Red Hat
Advanced Cluster Management
for Kubernetes

Techtalk: Next Generation Datacenter (NGDC)

Management

Robert Baumgartner
Senior Solution Architect
Red Hat Austria

Red Hat

Ablauf Webinarreihe

Overview: Das Next Generation Datacenter mit Red Hat gestalten
Franz Theisen
19.8.2022, 11.00 - 12.00 CEST

Compute: Virtualisierung und Container auf einer Platform
Domenico Piol
26.8.2022, 11.00 - 12.00 CEST

Management
Robert Baumgartner
2.9.2022, 11:00-12.00 CEST

Storage: MultiCloud, Unified, Converged oder klassisch
Matthias Rettl
9.9.2022, 11:00-12.00 CEST

Networking & Security
Robert Bohne
16.9.2022, 11:00-12.00 CEST

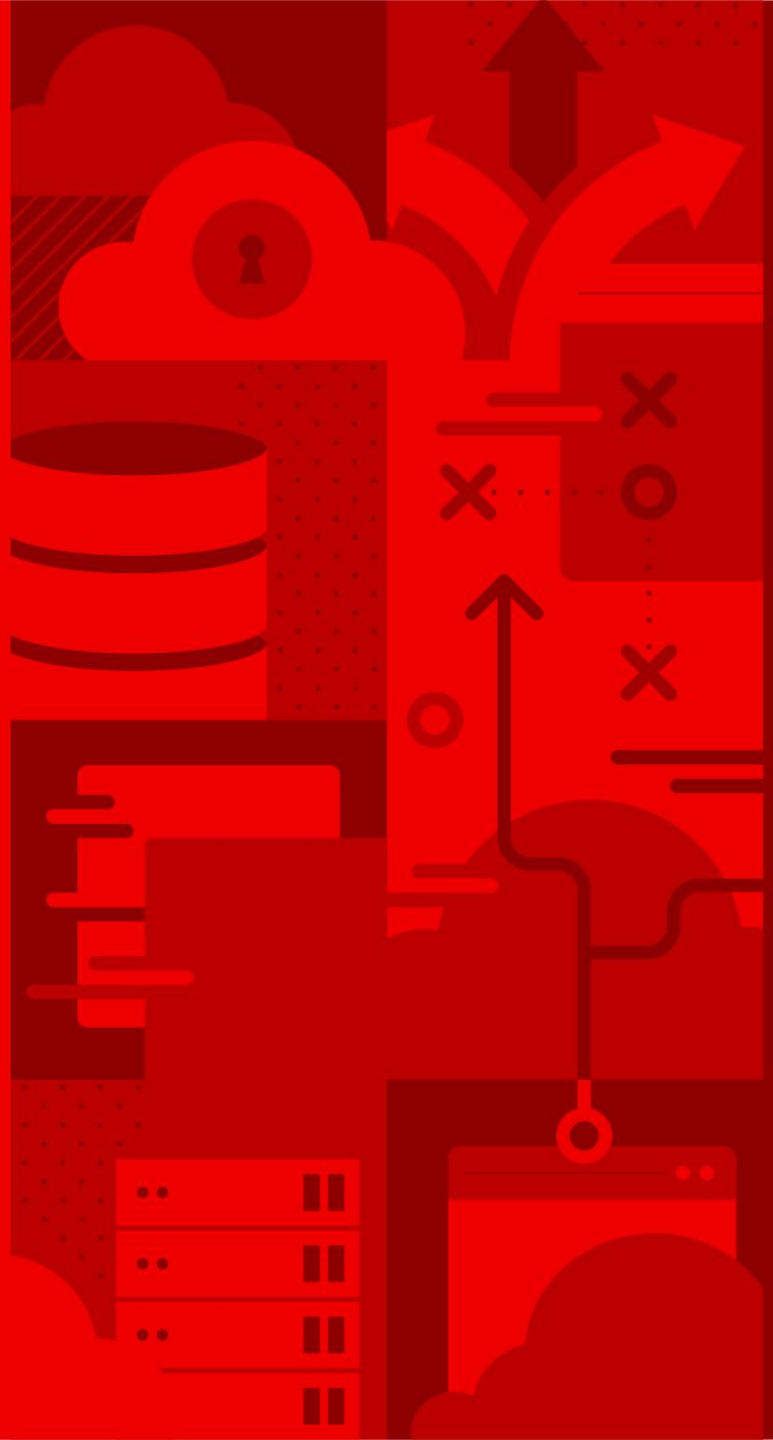
Anmeldung:

https://red.ht/3STjQg3

Agenda

- Market Trends and Challenges
- Key Personas
- Introducing Red Hat Advanced Cluster Management for Kubernetes
- Detailed Use Cases
- Architecture
- Q & A
- Resources and Next Steps

Red Hat



Market Trends and Challenges

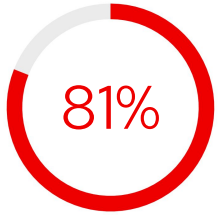
Hybrid multicloud management is really hard

As organizations deploy more across multiple clouds, new challenges arise.

- **Difficult and error prone** to manage at scale
- **Inconsistent security controls** across environments
- **Overwhelming to verify** components, configurations, policies, and compliance

IDC Survey of 200 US-based $1B companies actively using two or more "infrastructure clouds" for production applications

Using multiple infrastructure clouds*

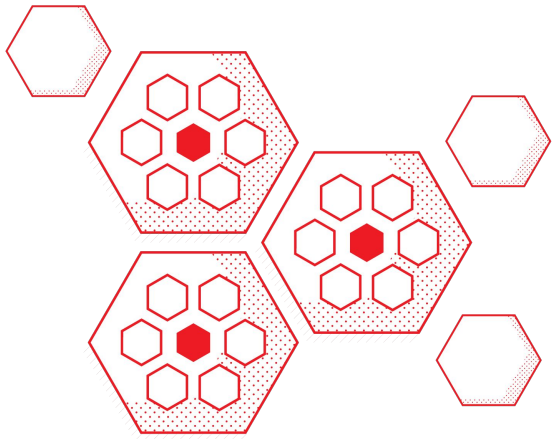


Using multiple public clouds and one or more private/dedicated clouds*

Source:
IDC Multicloud Management Survey, 2019: Special Study, Doc # US45020919, April 2019
*IDC Survey of 200 US-based $1B companies actively using two or more "infrastructure clouds" for production applications

Red Hat

Kubernetes adoption leads to multicluster



"As Kubernetes gains adoption across the industry, scenarios are arising in which I&O teams are finding they must deploy and manage multiple clusters, either in a single region on-premises or in the cloud, or across multiple regions... for a number of reasons, including multi-tenancy, disaster recovery, and with hybrid, multicloud, or edge deployments."

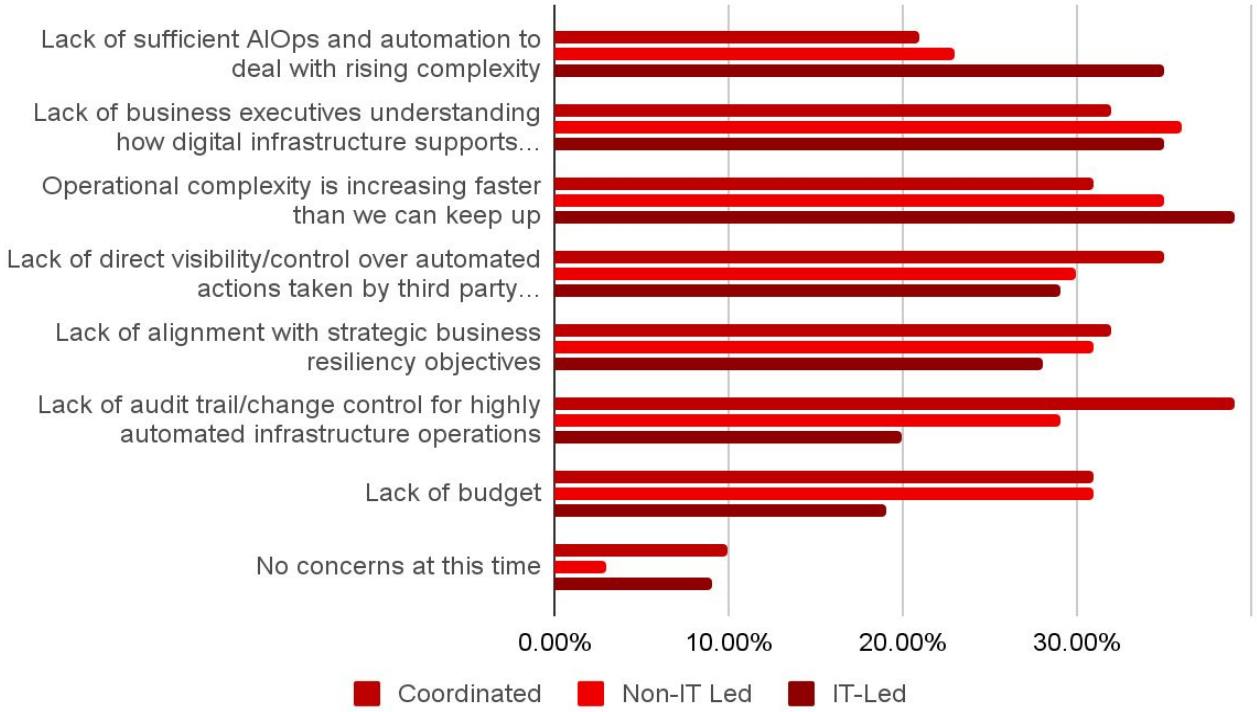
Source:
Assessing Patterns for Deploying Distributed Kubernetes Clusters doc # G00465217, by Tony Iams

Red Hat

Digital infrastructure concerns are around automation

Smaller, IT-Led organizations are concerned about lack of automation and AIOps while larger, more collaborative organizations are more concerned about lack of change control and limited business executive understanding of how digital infrastructure supports business resiliency

What are the greatest concerns regarding organizations' overall digital infrastructure strategy being able to fully support business resiliency plans?



