing a cluster using installer-provisioned infrastructure (IPI) on IBM Cloud

- ▶ Allows an OpenShift cluster to be deployed using **installer-provisioned infrastructure** on **IBM Cloud VPC infrastructure**
- ▶ Support covers public, **private, and restricted (disconnected) network** deployments as well deployments **into an existing VPC**

```
apiVersion: v1
baseDomain: example.com
...
...
metadata:
  name: my-new-cluster
networking:
  clusterNetwork:
    - cidr: 10.128.0.0/14
      hostPrefix: 23
  machineNetwork:
    - cidr: 10.0.0.0/16
  networkType: OVNKubernetes
  serviceNetwork:
    - 172.30.0.0/16
platform:
  ibmcloud:
    region: us-south
    resourceGroupName: eu-gb-example-network-rg
      vpcName: eu-gb-example-network-1
    controlPlaneSubnets:
      - eu-gb-example-network-1-cp-eu-gb-1
      - eu-gb-example-network-1-cp-eu-gb-2
      - eu-gb-example-network-1-cp-eu-gb-3
    computeSubnets:
      - eu-gb-example-network-1-compute-eu-gb-1
      - eu-gb-example-network-1-compute-eu-gb-2
      - eu-gb-example-network-1-compute-eu-gb-3
  credentialsMode: Manual
  publish: External
  pullSecret: '{"auths": ...}'
  fips: false
  sshKey: ssh-ed25519 AAAA...
```



Google Cloud Enhancements

- ▶ Hybrid cloud adoption from Google Cloud Platform Marketplace
 - Use committed Google Cloud Platform (GCP) spend to purchase and run Red Hat offerings directly through GCP Marketplace
- ▶ Shared VPC (XPN) deployment support with installer-provisioned infrastructure (IPI)
 - Deploy OpenShift in GCP Service Project while networks defined in GCP Host Project
 - Some resources (e.g. network, subnet, firewall rules, DNS configurations) must be pre-created and configured in advance
 - Technology Preview in OpenShift 4.12
- ▶ Authenticate using service account in a GCP VM
 - Installer deploys a cluster while authenticating with service account attached to a GCP VM
 - Enables users to deploy OpenShift clusters in GCP without downloading service account keys (json file)

Transparent Network Proxy Installs

Suggested install-config provided for installations that require proxy defined at network level

- ▶ Provides a more convenient configuration for customers installing clusters with transparent, network-level proxies

```
apiVersion: v1
baseDomain: devcluster.openshift.com
proxy:
  httpProxy: http://localhost:8000/
  httpsProxy: https://localhost:8000/
additionalTrustBundlePolicy: always
additionalTrustBundle: |
  -----BEGIN CERTIFICATE-----
MIIDLzCCAhegAwIBAgIUFrBWI5dQ0W/Na7dP7netoXZzbwcwDQYJKoZIhvcNAQEL
BQAwJzELMAkGA1UEBhMCVVMxGDAWBgNVBAMMD0V4YWlwbGUtUm9vdC1DQTAeFw0y
MjA1MTIwMzQ1NTdaFw0yNTAzMDEwMzQ1NTdaMCcxCzAJBgNVBAYTAlVTMRgwFgYD
VQQDDA9FeGFtcGxLLVJvb3QtQ0EwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEK
AoIBAQChzuZ4gvxmGNRCQ2F0096XEHWkgJnlsrnJ7cr0T8nUg+NI10PzUj+Dwxm3
0hpHPQxA0fil5npNqCQTKnrlH+fk10Cb83tUlyoHQ2xFujqWd1L0SJZPgCYE/G3U
41gkbEmv7qhSpo1tzwTYyKAp3HZ0sLqPIKKIkphDeU5t7ZpQ+FbMXLPGB6dhv3wS
MJbZ/wln3bDMCH082791nqjhhliCALeElFmL9fRTLIdyWd+xUNHYn6zqNjbsxjig
ZNjFSnDuBkxr996w7jBXg1x4zwer1N5lVZJyP0J4uogbm+alvVctGSja0rdBWyjy
JmY4YC2gSsC9Aj9yjd5xbXE7FH/1AgMBAAGjUzBRMB0GA1UdDgQWBBSVdHrd5pY5
jg/fAgcI74Jbny+lSTAfBgNVHSMEGDAwgBSVdHrd5pY5jg/fAgcI74Jbny+lSTAP
BgNVHRMBAf8EBTADAQH/MA0GCSqGSIb3DQEBCwUAA4IBAQB4tyzros8BLj0QjcVx
1neKj2Fx014M0S8jGUyoIGD+A6ZYSzYVbkx71pKUN25niSwcoT4ksYnj6KpDf1
tUelFtBhJ6MEymbvFNnefeTKUUFjfdCrDzvSR0dcwkegP1iKvIrOnJaucuMAf0
0/DAsSGxq4YSkEJlaKxtUMMbqFHTE3fatabrL94/yrqnrsuC3W4UALTNCYwOnC4i
5EZZRjl7rJ5/neoX0dNva828rLdm0itUVYwvNrrxqDfM3hNvL/X8ZW3MWyRY1uVz
wZwdtgBaI/7+PX DyX1aEDW8zXddYN0c9AMeAZG731RseLU/5vDFmb6/TYQDQ7IFU
ZQtz
  -----END CERTIFICATE-----
compute:
- architecture: amd64
  hyperthreading: Enabled
  name: worker
  platform: {}
  replicas: 3
```

Cluster Infrastructure



Providers

- Continue to provide integration with and maximum choice of cloud providers
- o-----o
- Updated tested/supported list to be same as installer - reduced confusion, eliminate lag of support



Managed Control Planes

- Bring flexibility and operational simplicity to the control plane
- o-----o
- Control plane can scale up/down via Machine API and Machine Controller
- Use for vertical scaling and replacement of control plane machines
- Allow setting verbosity of Cluster Autoscaler



Extensions

- Access more cloud provider functionality seamlessly via OpenShift
- o-----o
- **Azure:** config of boot diagnostics on compute nodes
- **GCP:** handle userDataSecret for Windows MachineSets

Systems Enablement



Multi-architecture Compute

- Allow more flexibility in a clusters by mixing compute node architectures (aka Heterogeneous Compute)
- - Azure offering remains in Tech preview for now
 - Multi-arch payload there but only for above
 - No upgrade yet though you can --force



OpenShift on Arm

- Run OpenShift on highly efficient, high performance per watt architectures
- - **OCP for Arm on Azure IPI**
 - AWS Graviton 3 support

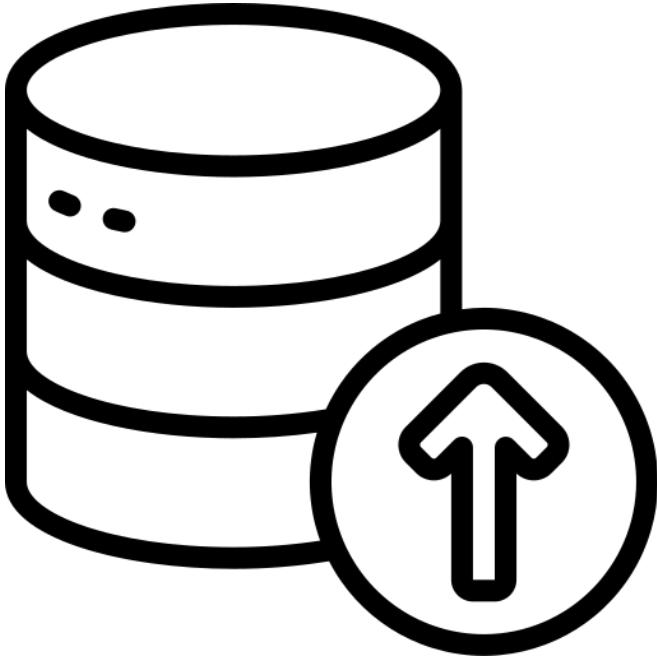


IBM Power and zSystems

- Run OpenShift on highly available, highly secure, scalable hardware
- - **IBM Power:**
 - Working on IPI for PowerVS
 - **IBM zSystems:**
 - Secure Execution TP
 - Notification of deprecated systems

RHEL CoreOS

We're making containers **bootable**



More info:

<https://coreos.github.io/rpm-ostree/container/>
<https://github.com/containers/bootc>

RHEL CoreOS will ship as bootable **node base image** which you can customize with any OCI-container tooling before using with your bare metal or virtual OpenShift machines.

- ▶ Support for adding RHEL hotfix packages is **GA in 4.12!**
- ▶ **Developer Preview in 4.12:** anything you want to try!
Pre-install additional software, copy configuration files in directly, even run Ansible playbooks against the image pre-deployment!

Deploy RHEL hotfixes directly

GA in 4.12 (with open support case)

- ▶ Prepare

```
$ cat Dockerfile

FROM registry.example.com/rhcos/rhel-coreos-4-12:latest

ADD openssh-server-hotfix.rpm openssh-clients-hotfix.rpm .

RUN rpm-ostree override replace openssh-{server,clients}-hotfix.rpm && \
    ostree container commit
```