Source:
Future of Digital Infrastructure Agenda Q2 Survey 2021, IDC, June, 2021. n = 254 US decision makers.

Red Hat

Remote container clusters are becoming modern-day LAN servers

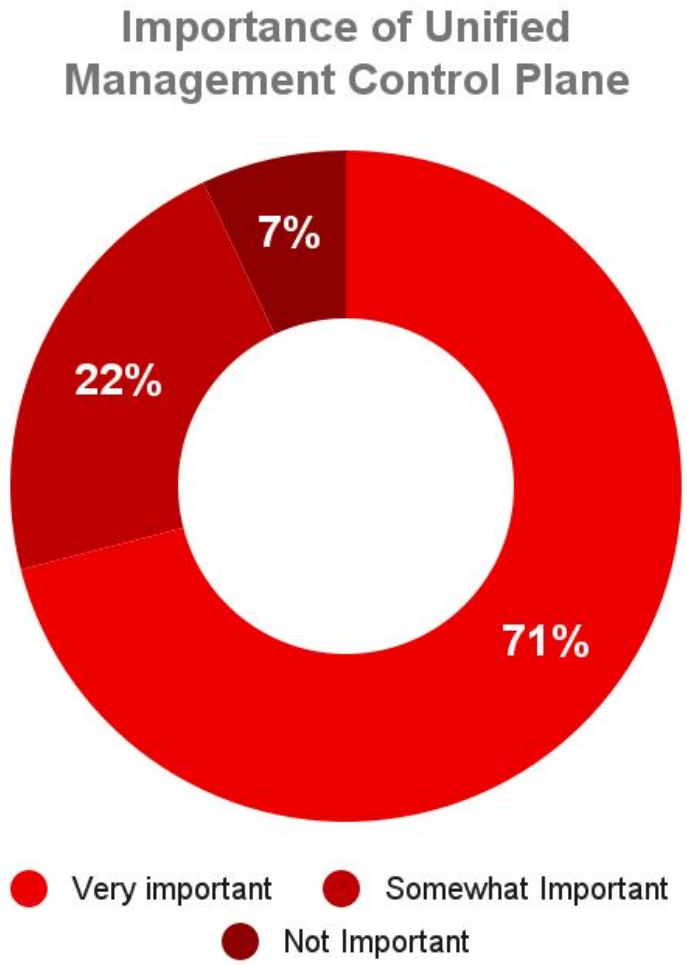
In many ways, remote container clusters are becoming modern-day LAN servers, which requires tooling for managing the distributed clusters.

Software and service providers are differentiating their offerings by providing more complete solutions, adding capabilities such as

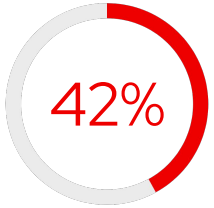
- **Distributed management of multiple clusters**
- **Application lifecycle integration**
- **Policy management**
- **Monitoring and security to the foundational container orchestration capabilities**

Source:
Market Guide for Container Management, Gartner, 2021.

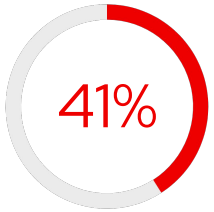
Unified, consistent, autonomous operations priorities



*Most important reasons organizations need a unified management control plane for all digital infrastructure resource is to



Improve data integration and data protection



Optimize infrastructure costs and usage

*Source:
Future of Digital Infrastructure Agenda Q2 Survey 2021, IDC, June, 2021. n = 254 US decision makers.

Red Hat

Where is the growth in cluster deployments?

Small Scale Dev Teams

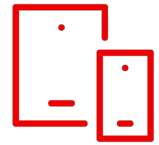
- Managing and syncing across Dev/QE/Pre-Prod/Prod clusters can be difficult

Medium Scaled Organizations

- Retail with small clusters across 100s of locations
- Organizations with plan for growth 10-15 clusters moving to 100s

Large scale

- Global organizations with 100s of clusters, hosting thousand of applications
- Large Retail with 1000s of stores



Edge scale / Telco

- 100s of zones, 1000s of clusters and nodes across complex and air-gapped topologies

Reasons for deploying clusters

Application availability

Reduced latency

Address industry standards

Geopolitical data residency guidelines

Disaster recovery

Edge deployments

CapEx cost reduction

Avoid vendor lock-in

Red Hat

Multicluster management challenges

How do I normalize and centralize key functions across environments?

Management requirements

Centralized operations

Build and deploy a containerized app

- Easy cluster provisioning
- Controlling cluster configuration drift
- Ensuring app deployment from development to production

DevOps

Develop, test, and produce clusters

- Consistent cluster provisioning
- Policy enforcement and governance across development, test, and production clusters
- Finding/modifying resources across clusters

Hybrid multicloud

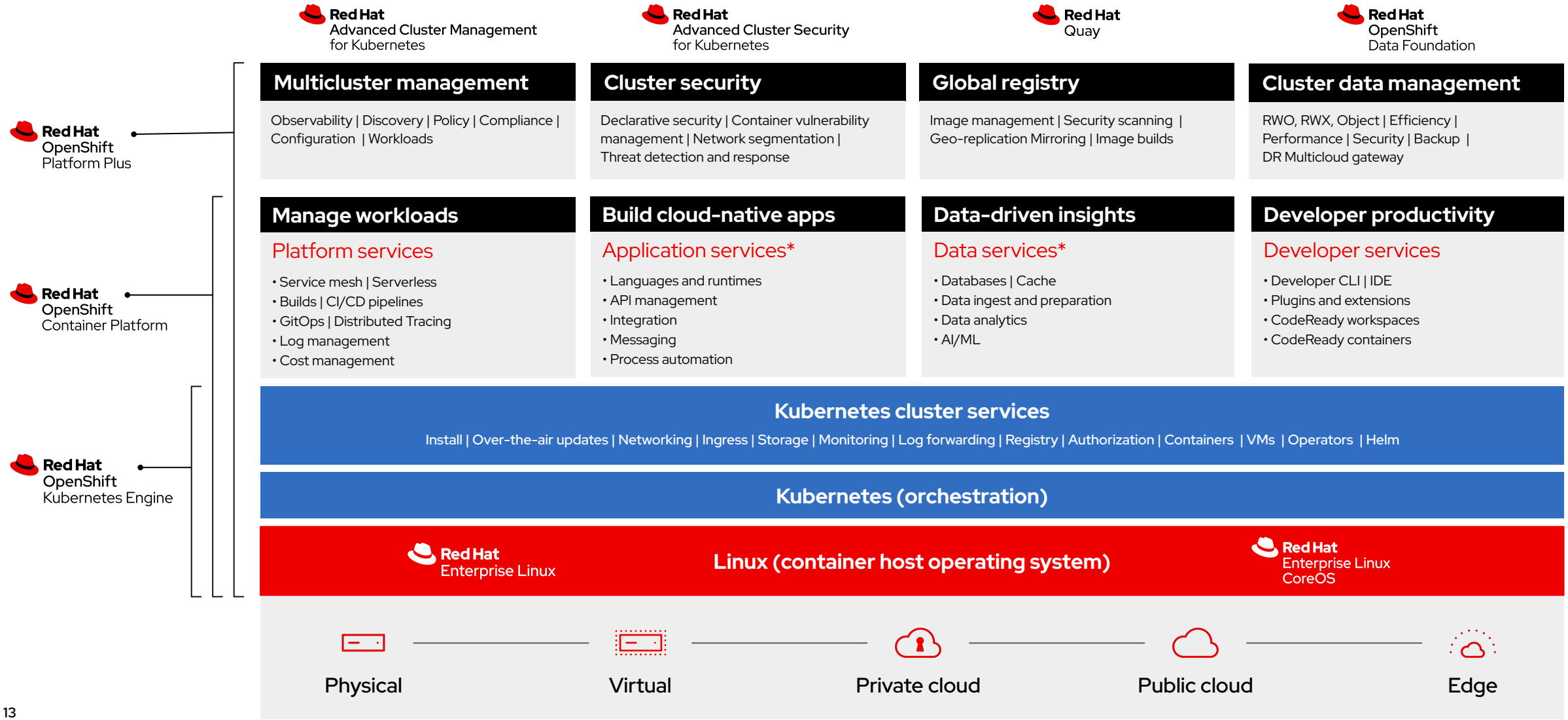
Automated clusters deployed across public, private clouds, edge, in different geographies

- Automated cluster creation with zero touch provisioning
- Single pane of glass visibility
- Deploying and distributing applications at scale
- Auditing and compliance

Single cluster | Multicluster growth | Distributed multicluster

Red Hat

Red Hat open hybrid cloud platform

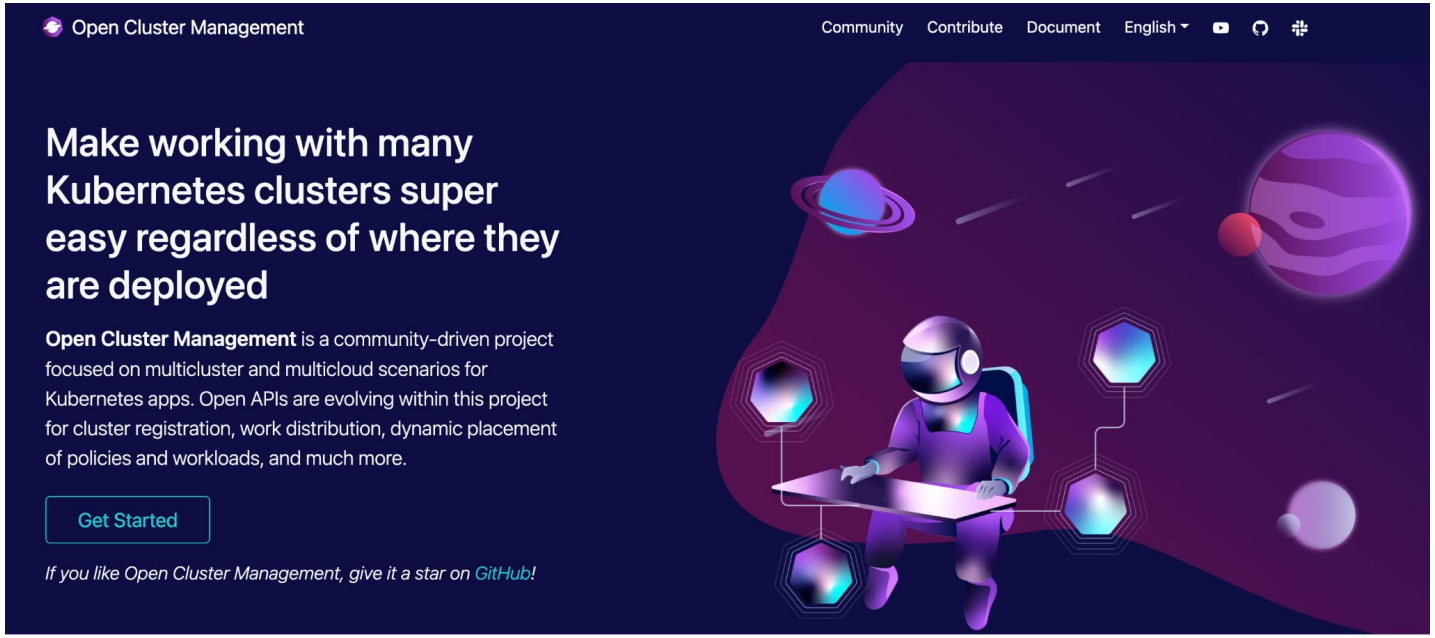


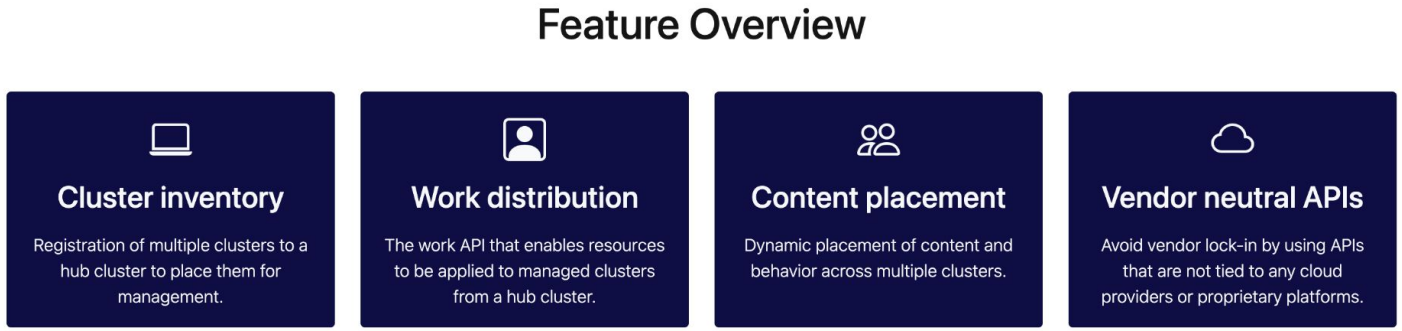
* Red Hat OpenShift® includes supported runtimes for popular languages/frameworks/databases. Additional capabilities listed are from the Red Hat Application Services and Red Hat Data Services portfolios.

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

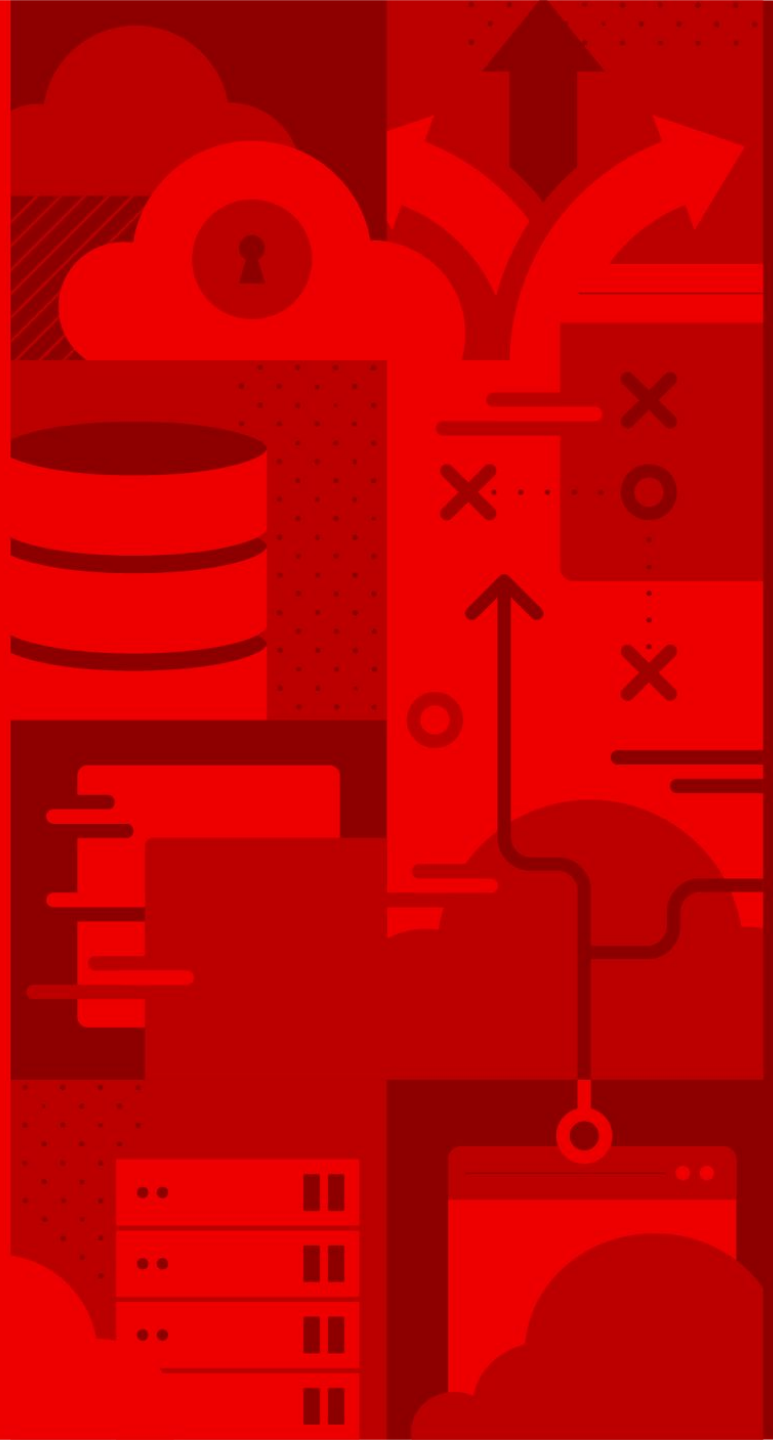
Open Source Commitment

- Open Cluster Management has been accepted as a CNCF Sandbox
  - https://www.cncf.io/projects/open-cluster-management/
- Collaboration in Key Kubernetes Special Interest Groups
  - Sig-MultiCluster
  - Sig-Application
  - Sig-Policy
- Growing together with support from partners and contributors
  - Ant Group
  - Alibaba
  - Tencent
  - Microsoft **



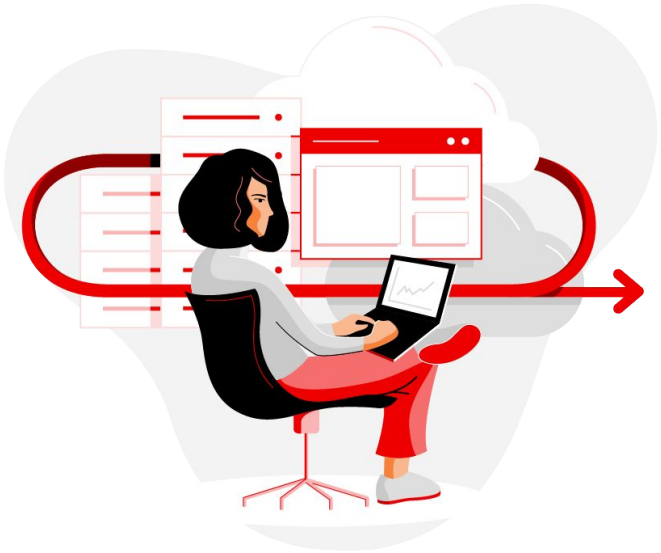


Red Hat



Key Personas

IT Operations



"How can I manage the lifecycle of multiple clusters regardless of where they reside using a single control plane?"

"How can I quickly get to the root cause of failed components?"

"How do I monitor usage across multiple clouds?"

Louise Mar
Senior IT Ops, Acme Unlimited

SRE/DevOps

"How do I get a simplified understanding of my cluster health and the impact on my application availability?"

"How do I automate provisioning and destroying of my clusters, workload placement based on capacity and policies, and the pushing of application from dev to prod?"