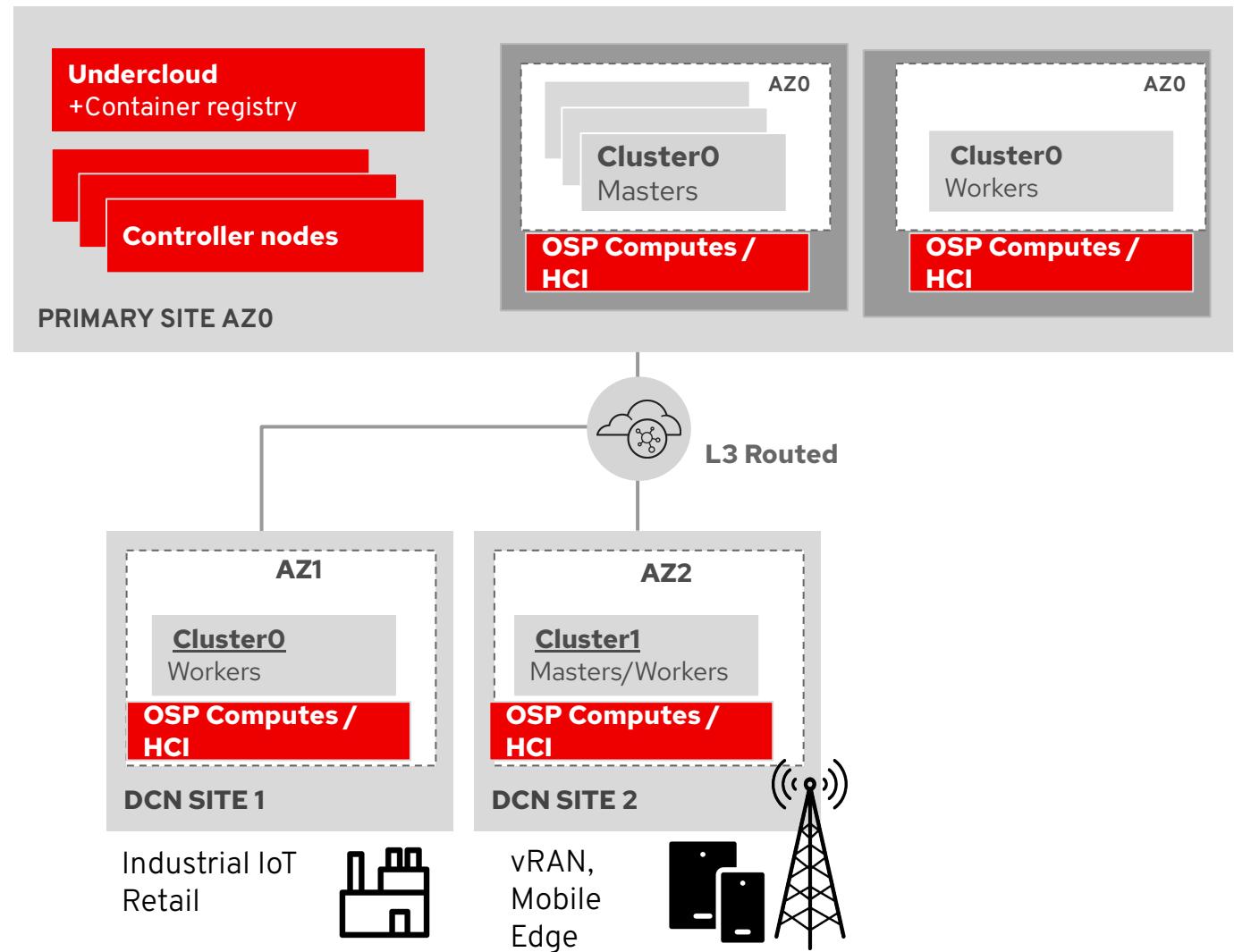
- ▶ Build & Push

```
$ podman build -t custom-rhcos -f ./Dockerfile

$ podman push custom-rhcos registry.example.com/custom-rhcos/custom-rhcos-4-12
```

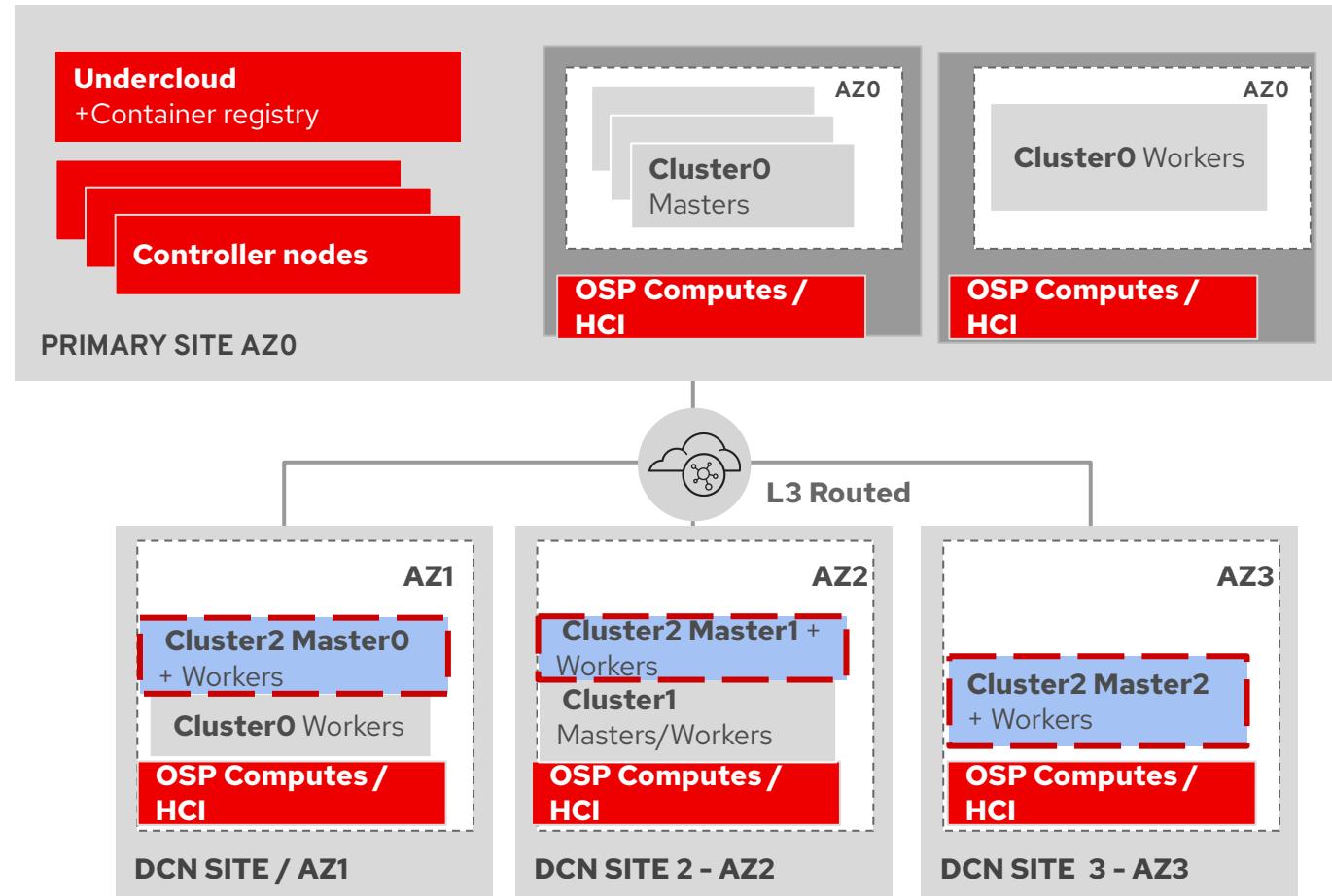
Shift on Stack – DCN Architecture Today (OSP 16.2+ w/ OCP 4.10-4.12)

- Leveraging Spine/Leaf Network topologies and Routed Provider networks
- Multiple Openstack AZs
- Focus on Remote Clusters per AZ (master+workers) or remote workers per AZs with masters on main AZ
- GA in OCP 4.12
- 100 ms RTT main (AZ0) to remote AZs
- Requires OSP 16.2+ DCN architecture



Shift on Stack – DCN Architecture Fully Stretched Clusters (OSP 16.2+ OCP 4.12+)

- Leveraging Spine/Leaf Network topologies and Routed Provider networks
- Fully Distributed OCP Clusters, controlplane and compute under different subnets (stretched ctlplne)
- Focus on Campus HA and workload isolation (OCP Master node RTT latency. So low latency interconnects are mandatory)
- Dev Preview in OCP 4.12
- Tech Preview Preview planned in OCP 4.13
- Requires OSP 16.2+ DCN architecture





OSP Director Operator

Hardware Provisioning

OpenStackNet

- Integrated IPv4/IPv6 IPAM

OpenStackControlPlane



Kubevirt

OpenStackBaremetalSet



Metal3

Software Configuration

OpenStackPlaybookGenerator



Generate Ansible Playbooks

OpenStackClient (pod)



Execute Ansible, Run openstackclient

- ▶ Deployed in an external ceph or HCI topologies
- ▶ Adheres to tripleo and heat as a pre-provision setup
- ▶ Is considered an interim step until next gen comes on-line
- ▶ Requires NPSS involvement for deployment (not supported as a "download and deploy")
- ▶ Requires Bare Metal Openshift cluster

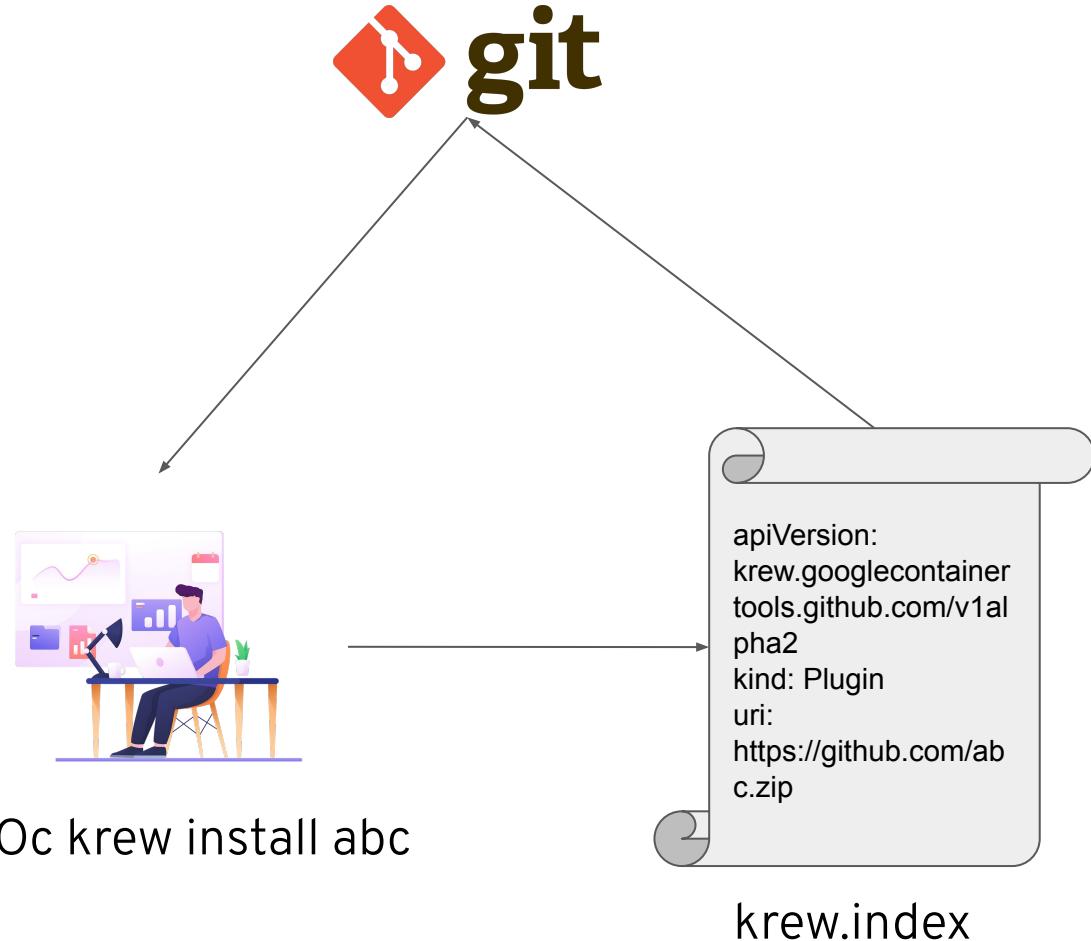


Ansible Playbooks
Git Store

Control Plane Updates



CLI Manager - Krew (Tech Preview)



CLI Manager - Krew

- Discover OC plugins
- Install them on openshift clients
- Keep the installed plugins up-to-date

Crun and Cgroup V2 (Tech Preview)

Crun

- ▶ An OCI-runtime written in C.
- ▶ Faster and lower memory footprint than runc.

Cgroup V2

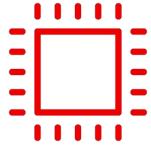
- ▶ Next generation of cgroups in the kernel. All new development happens in v2.
- ▶ Better node stability under OOM pressure scenarios.
- ▶ Better page cache write-back accounting.
- ▶ Current implementation is a 1:1 with v1 but it opens the door to start consuming new v2 specific features.

Security

Red Hat Advanced Cluster Security

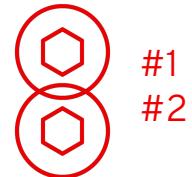
- 1 **Faster time to value and reduce complexity with Red Hat ACS cloud services**
Fully-Managed ACS throughout the stack, 24x7 expert SRE support and an industry leading 99.0% SLA
- Field Trial
3 **Ready to use policies**
New out-of-the-box policies, privilege escalation, externally exposed services,
- 2 **Simplified issue prioritization** with the new dashboard and network graph enhancements
- 4 **Improved performance , backup and restore and disaster recovery**
PostgreSQL
- Tech. Preview
5 **Shift-left your NW policies creation**
Generate Kubernetes network policies based on Application YAML manifests
- 6 **Vulnerabilities at a glance**
Support for RHEL 9, and CVEs introduced in Docker files

Compliance Operator



**Better control resources
allocated to scans** by:

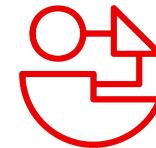
- customizing CPU and memory resources per scans
- watching resources in given namespace



**Prioritize which
pods to scan first**
in your workloads



More accurate scan results
evaluating default configuration values against compliance rules

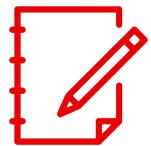


**Expanded support of
PCI-DSS profiles**, now supported on IBM Power architectures

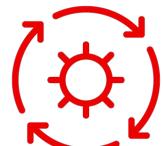


Security Profile Operator

Helps admins use **SELinux** and **seccomp effectively**



Easy seccomp and SELinux profile creation by recording what your application needs and creates a profile from it



Manages profiles across nodes and namespaces

It also validates if node supports seccomp and doesn't synchronize it if

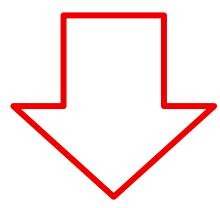


Validate your profile

not



Reuse profiles across namespaces



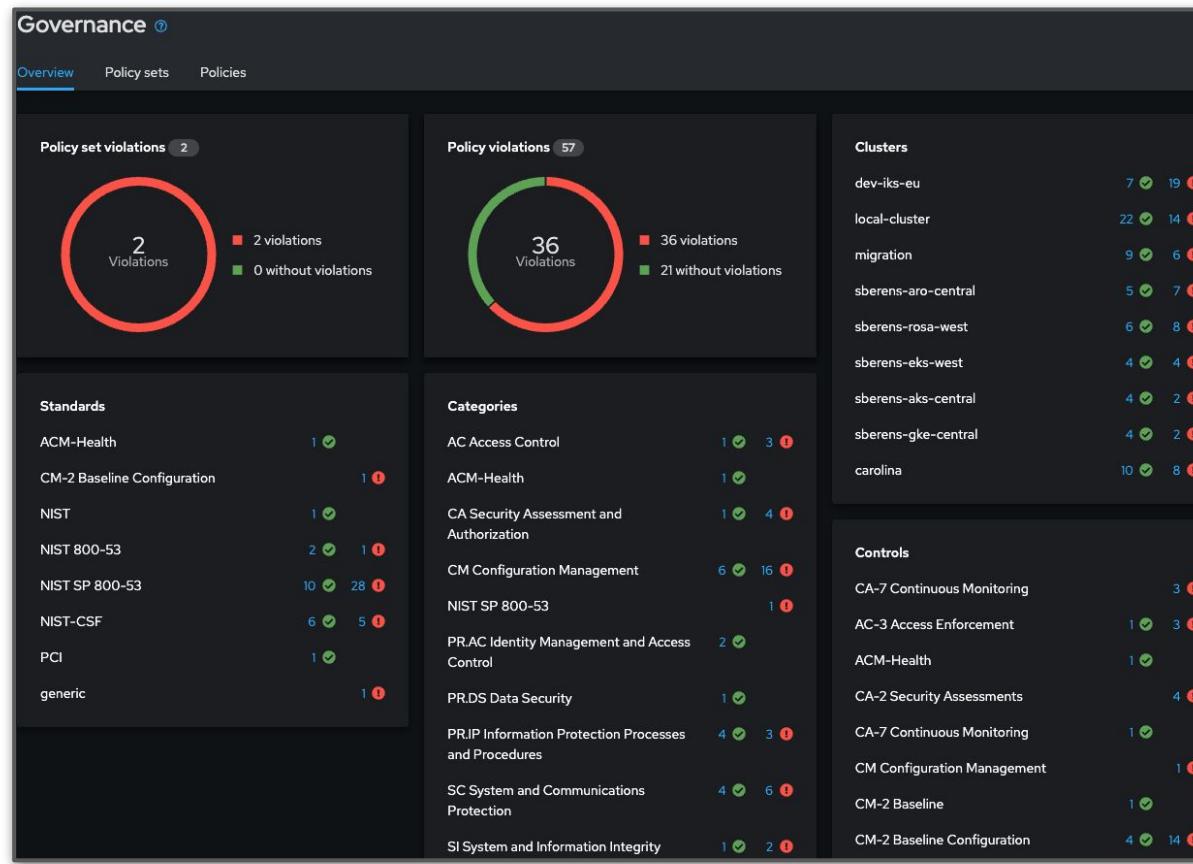
Available in [OperatorHub](#)

Management

Red Hat Advanced Cluster Management for Kubernetes

What's new in RHACM 2.7

Governance



Red Hat Advanced Cluster Management's Governance framework is continuously evolving to keep up with the growing Kubernetes policy landscape.

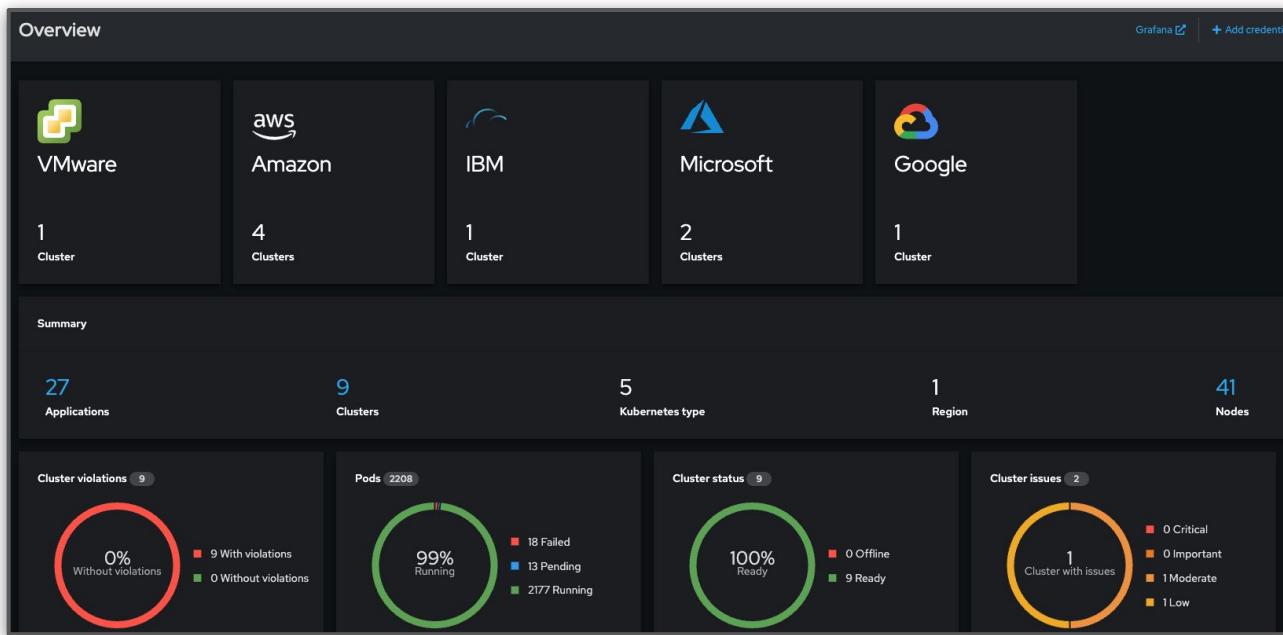
- **Policy Execution Ordering**
 - The RHACM policy engine now allows ordering the execution of policies through dependencies, allowing a hierarchy to be formed.
- **Automatic reconciliation when syncing secrets** and other resources via policy templating from the hub to managed clusters
- **Policy Generator to reference local and remote** (i.e. HTTP(S)) Kustomize configurations for enhanced flexibility

Red Hat Advanced Cluster Management for Kubernetes

What's new in RHACM 2.7

Better Together

With key integrations across tools, we continue offering you the best experience across your Kubernetes fleet.