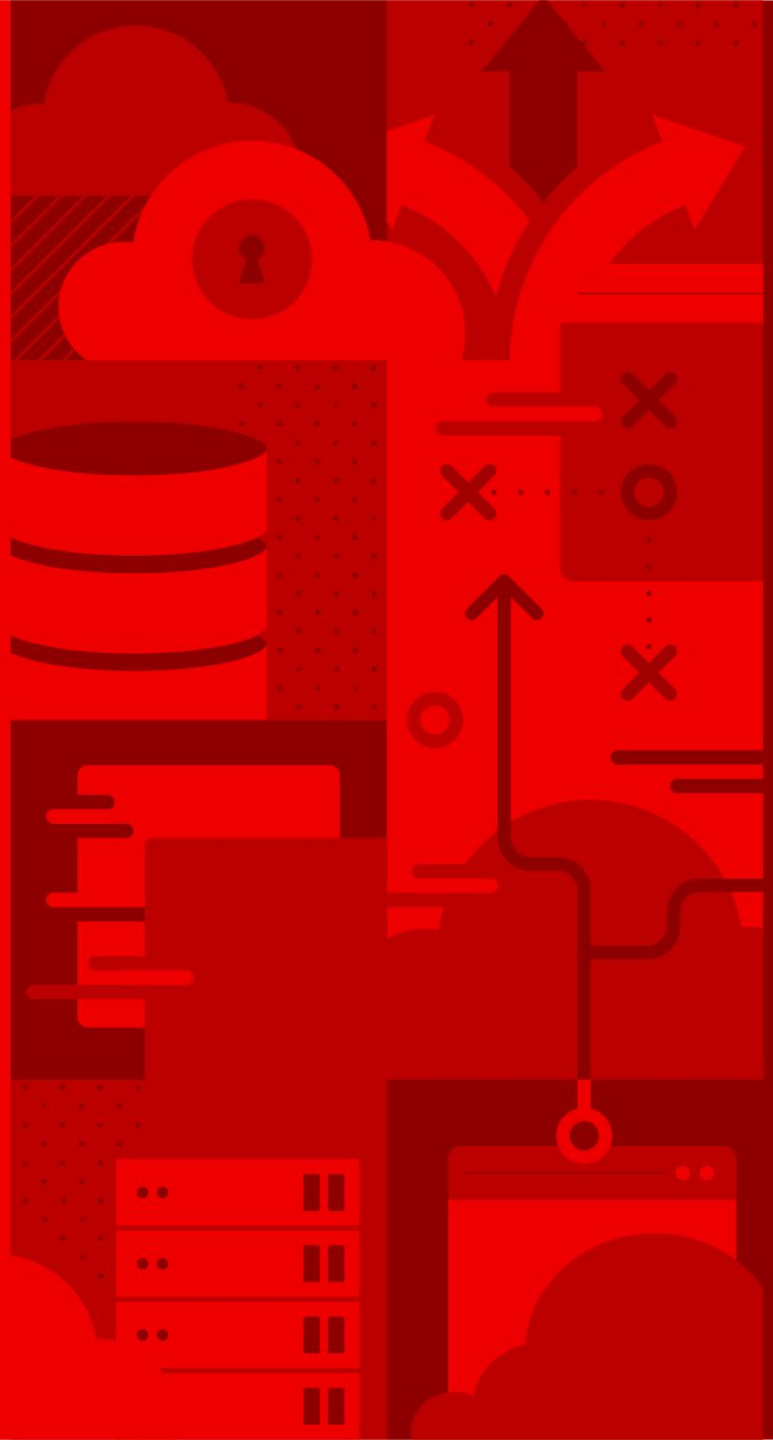
Clete Liedl
Senior DevOps Engineer, Acme Unlimited

SecOps

"How do I ensure all my clusters are compliant with my defined policies?"
"How do I set consistent security policies across diverse environments and ensure enforcement?"
"How do I get alerted on any configuration drift and remediate it?"

Jay Schefter
Senior Security Engineer, Acme Unlimited

Red Hat Advanced Cluster Management for Kubernetes



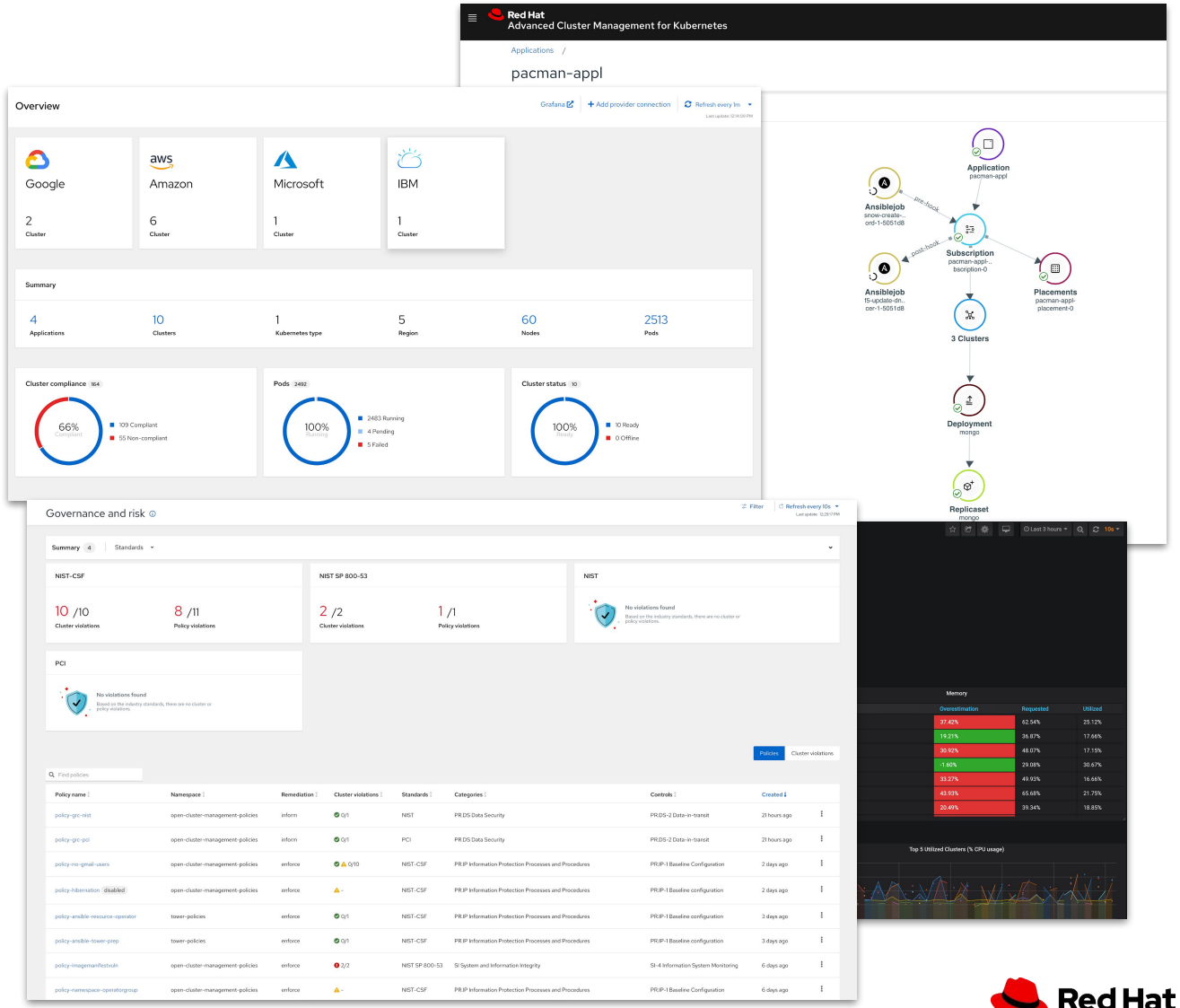
Introducing Red Hat Advanced Cluster Management For Kubernetes

Red Hat

Robust. Proven. Award winning.