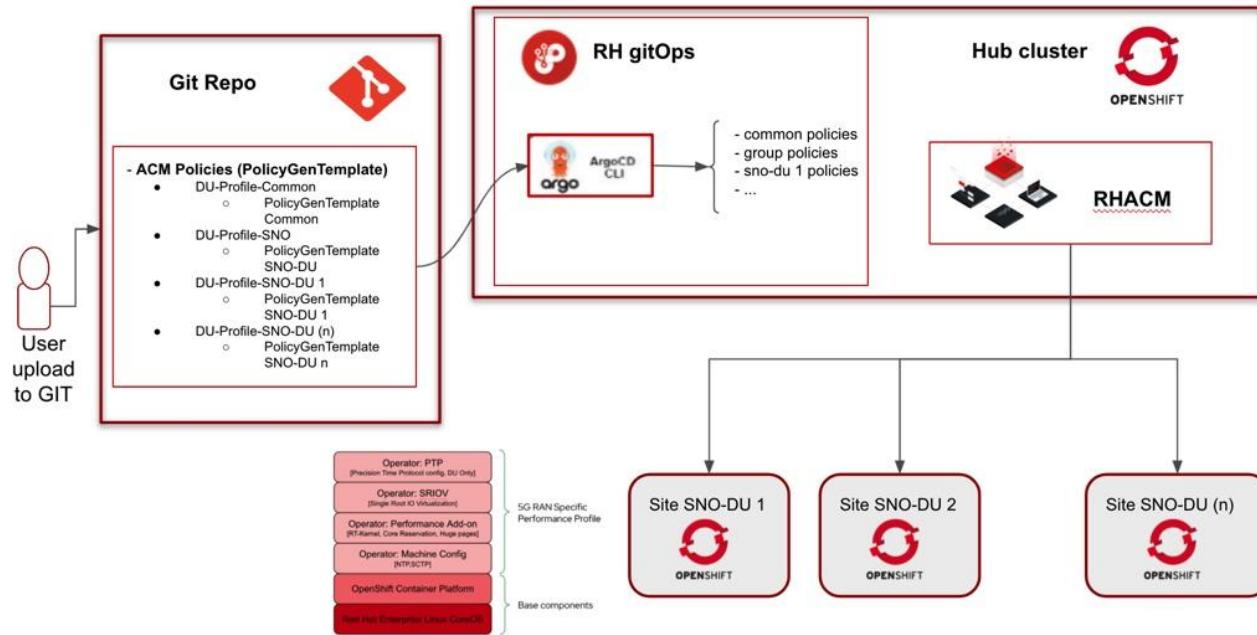
- Provide **Additional Context** to Ansible Automation during **policy violation**
- Invoke **Ansible Workflows** from RHACM **Cluster and Application Lifecycle events**
- Support for **label and tags** when using Ansible Automation
- ACM and MCE **community operators** available as `stolostron` and `stolostron-engine` in OperatorHub
- **Business Continuity** for Applications using **Metro DR** is **GA**
 - Regional DR remains Tech Preview
- **Multicluster Networking Submariner** enhancements:
 - Automated configuration for ARO & ROSA
 - Added support for VMware, OVN SDN, Disconnected / Air-gapped environments

Red Hat Advanced Cluster Management for Kubernetes

What's new in RHACM 2.7

Manage At the Edge

At Red Hat, we see edge computing as an opportunity to extend the open hybrid cloud all the way to the data sources and end users. Edge is a strategy to deliver insights and experiences at the moment they're needed.



- **Deploy & manage 3500 SNO (GA):** Support DU profile delivery with ACM in IPv6 connected and disconnected scenarios.
- **Search v2 Odyssey for high-scale environments – (GA):** Resilience and scalability of the managed cluster collected Kubernetes resources.
 - Enhanced Search resource details page for more in-depth troubleshooting experiences

Topology Aware Lifecycle Manager (TALM)

TALM matured to Generally Available (GA)

The Topology Aware Lifecycle Manager (TALM) **manages the deployment of Red Hat**

Advanced Cluster Management (RHACM) policies for one or more OpenShift

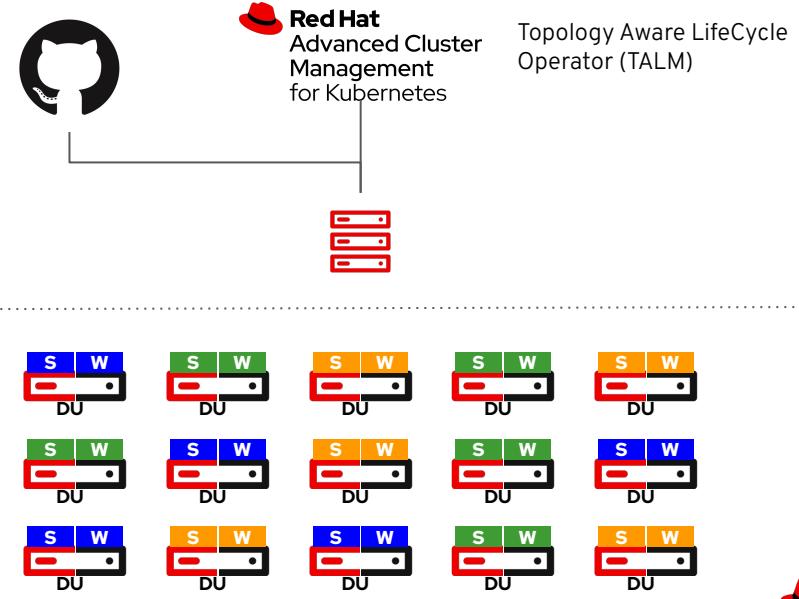
Container Platform clusters. Using the TALM in a large network of clusters allows the **phased rollout of policies to the clusters in limited batches.**

Things you can do with TALM:

- Update all Distributed Unit's (DU) from 4.10.27 to 4.10.50 (*example release numbers*)
- Do a Canary Upgrade on a small set of clusters before upgrading the fleet
- Upgrade the fleet of clusters in batches
- Upgrade day-2 operators (RH Supported day-2 Operator, e.g. PTP Operator), all at once or in batches
- Schedule the cluster upgrade sequence to start at time of next maintenance window
- Create backups (etcd, content, deployment, images, files, ...), restore using scripts on failure
- Pre-cache images before updates, to reduce startup-time during initial reboot of new version

The TALM supports the orchestration of the OpenShift Container Platform y-stream and z-stream updates, and day-two operations on y-stream and z-streams.

Infra as code in Git

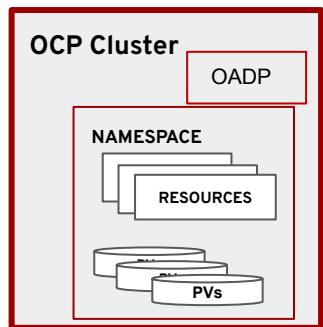


Backup Solutions for Red Hat OpenShift

Business Continuity

OpenShift native backup utility

-or-



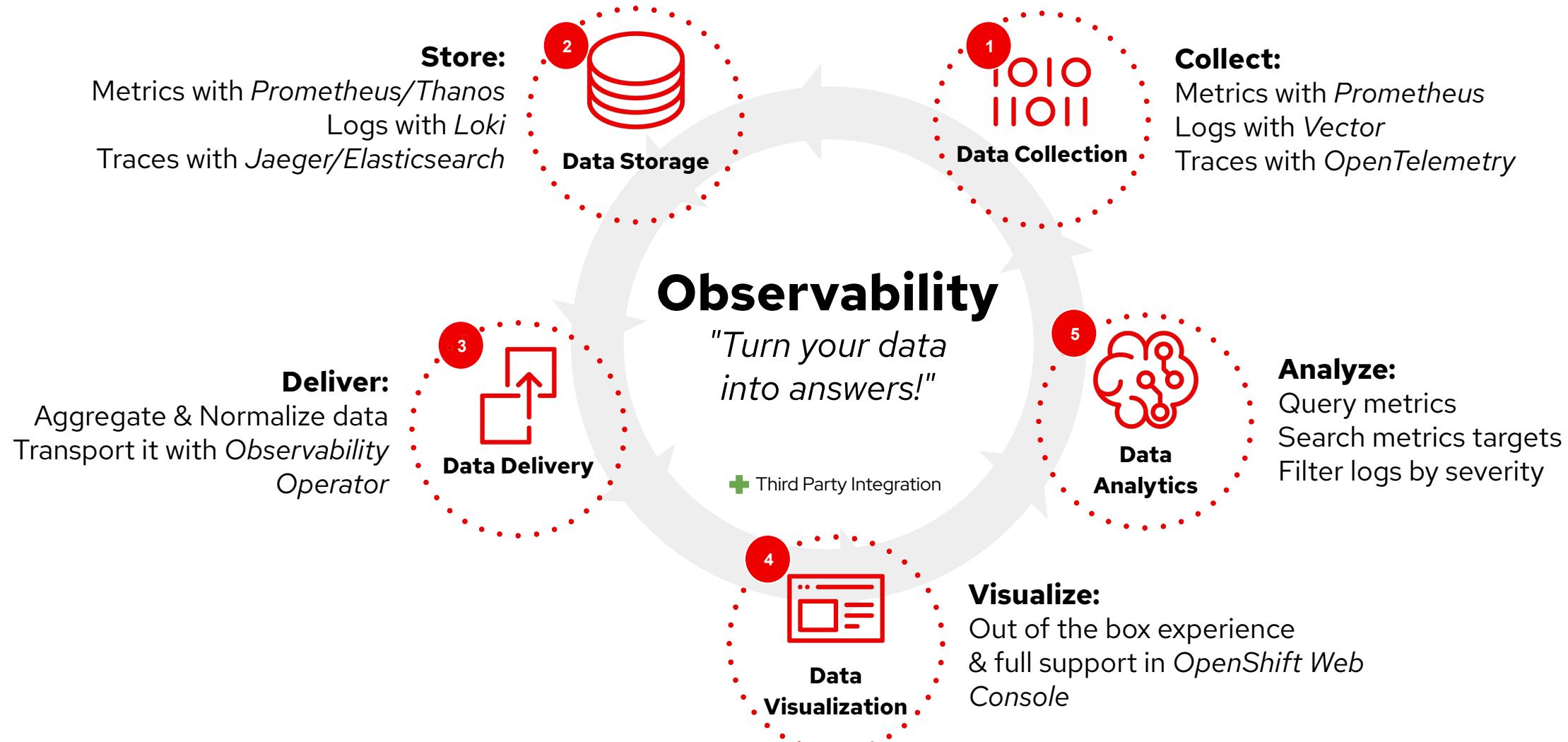
OpenShift OADP 1.1 - Native backup utility with 4.12