End-to-end automation with Red Hat Ansible Automation Platform integration

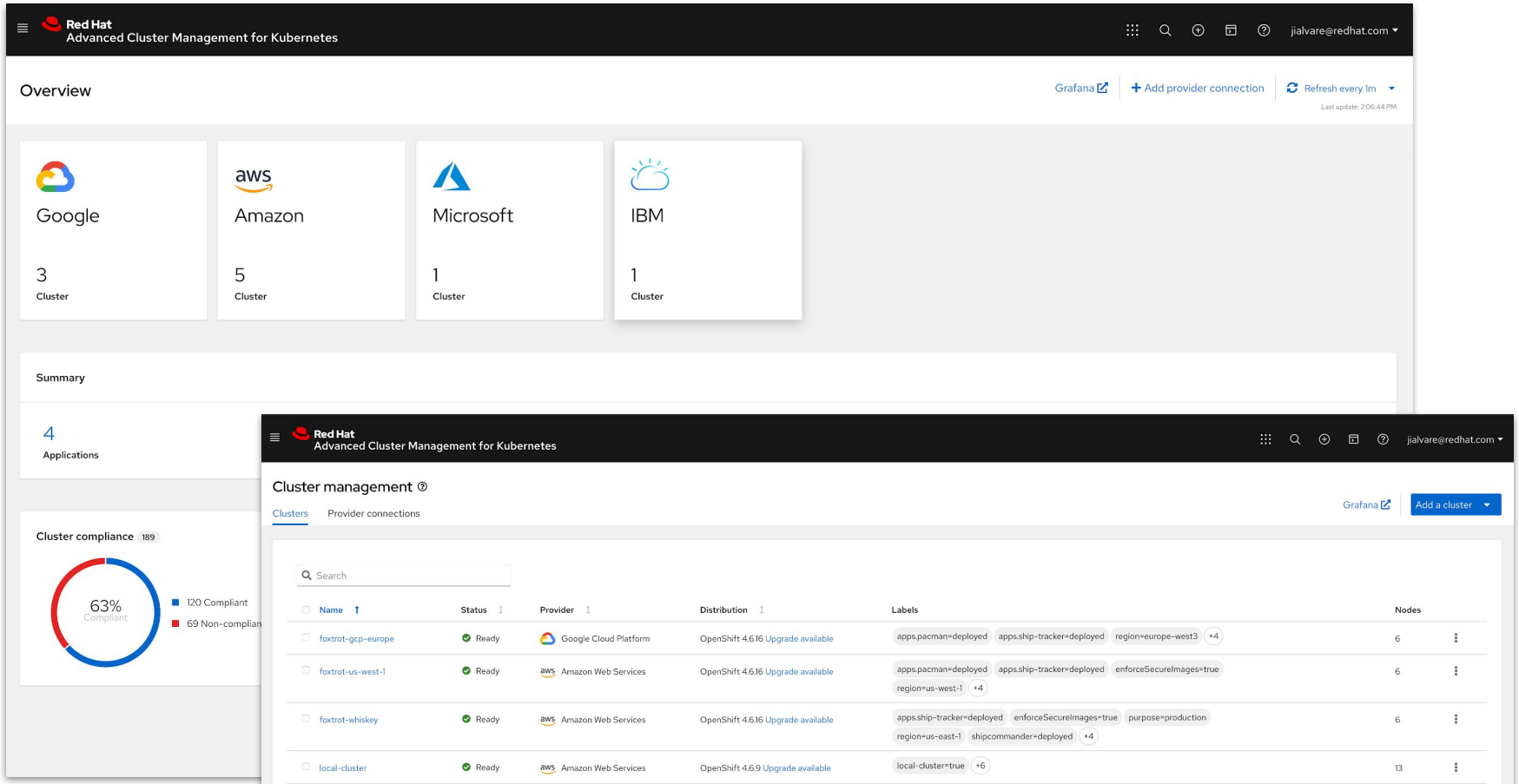
- Multicluster lifecycle management
- Policy driven governance, risk, and compliance
- Advanced application lifecycle management
- Multicluster observability for health and optimization
- Multicluster networking for interconnecting

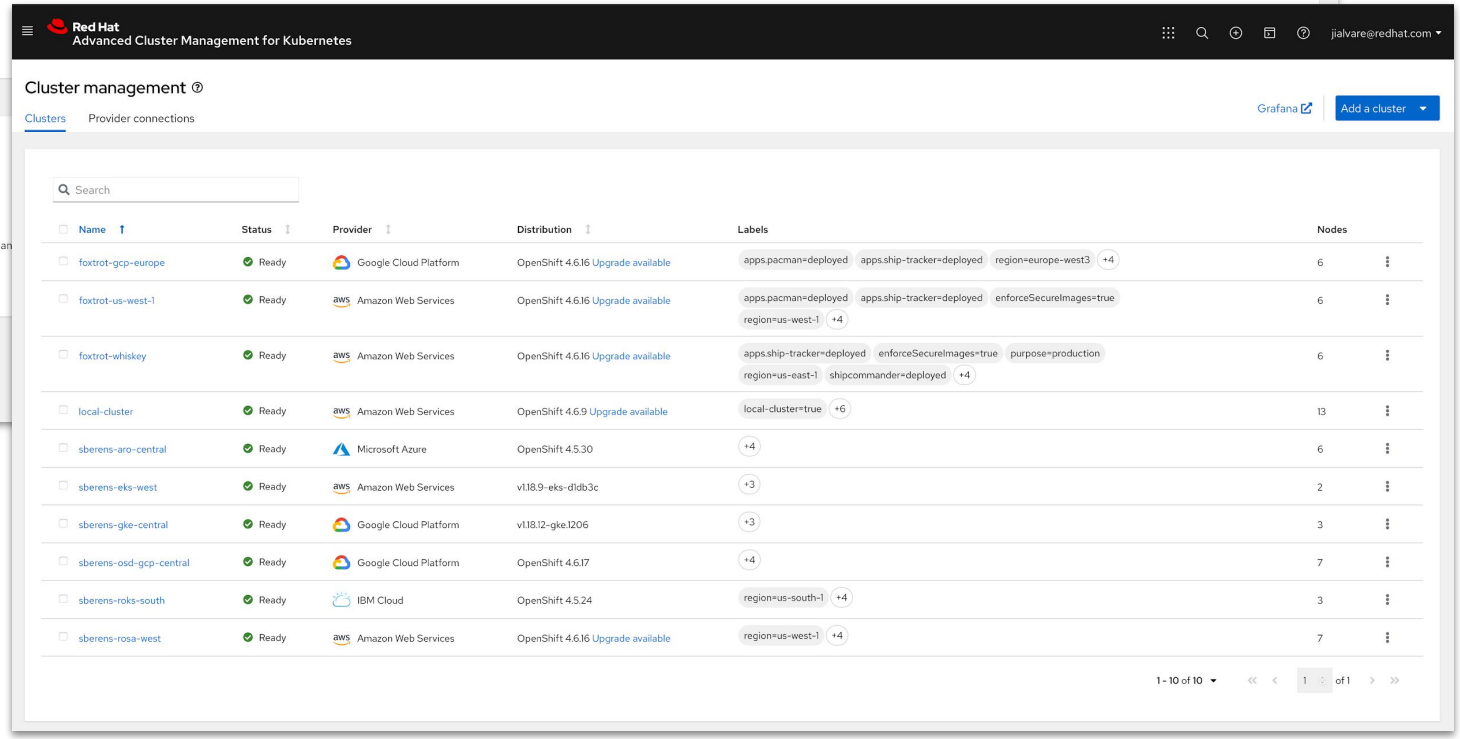


Red Hat

Unified Multi Cluster Management

Single Management for all your Kubernetes Clusters



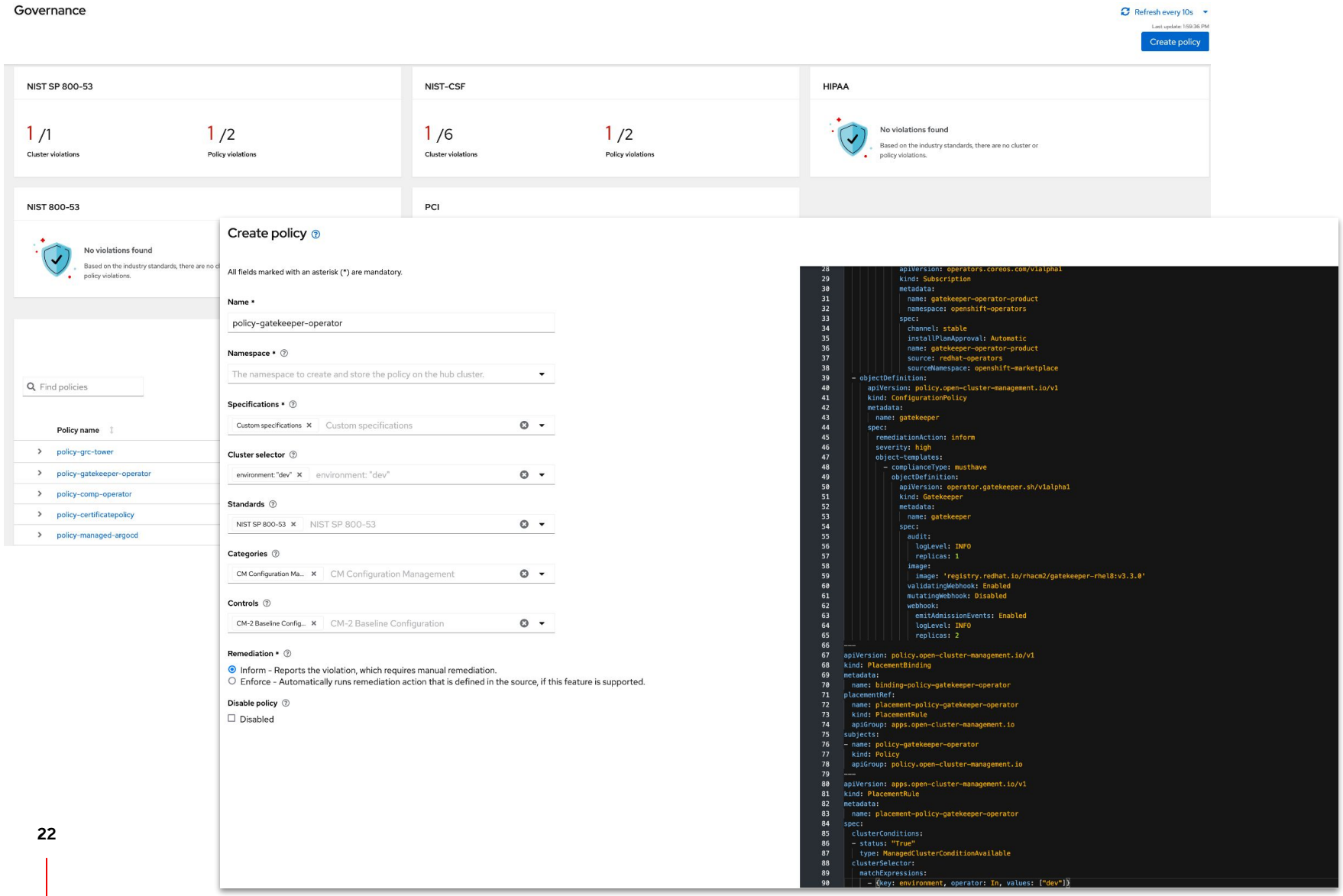


- **Centrally** create, update and delete Kubernetes clusters **across multiple** private and public clouds
- **Hibernate / Resume** OCP Clusters across your domain
- **Configure Cluster Sets & Cluster Pools** for simplified OCP cluster management
- Search, find and modify **any** kubernetes resource across the **entire** domain
- **Quickly** troubleshoot and resolve issues across your **federated** domain