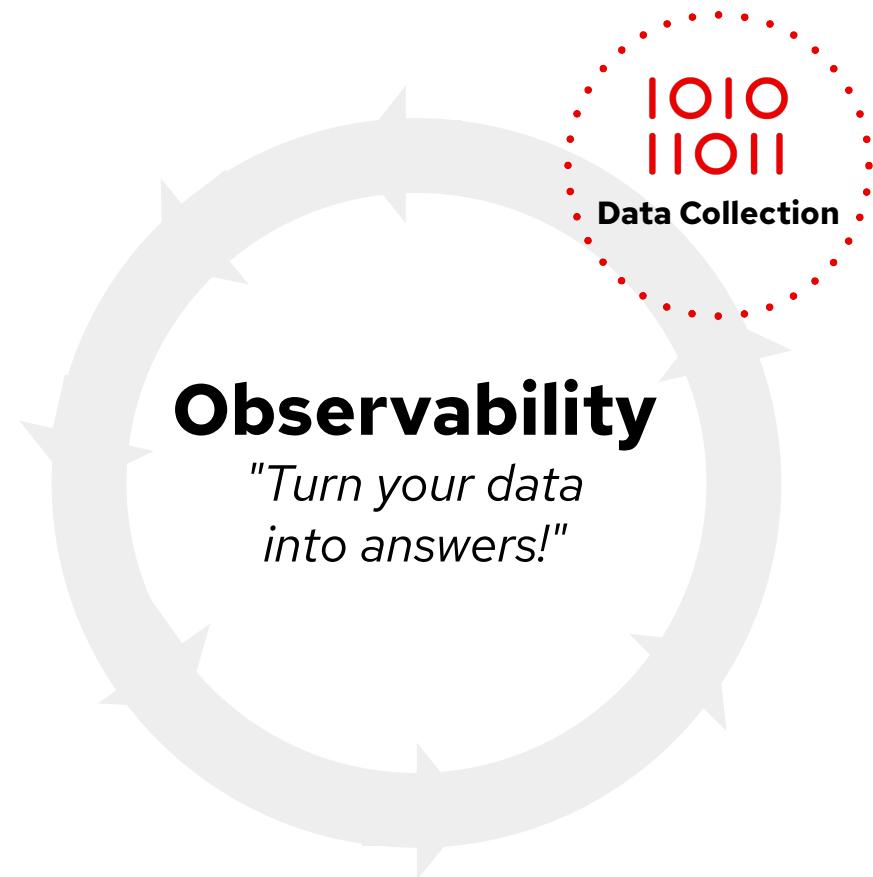
- Application level (Namespace), consistent backups with OADP
- CLI based scheduling and management of backups
- Built-in data mover enables CSI-based storage snapshots to be backed up to a remote S3 compatible object store.
 - Plugable DataMover support is Tech Preview (ie. VolSync)
- Supports all OpenShift storage provisioners that also support CSI Snapshots

Observability



OpenShift Observability: Five Pillars



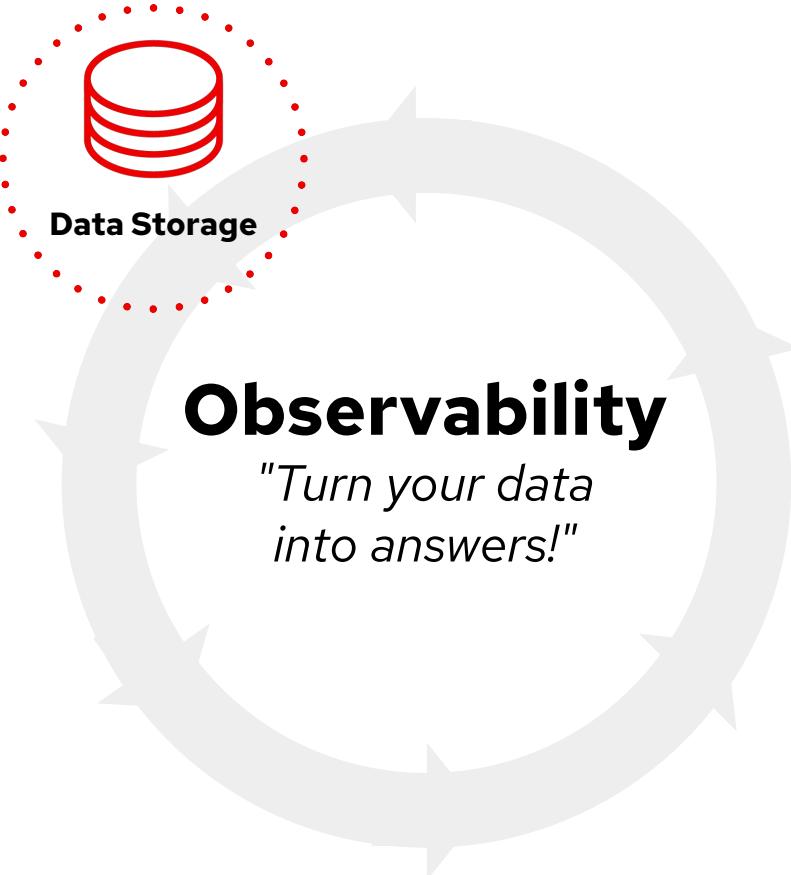


OpenShift 4.12 Monitoring

- ▶ Option to specify Topology Spread Constraints for Prometheus, Alertmanager & Thanos Ruler
- ▶ Option to improve consistency of prometheus-adapter CPU and RAM time series

Logging 5.6

- ▶ GA release of Vector as an alternate collector to Fluentd



OpenShift 4.12 Monitoring

- ▶ Version updates to Monitoring stack components & dependencies

Logging 5.6

- ▶ Exposed stream-based retention capabilities in the Loki Stack custom resource for OpenShift Application owners and OpenShift Administrators



Observability

"Turn your data into answers!"



OpenShift 4.12 Monitoring

- ▶ Tech Preview: Allow admin users to create new alerting rules based on platform metrics

Logging 5.6

- ▶ Support for forwarding logs to Splunk



OpenShift 4.12 Monitoring

- ▶ Improved UX experience in OpenShift Web Console:
Easier selection of records in Metrics UI
- ▶ Support for Alertmanager's negative matchers

Logging 5.6

- ▶ Log Exploration UI available in OpenShift Web Console
 - Developer Perspective: Observe > Aggregated Logs
- ▶ Improved UX experience in OpenShift Web Console:
Custom time range & Predefined filters to easily search logs (namespace, pod, container)

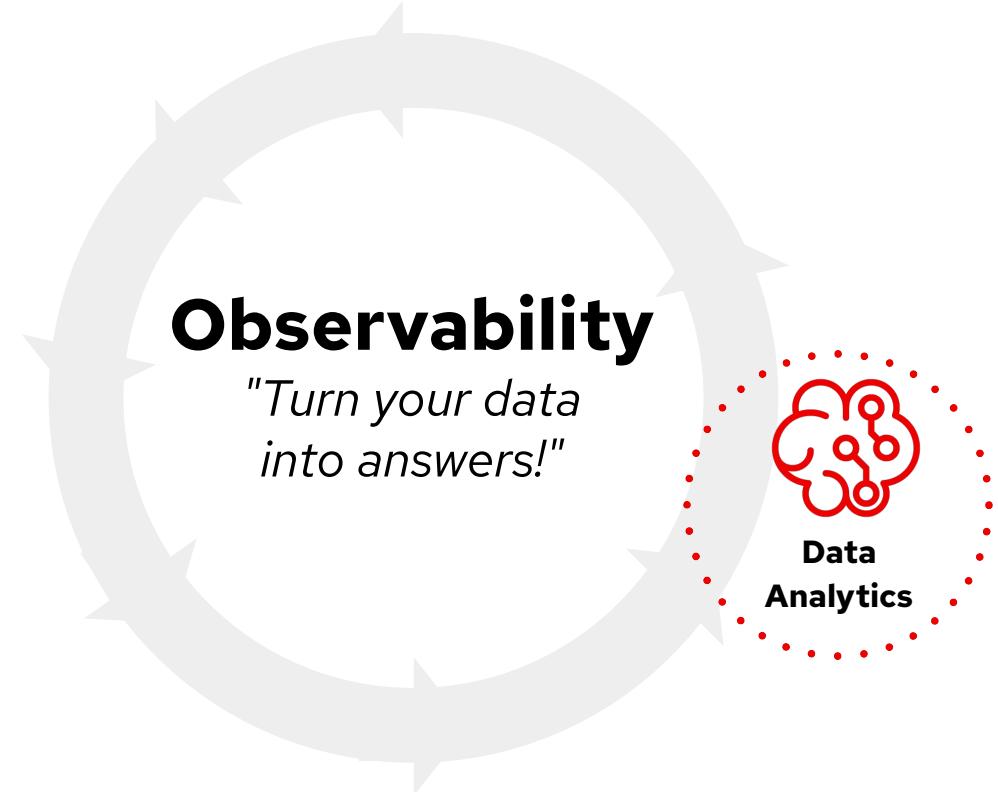
OpenShift Observability

The screenshot shows the Red Hat OpenShift Developer Console interface. The top navigation bar includes the Red Hat OpenShift logo, a user dropdown, and a project selector for 'test'. The left sidebar contains links for Developer, Add, Topology, Observe, Search, Builds, Helm, Project, ConfigMaps, and Secrets. The main content area is titled 'Observe' and features tabs for Dashboard, Metrics, Events, and Aggregated Logs, with 'Aggregated Logs' currently selected. Below the tabs is a histogram showing log event counts over time from 12:09 to 13:09. The histogram bars are stacked with colors representing different log levels. Underneath the histogram is a table of log entries. The table has columns for Date, Message, and Severity. The Date column is sorted by descending timestamp. The first few log entries are:

Date	Message
21 Nov 2022, 13:09:35.999	ts=2022-11-21T12:09:35.999567044Z stream=stderr host=logger-77f7648b76-s8lsw.0.00000000000000008CBD706BDE6FD2F3 level=error count=1711 msg="could not compute the last digit of PI"
21 Nov 2022, 13:09:34.999	ts=2022-11-21T12:09:34.999378931Z stream=stderr host=logger-77f7648b76-s8lsw.0.00000000000000008CBD706BDE6FD2F3 level=error count=1710 msg="failed to get an error message"
21 Nov 2022, 13:09:33.999	ts=2022-11-21T12:09:33.999282678 stream=stderr host=logger-77f7648b76-s8lsw.0.00000000000000008CBD706BDE6FD2F3 level=info count=1709 ms g="John Doe solved the Travelling Salesman problem in O(1) time. Here's the pseudo-code: Break salesman into N pieces. Kick each piece to a different city."
21 Nov 2022, 13:09:32.999	ts=2022-11-21T12:09:32.999176279Z stream=stderr host=logger-77f7648b76-s8lsw.0.00000000000000008CBD706BDE6FD2F3 level=warn count=1708 ms sg="failing to cook potatoes"
21 Nov 2022, 13:09:31.999	ts=2022-11-21T12:09:31.999070109Z stream=stdout host=logger-77f7648b76-s8lsw.0.00000000000000008CBD706BDE6FD2F3 level=warn count=1707 ms sg="change stuff and see what happens"
21 Nov 2022, 13:09:30.999	ts=2022-11-21T12:09:30.998969983Z stream=stderr host=logger-77f7648b76-s8lsw.0.00000000000000008CBD706BDE6FD2F3 level=error count=1706 msg="failed to reach the cloud, try again on a rainy day"