Red Hat

Policy based Governance, Risk, and Compliance

Don’t wait for your security team to tap you on the shoulder

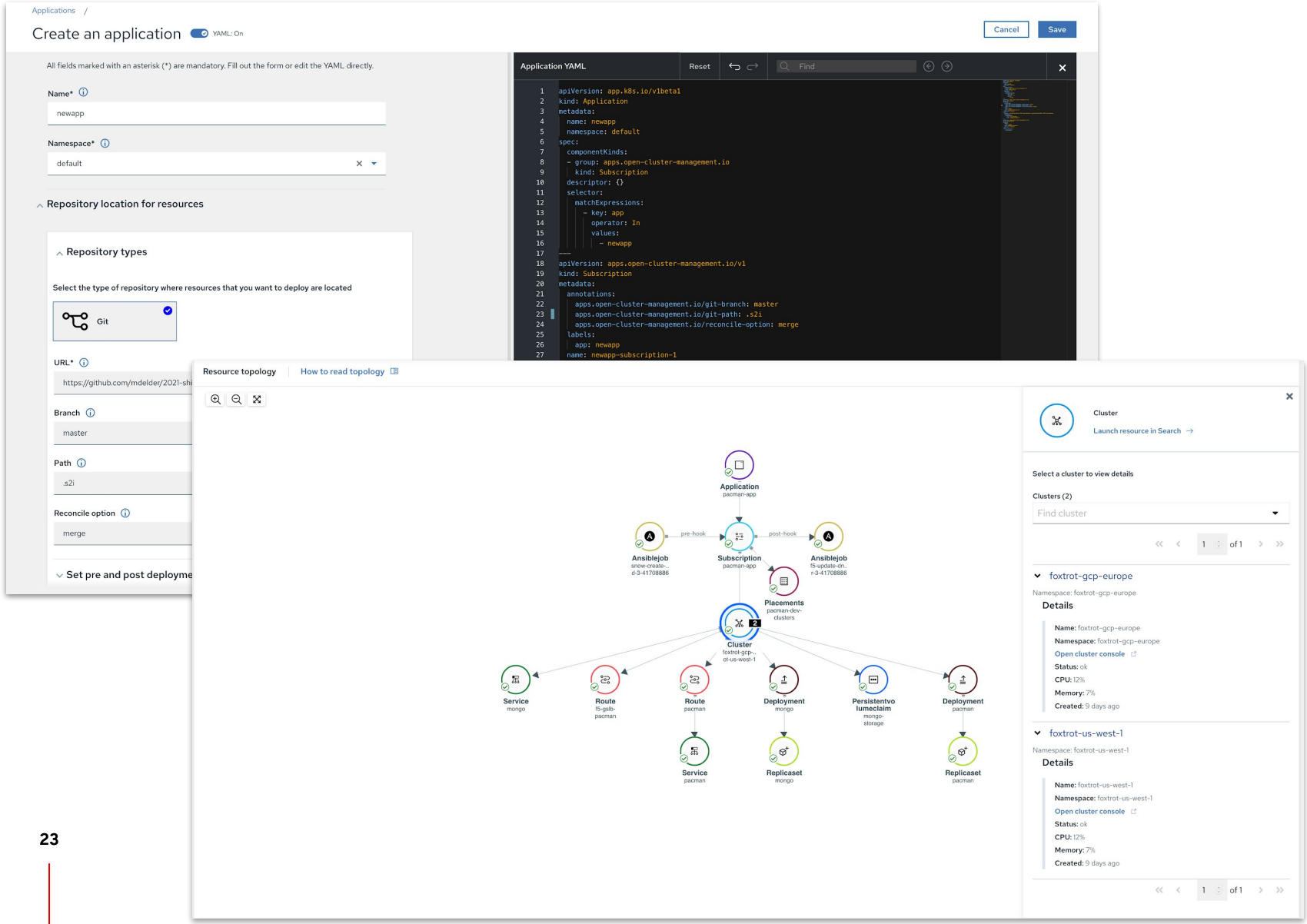


- **Centrally** set & enforce policies for security, applications, & infrastructure
- Quickly **visualize** detailed **auditing** on configuration of apps and clusters
- Perform remediation actions by leveraging **Ansible Automation Platform** integration.
- Built-in **compliance policies** and audit checks, including **GitOps** Integration.
- **Immediate** visibility into your compliance posture based on **your** defined standards

Red Hat

Advanced Application Lifecycle Management

Simplify your Application Lifecycle



- **Easily** deploy an Application using the **Application Builder**
- Deploy Applications from **Multiple** Sources (GIT / HELM / Object Storage)
- Integrate with **OpenShift GitOps** (Argo CD).
- Automatically **detect and visualize Argo CD** Applications in RHACM
- Quickly **visualize** application relationships **across** clusters and those that **span** clusters

Red Hat

Multicluster Observability

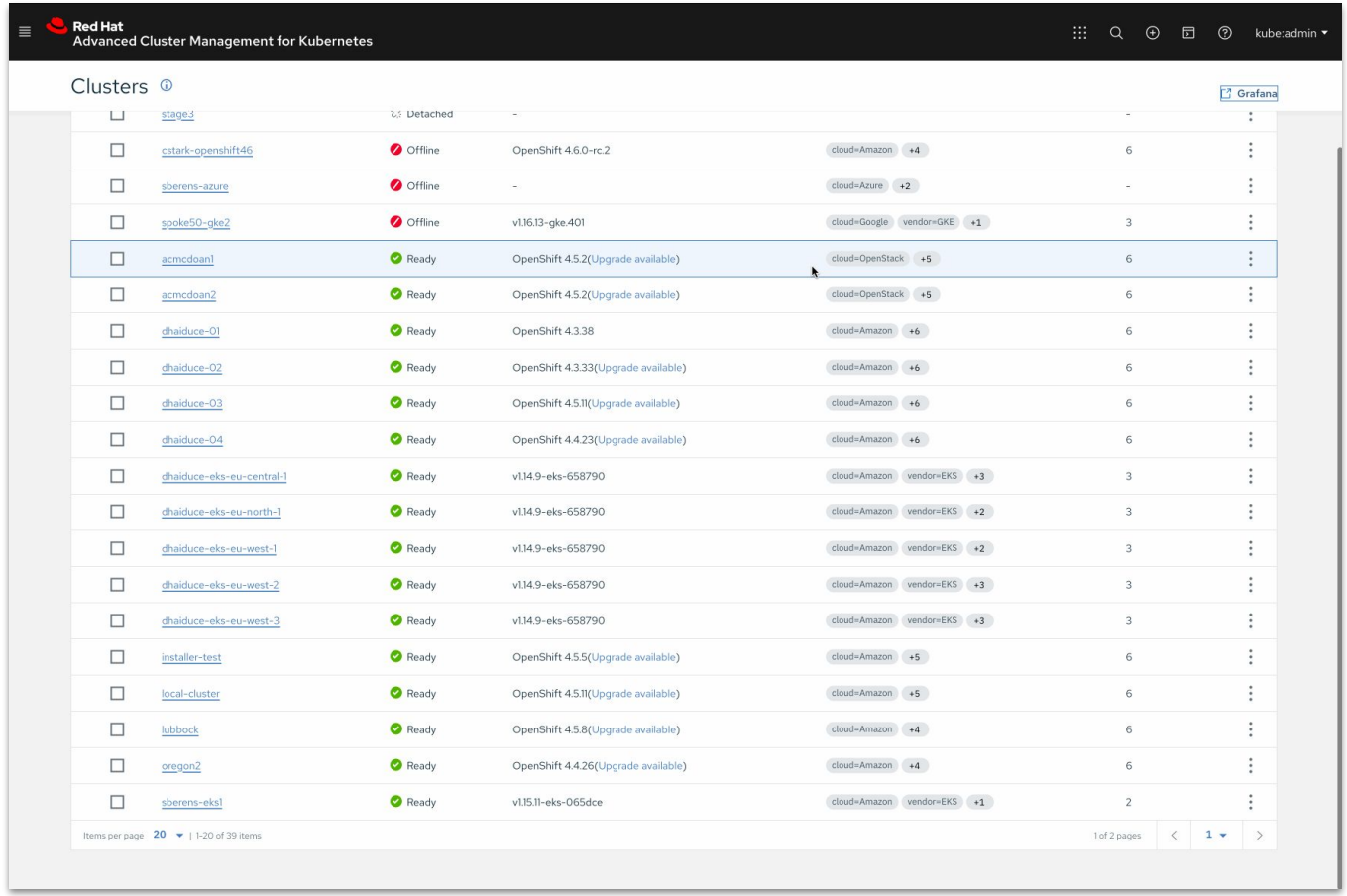
Overview

- Global Query view with **Grafana** for OCP Clusters
  - Out of the Box multi cluster health monitoring dashboards
  - PromQL compliant - Build your own queries

- **Centralize Alerts** and notifications on the **RHACM Hub**. Forward to 3rd Party Systems (PagerDuty / Slack)

- Centralized **Database**
  - Optimized set of metrics collected from managed clusters
  - Focused on Cluster Management

- Unlimited **Data Retention**
  - Observe Metric trends
  - Set Alert Patterns
  - Supported Object Storage
    - AWS S3 (and compatible)
    - Ceph for on-premise
    - Google Cloud Storage
    - Azure Storage