New entry:
Aggregated Logs
view in Developer
Console

Improved UX:
Filter by content
(namespace, pod,
container) AND
Search by content
AND Filter by
severity

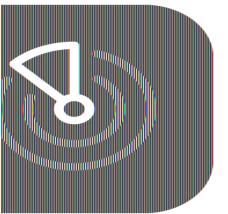


OpenShift 4.12 Monitoring

- ▶ Runbooks URLs enabled in the Alerting UI of OpenShift Console

Logging 5.6

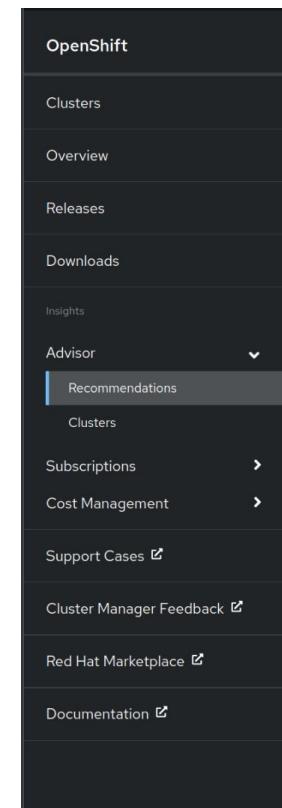
- ▶ Add the OpenShift cluster ID to log records so that clusters can be uniquely identified in aggregated logs



Insights Advisor for OpenShift

- ▶ **Free service leveraging Red Hat experience with supporting and operating OpenShift**
- ▶ New recommendations based on analysis of Kubernetes YAML files (available for managed OpenShift only ATM)
- ▶ Alerts in OpenShift WebConsole for most critical recommendations
- ▶ **New recommendations focused on storage performance, etcd issues etc.**
- ▶ Improved internal integrations for more stable upgrades

<https://console.redhat.com/openshift/advisor>
<https://console.redhat.com/settings/notifications/openshift>

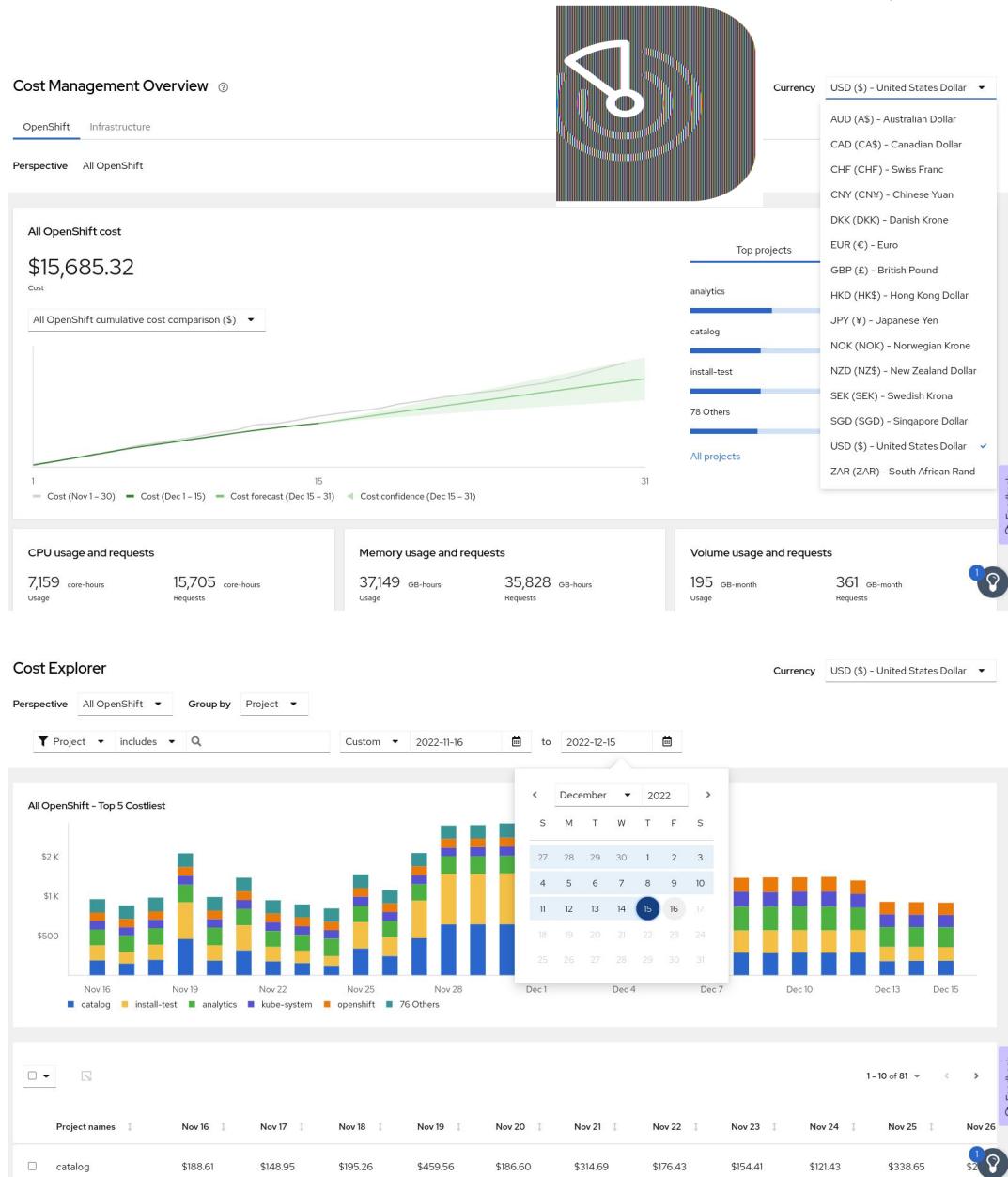


Advisor recommendations

Name	Added	Category	Total risk	Clusters
Cluster upgrade will fail when default SCC gets changed	2 years ago	Service Availability	Important	1
Workloads are still using the deprecated APIs which will be removed in the next release	5 months ago	Service Availability	Important	6
SystemMemoryExceedsReservation alerts when the system daemons memory usage on nodes exceeds 90% of the reservation for them	4 months ago	Service Availability	Important	1
Workloads are using the deprecated PodSecurityPolicy API	5 months ago	Performance	Moderate	3
CVE-2021-30465: runc vulnerable to privilege escalation	9 months ago	Security	Moderate	1
Nodes will become Not Ready due to a CRI-O PID leak in the running OpenShift Container Platform version	5 months ago	Service Availability	Moderate	13
The running OpenShift version has reached its End of Life	2 years ago	Service Availability	Moderate	1
Pods could fail to start if openshift-samples is degraded due to FailedImageImport which is caused by a hiccup while talking to the Red Hat registry	2 years ago	Service Availability	Moderate	1
Prometheus metrics data will be lost when the Prometheus pod is restarted or recreated	1 year ago	Service Availability	Moderate	50
The authentication operator is degraded when cluster is configured to use a cluster-wide proxy	2 years ago	Security	Moderate	1
An OCP node behaves unexpectedly when it doesn't meet the minimum resource requirements	2 years ago	Performance	Moderate	2

Insights Cost Management

- ▶ **Free service to monitor per-project and per-cluster spending**
- ▶ Currency support
- ▶ Marketplace services reported including ROSA, ARO, RHEL, ODF, 3rd parties, etc
- ▶ ROSA and ARO costs distributed to projects
- ▶ Costs now distributed according to the same resource consumption criteria in every view
- ▶ Cost of unallocated capacity accounted (both workers and platform)
- ▶ Filtering gained exclude capabilities ("negative filtering")
- ▶ AWS costs default to amortized when Savings Plans are involved
- ▶ Previous month report and custom date picker in Cost Explorer
- ▶ Performance improvements for OCP clusters running on GCP
- ▶ Integration with console.redhat.com notifications