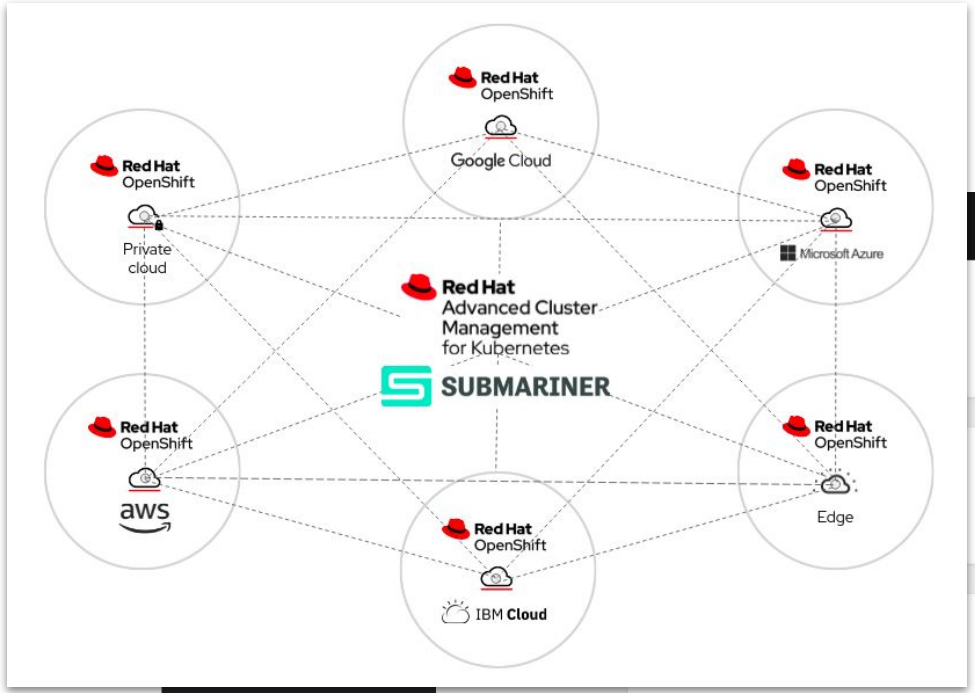


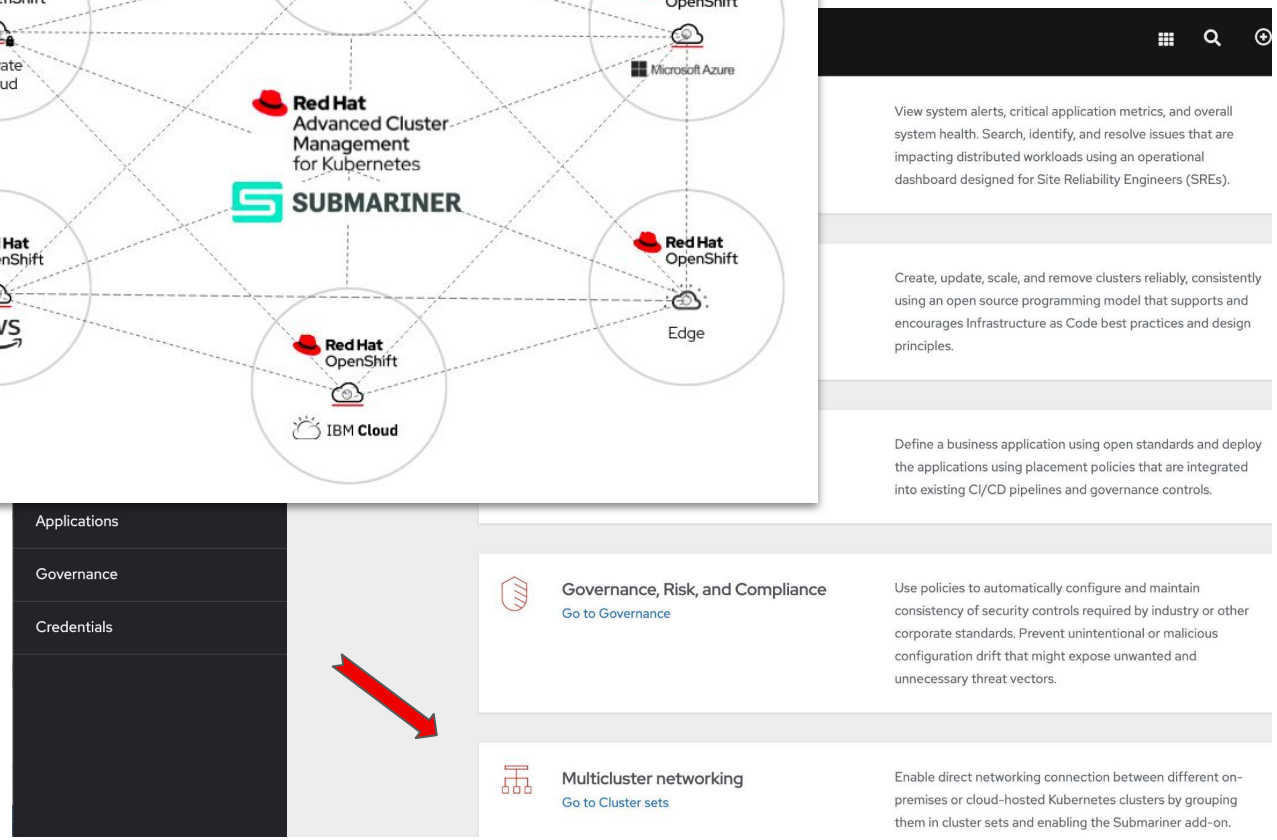
Red Hat

Multicluster Networking

MCN features overview & look ahead

- **ACM MCN, aka 5th pillar**
- Presenting **Submariner**: an CNCF open source project in the form of an **add-on** for RHACM, now generally available
- Enable **direct networking** between Pods in different Kubernetes clusters as well as **Service Discovery**, either on-premises or in the cloud
- Leverage **Cluster Sets** - All done via a group of clusters with a high degree of mutual trust that share services
- **Globalnet** - Support for interconnecting clusters with overlapping CIDRs
- **Future work (subject to change)**
  - ACM Red Hat OpenShift Service mesh integration
  - Discovery Deploy & Configure Federation
  - Custom - upstream Istio, Gloo...





Red Hat

Benefits

Red Hat OpenShift and Red Hat Advanced Cluster Management for Kubernetes

Accelerate development to production

Self-service provisioning allows app dev teams to request clusters directly from a catalog removing central IT as a bottleneck.

Increase application availability

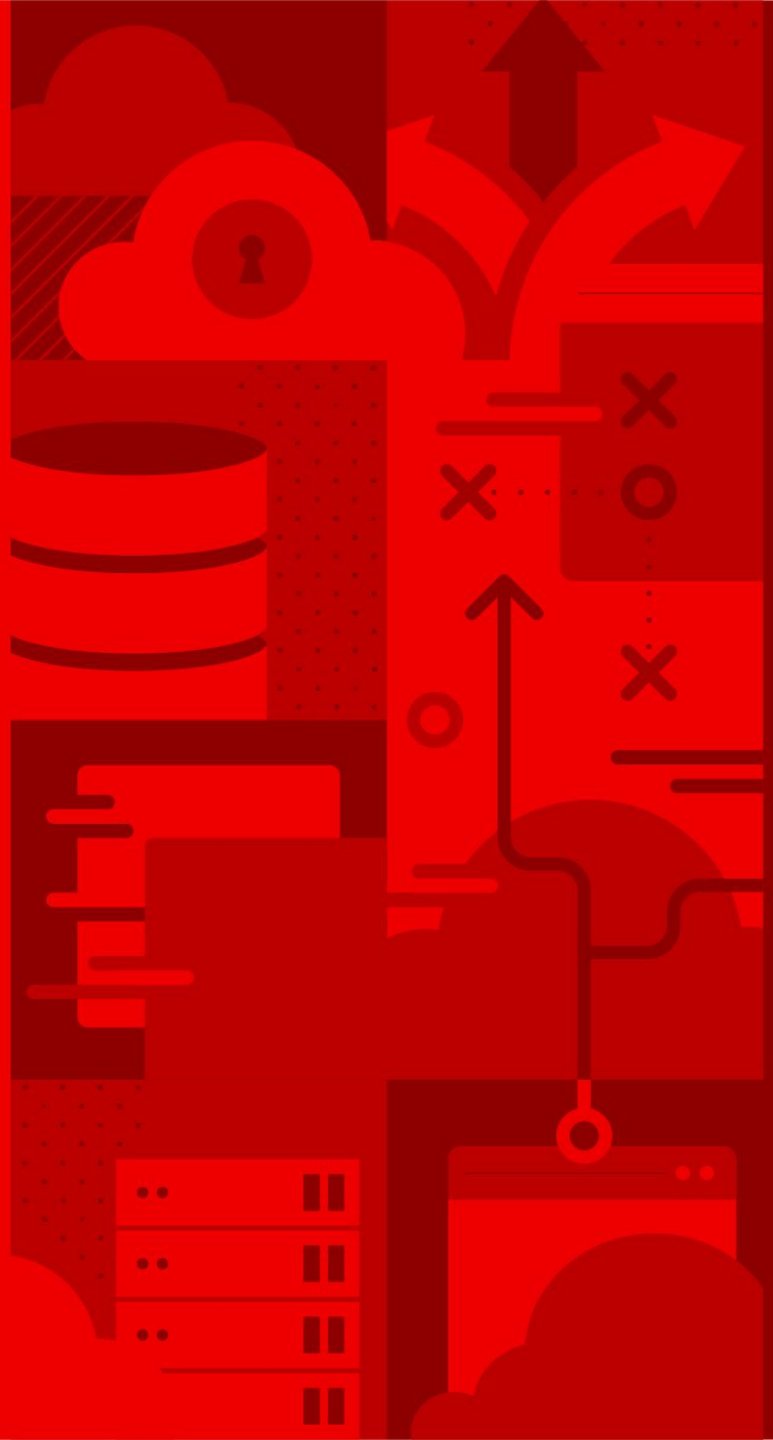
Placement rules can allow quick deployment of clusters across distributed locations for availability, capacity, and security reasons.