<https://console.redhat.com/openshift/cost-management>

<https://console.redhat.com/settings/applications/cost-management>

<https://console.redhat.com/settings/notifications/openshift>

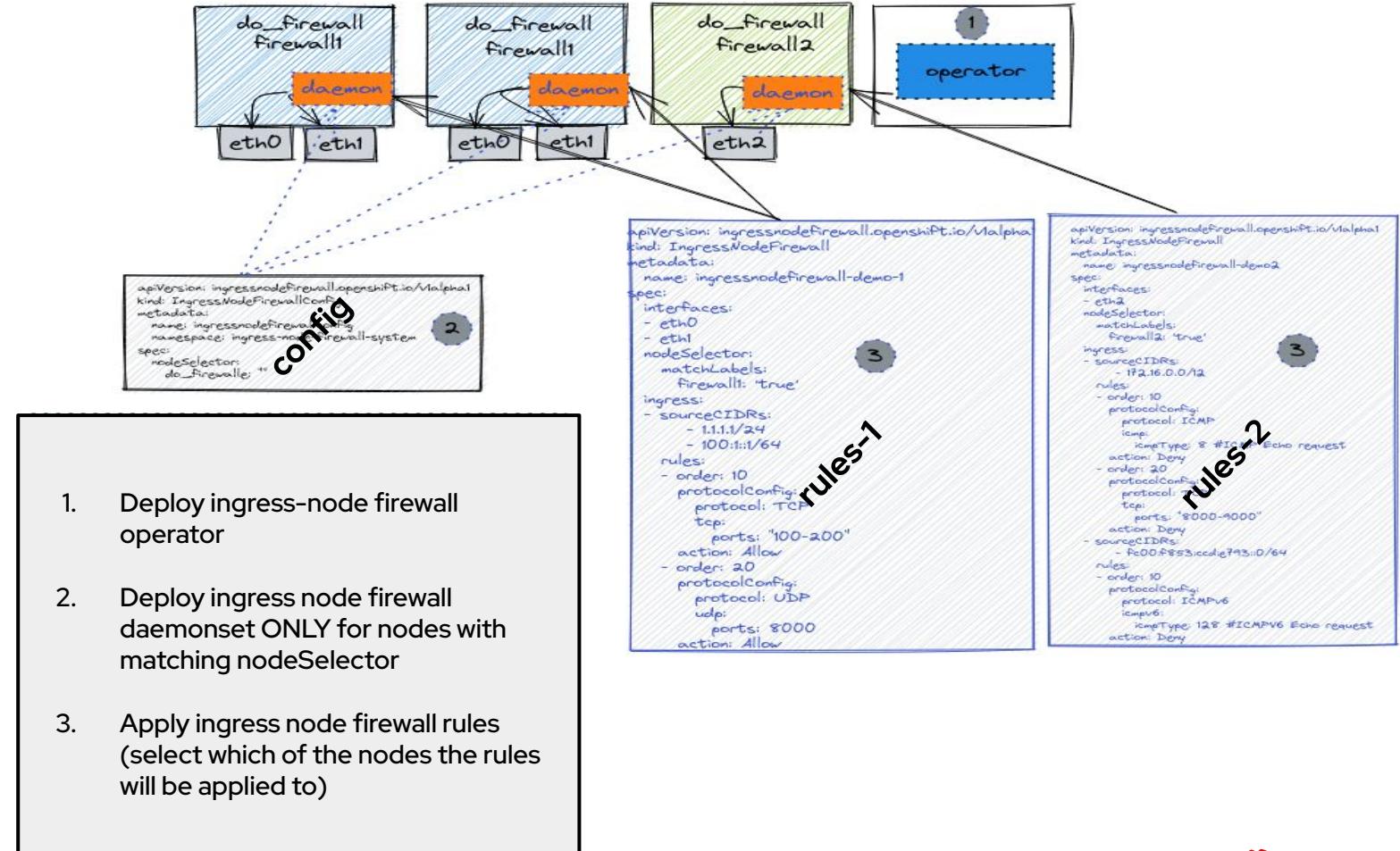


Networking & Routing

Stateless Node-Level Network Ingress Firewall

Security

- Tech Preview at 4.12
- Optional security-enhancing operator
- Implemented with XDP/eBPF for high performance
- To secure OCP nodes from external (e.g. DOS) attacks
- Admin configures specific stateless policies
- Stateful policy enhancement at 4.13 GA



Ingress Enhancements

Ingress Updates

Configurable DNS Management for LoadBalancerService Ingress Controllers

This feature also allows seamless transition between "Managed" and "Unmanaged" DNS management policies.

```
apiVersion: operator.openshift.io/v1
kind: IngressController
metadata:
  namespace: openshift-ingress-operator
  name: <name>
spec:
  domain: <domain>
  endpointPublishingStrategy:
    type: LoadBalancerService
  loadBalancer:
    scope: External
  dnsManagementPolicy: Unmanaged
```

Ingress Updates

Ability to tune the caching done by CoreDNS

```
apiVersion: operator.openshift.io/v1
kind: DNS
metadata:
  name: default
spec:
  cache:
    successTTL: 1h
    denialTTL: 0.5h10m
```

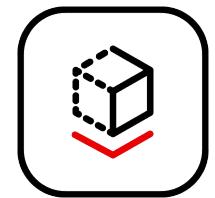
Ingress Controller Autoscaling

- Tech Preview 4.12
- Uses the Custom Metrics Autoscaler Operator [CMA]
- Dynamically scale based on metrics in your deployed cluster, eg Number of worker nodes

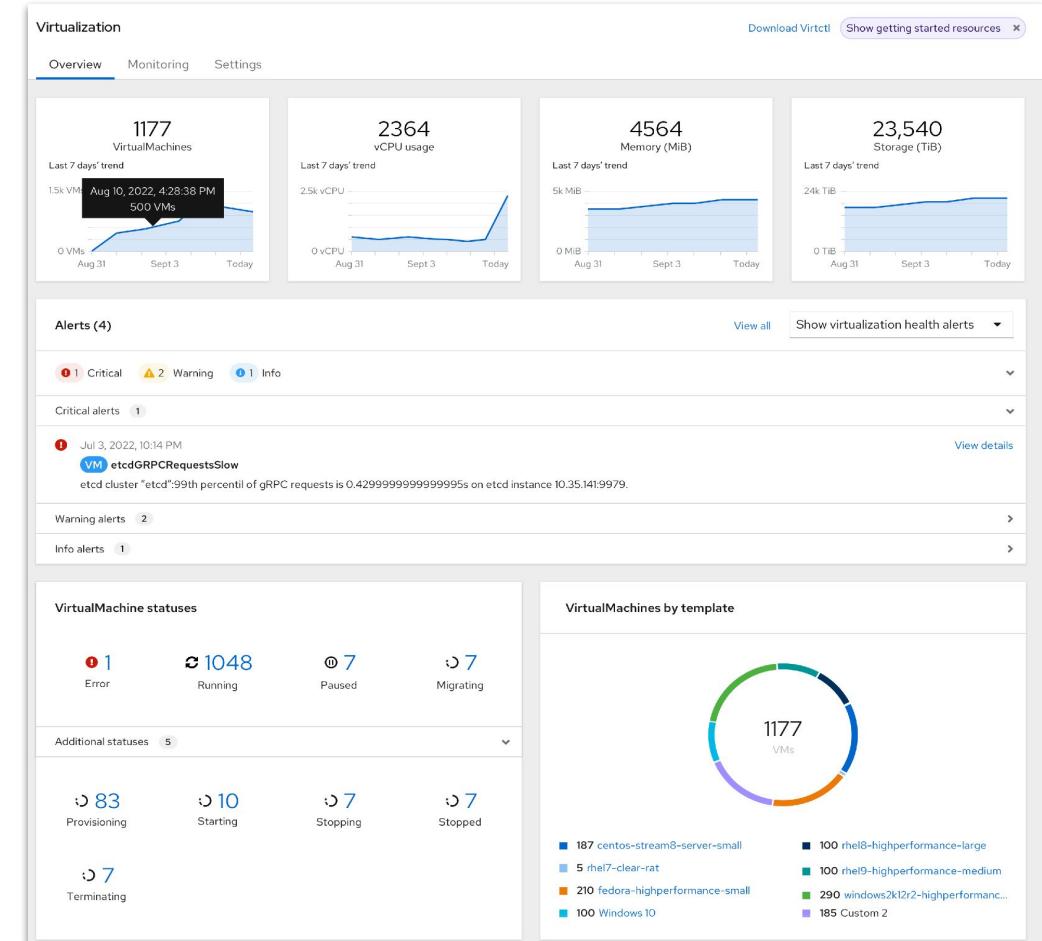
Virtualization

OpenShift Virtualization

Modernize workloads, bring VMs to Kubernetes



- ▶ Data Protection
 - Share and transfer VMs between clusters with raw VM export
- ▶ Administrator workflow improvements
 - At a Glance Status for Virtualization Overview
 - Tunnel SSH over the API
- ▶ Observability
 - Cluster and VM health monitoring enhancements
 - Reducing false alerts during upgrades
 - Easier configuration & monitoring with Live Migration page
- ▶ Load balancing through MetalLB
- ▶ Microsoft Windows Server 2022 and Windows 11 guest support
- ▶ Tekton Reference Pipeline for VMs (TP)
- ▶ CIDR-based network filtering CNI
- ▶ Better cluster density with OpenShift on OpenShift
 - Hosted Control Plane and KubeVirt provider (Dev Preview)
- ▶ Run Sandboxed containers on all footprints
 - Dev Preview of AWS



Specialized Workloads

Windows Workers



Windows Server 2022

The following table lists the [Windows Server Versions](#) that are supported by WMCO 7.0.0, based on the applicable platform.

Platforms	Windows Server Versions
Amazon Web Services (AWS)	Windows Server 2019 (version 1809)
Microsoft Azure	Windows Server 2019 (version 1809) Windows Server 2022 with the Windows KB5012637 patch .
VMware vSphere	Windows Server 2022 with the Windows KB5012637 patch .
Bare-metal or provider agnostic	Windows Server 2019 (version 1809) Windows Server 2022 with the Windows KB5012637 patch .
Google GCP NEW	Windows Server 2022 with the Windows KB5012637 patch.

Kernel Module Management (KMM) operator

- Day 2 operator to help partners enabling new hardware, examples: AI or Telco accelerators
- Upstream in Kubernetes sig-node
- Quick go to market enabler for partner accelerated solutions
- Can be used permanently, or for a transition period before the drivers get intree and inbox
- KMM builds, signs and loads kernel modules
- KMM can enable Device Plugins
- KMM supports loading device firmware corresponding to the kernel module
- Manages upgrades and life cycle
- KMM is replacing SRO
- KMM/DTK are GA, Hub and spoke support in Tech Preview
- Third party driver containers enabled by KMM are falling under the Third Party Support Policy

```

---
apiVersion: kmm.sigs.x-k8s.io/v1beta1
kind: Module
metadata:
  name: kmm-ci
spec:
  moduleLoader:
    container:
      modprobe:
        moduleName: kmm-ci
      kernelMappings:
        - literal: 4.18.0-372.19.1.el8_6.x86_64
          containerImage:
            image-registry.openshift-image-registry.svc:5000/default/kmm-kmod:4.18.0single
          build:
            dockerfileConfigMap:
              name: build-module-single
      selector:
        feature.kmm.lab: 'true'

```

Operator Framework

Simplified Operator Catalogs

Dev Preview



A new declarative approach to maintaining OLM catalogs is replacing the previous imperative CLI-based approach.

```

Schema: olm.semver
GenerateMajorChannels: true
GenerateMinorChannels: false
Fast:
  Bundles:
    - Image: quay.io/foo/olm:testoperator.v0.1.0
    - Image: quay.io/foo/olm:testoperator.v0.1.1
    - Image: quay.io/foo/olm:testoperator.v0.1.2
    - Image: quay.io/foo/olm:testoperator.v1.1.0
Stable:
  Bundles:
    - Image: quay.io/foo/olm:testoperator.v0.2.1
    - Image: quay.io/foo/olm:testoperator.v0.3.0
    - Image: quay.io/foo/olm:testoperator.v1.0.1
    - Image: quay.io/foo/olm:testoperator.v1.1.0
    - Image: quay.io/foo/olm:testoperator.v2.0.1
Candidate:
  Bundles:
    - Image: quay.io/foo/olm:testoperator.v1.0.1
  
```

\$ opm render...

The screenshot shows the Red Hat OpenShift Container Platform interface. At the top, it says "Red Hat OpenShift Container Platform". Below that is a navigation bar with "local-cluster" and "Administrator". The main area is titled "Install Operator" with the sub-section "Operator Installation". It has fields for "Update channel" (radio buttons for fast-v0.x, fast-v1.x, stable-v0.x, stable-v1.x, stable-v2.x, candidate-v1.x, with stable-v2.x selected) and "Installation mode" (radio buttons for All namespaces on the cluster (default) and A specific namespace on the cluster, with A specific namespace on the cluster selected). The bottom of the screenshot shows the "OperatorHub" section of the navigation bar.

✓ A single, human-friendly YAML file per operator

✓ Can automatically create update paths

✓ Easily add new releases

✓ Auto-creates channels

✓ No more "replaces", "skips", or "skipRange"

✓ Simple to embed in CI, one command

✓ Easier to read than low-level file-based catalogs

Storage

OpenShift Storage - Journey to CSI

- CSI Operators - plugable, built-in upgrade, storage integration
 - GCE Filestore (**TP**)
 - NFS Protocol
 - No default Storage Class deployed
- CSI Migration in 4.12
 - AWS EBS (**GA**)
 - GCE PD (**GA**)
- CSI Migration
 - No data migration
 - Translate calls to CSI on the fly
 - Transparent & enabled by default when GA
 - CSI storage class is default for new clusters
 - For upgraded clusters, the default SC is not changed
 - Recommended to set the CSI SC as default

CSI Operators		
Operator target	Migration	Driver
AliCloud Disk	n/a	GA
AWS EBS	GA	GA
AWS EFS	n/a	GA
Azure Disk	GA	GA
Azure File	Tech Preview	GA
Azure Stack Hub	n/a	GA
GCE Disk	GA	GA
GCE Filestore	n/a	Tech Preview
IBM Cloud	n/a	GA
RH-OSP Cinder	GA	GA
vSphere	Tech Preview	GA

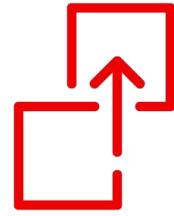


OCP 4.12 vSphere storage requirements



vSphere >= v7.0.2

CSI migration (4.13) requires
>= 7.0.2 make sure you
upgrade vSphere **before**
upgrading to OCP 4.13



Third Party CSI

OCP can't run two versions of
the same CSI driver at the
same time.

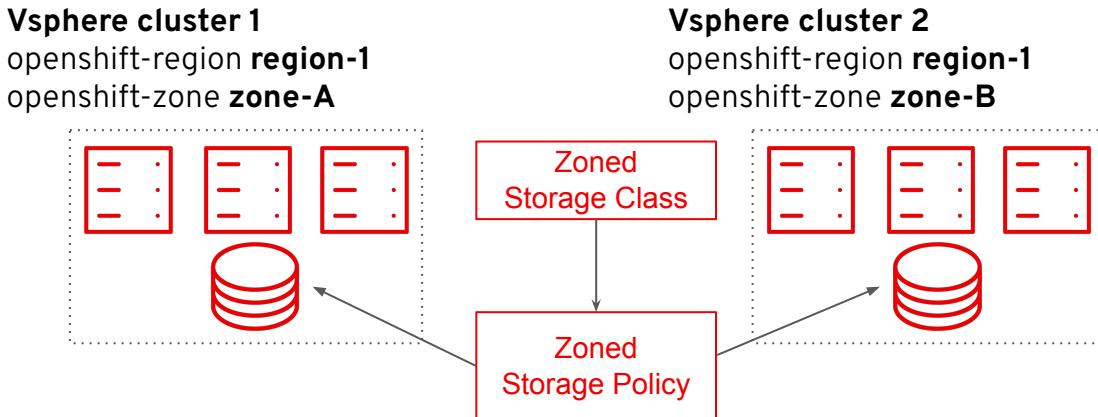
If another vSphere CSI driver is
present, remove it from the
cluster **before** upgrading to
4.13.

(Red Hat vSphere CSI installation will
automatically resume with no dataplane
downtime nor dataloss)

OCP 4.12 clusters that don't meet these requirements **will be marked unupgradable**.

OpenShift Storage - vSphere CSI topology awareness

- Support for vSphere CSI topology
- Define zones across compute clusters
- Store PVs into same datastore zone as the worker
- Day2 manual configuration
 - IPI native support targeted for 4.13



```
kind: ClusterCSIDriver
apiVersion: operator.openshift.io/v1
metadata:
  name: csi.vsphere.vmware.com
spec:
  ...
  driverConfig:
    driverType: vSphere
    vSphere:
      topologyCategories:
        - openshift-zone
        - openshift-region
```

```
kind: StorageClass
allowVolumeExpansion: true
apiVersion: storage.k8s.io/v1
metadata:
  name: zoned-sc
parameters:
  StoragePolicyName: zoned-storage-policy
provisioner: csi.vsphere.vmware.com
reclaimPolicy: Delete
volumeBindingMode: WaitForFirstConsumer
```

LVM Storage - Storage for Single Node OpenShift

- Logical Volume Manager Storage - LVM Storage - LVMS
- thin provisioning, snapshots and clone, backed by LVM logical volumes.
- Block and File storage
- Install via ACM or Operator Hub
- GA with V4.12 for Single Node OpenShift
- Old pre-GA Name: ODF-LVM, LVMO (**new install necessary, no upgrade path from ODF-LVM**).

```
# oc get pv
NAME          CAPACITY   ACCESS MODES  RECLAIM POLICY  STATUS    CLAIM           STORAGECLASS  REASON  AGE
pvc-8e290380-81e9-470c-853c-c3bc79b0d982  1Gi        RWO          Delete       Bound    default/my-lv-pvc  lvms-vg1      15s
```

```
# lvs
LV            VG Attr  LSize Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
6ba8c776-3ec2-49d4-b125-1a8000cb28e5  vg1 -wi-ao--- 1.00g
```

```
sh-4.4# lsblk
NAME      MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda        8:0    0 120G  0 disk
|-sda1     8:1    0   1M  0 part
|-sda2     8:2    0 127M  0 part
|-sda3     8:3    0 384M  0 part /boot
`-sda4     8:4    0 119.5G 0 part /sysroot
sdc        8:32   0   50G  0 disk
`-vg1-6ba8c776--3ec2--49d4--b125--1a8000cb28e5
              253:0   0   1G  0 lvm
/var/lib/kubelet/pods/4d2f39c2-75bc-4a09-b226-4937a7357913/volumes/kubernetes.io~csi/pvc-8e290380-81e9-470c-853c-c3bc79b0d982/mount
```

OpenShift Data Foundation 4.12 updates

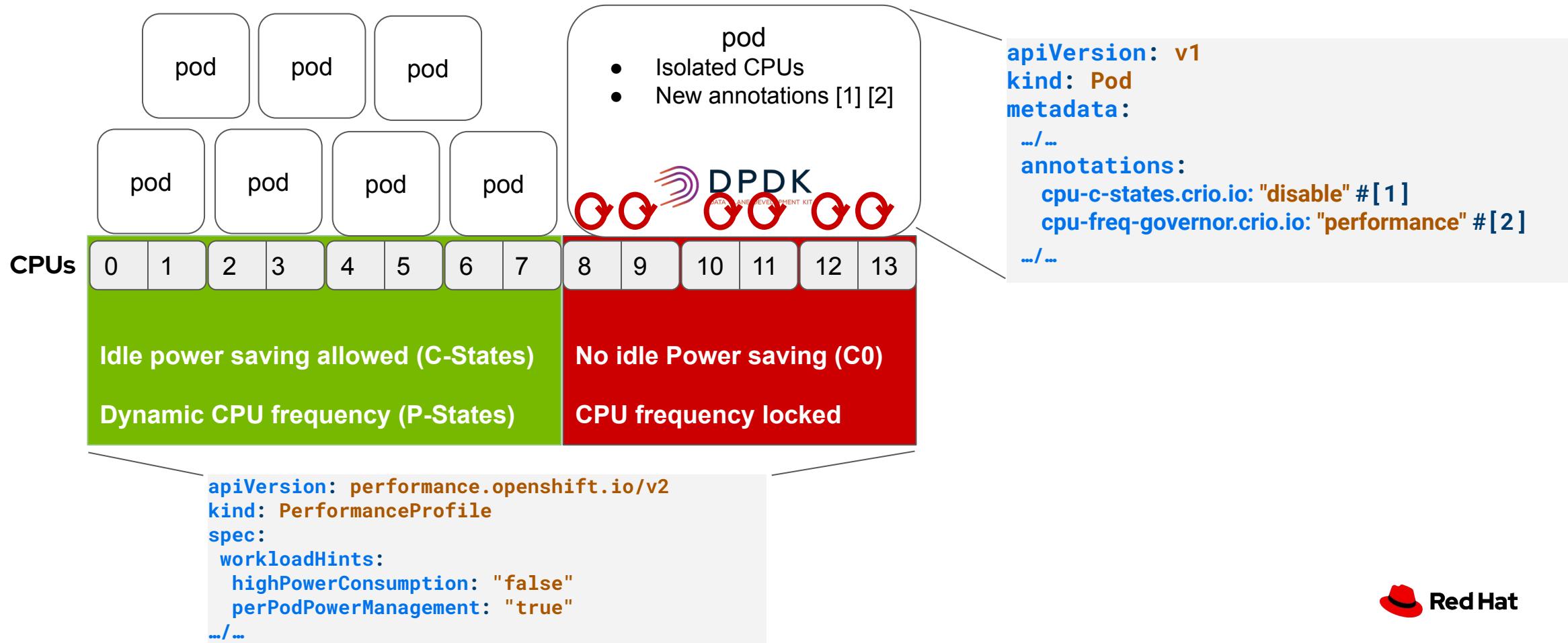
- Data Resiliency
 - Metro DR with ACM 2.7 (GA)
 - Regional DR with ACM UI (TP)
 - Regional DR for CephFS (TP)
- Security
 - KMS support for vendors using KMIP
- IPv6 single stack (GA)
- Dev Preview
 - Ephemeral volumes
 - Non resilient storage class

Out of the box support	
Block, File, Object	
Platforms	
AWS/Azure	Google Cloud (Tech Preview)
RHV	OSP (Tech Preview)
Bare metal/IBM Z/Power	VMWare Thin/Thick IPI/UPI
ARO - Self managed OCS	IBM ROKS & Satellite - Managed ODF (GA)
ROSA - Managed ODF (Limited availability, GA in OCT 2022)	
Deployment modes	
Disconnected environment and Proxied environments	

Telco 5G

Per-core runtime tuning of CPU power states

PerformanceProfile driving tuned & crio



Factory Pre-Staging for Optimizing New Installations

Increase the velocity of RAN deployments on Single-Node OpenShift

Benefit

- Decrease SNO installation time by reducing data needed to be downloaded when Zero Touch Provisioning.

Process

- At Factory: Use pre-staging tool to pre-populate storage partition with OpenShift installation artefacts.
- At Far Edge Site: Rack, Cable and Power On Server.
- At ACM Hub Cluster: Connect to SNO and initiate ZTP (via GitOps)
- At Far Edge Site: Installation process utilizes pre-staged installation artefacts instead of downloading payload.

Thank you for joining!

Guided demos of
new features
on a real cluster

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