Reduce costs

Centralized management of clusters reduces operational cost, makes the environment consistent, and removes the need to manually manage individual clusters.

Ease Compliance

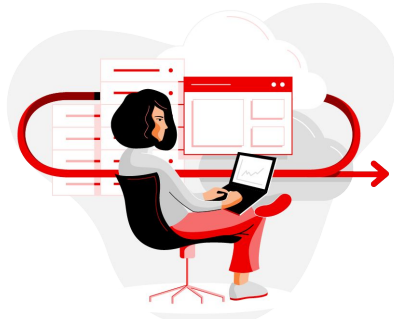
Policies can be written by the security team and enforced at each cluster, allowing environments to conform to your policy.



3 Detailed Use Cases out of ?

Multi-cluster Lifecycle Management

Overview



IT Operations

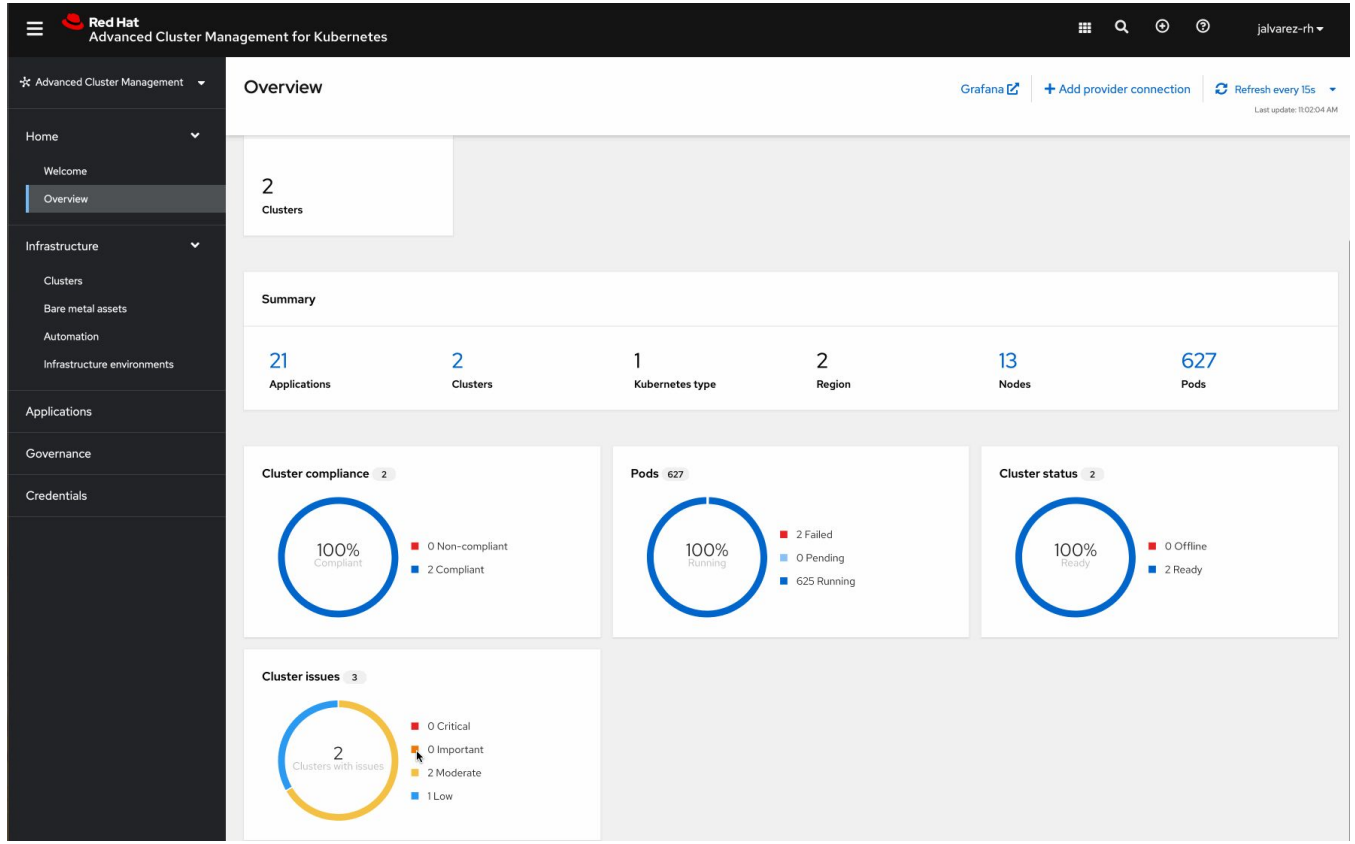
DevOps/SRE

- **Full Management of OCP Kubernetes**
  - Provision new OCP 4.8.x and above
  - Manage existing **OCP 3.11 (Limited Support)** 4.8.x and above
  - Support for OCP 4.9+ Single Node (SNO)

- **Public cloud managed kubernetes**: EKS, AKS, GKE, IKS,ROKS, ROSA, ARO, OSD.
  - Deploy Policies and Applications, Search, find and modify kubernetes resources.

- See **high level summaries** across all clusters
  - Misconfiguration
  - Pod status
  - Resource capacity

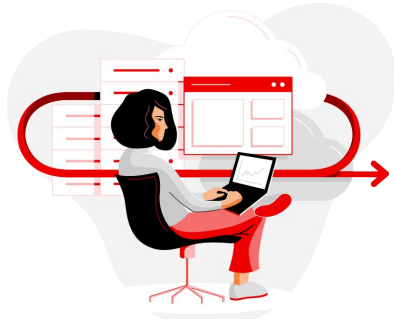
- **Troubleshoot and resolve** issues across the federated domain
  - See in dashboard or via a list/table form
  - Table shows custom tagging
  - Regions
  - Business Purpose
  - Version



Red Hat

Multi-cluster Lifecycle Management

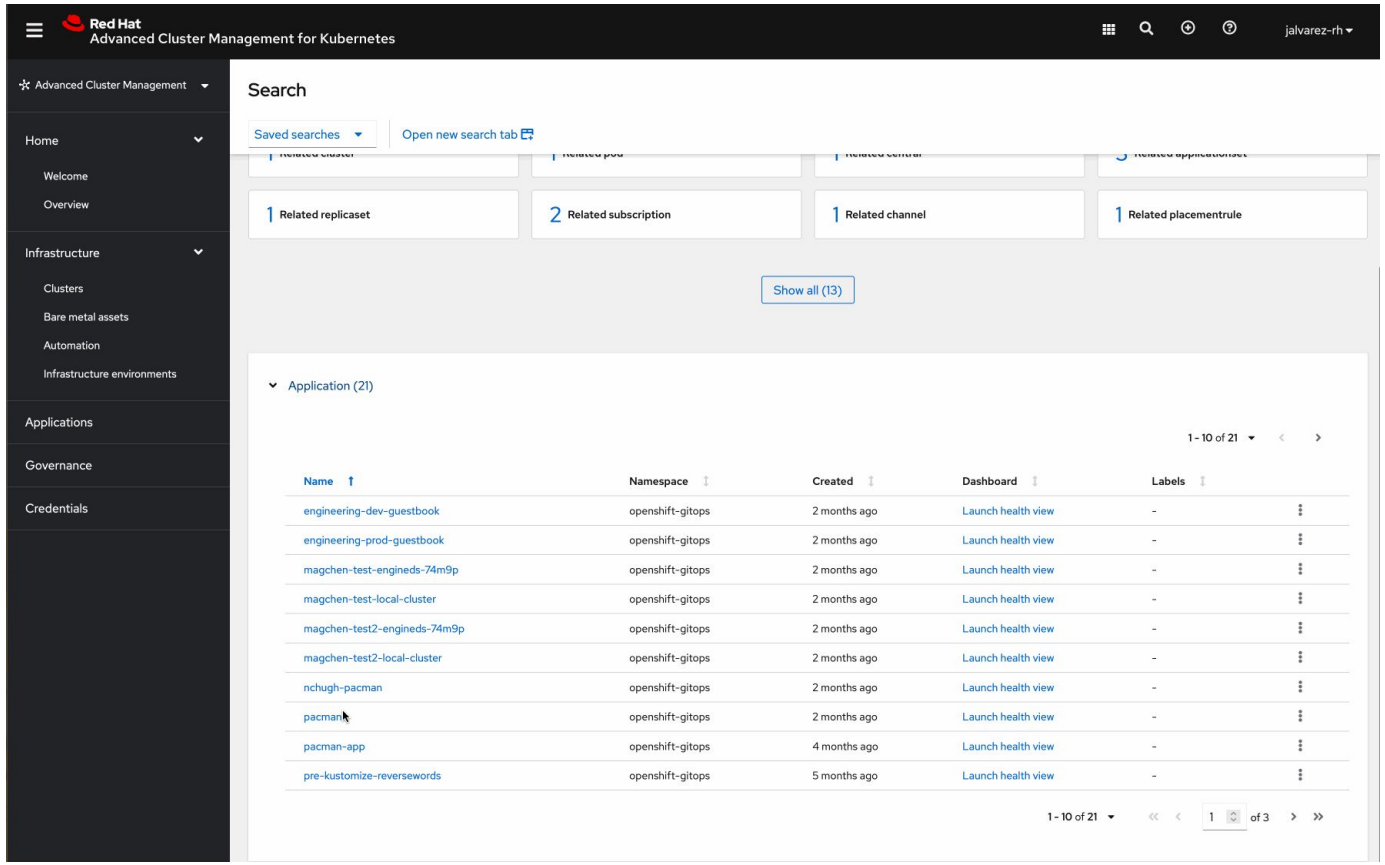
Dynamic Search



IT Operations

DevOps/SRE

- Troubleshooting across clusters via relationships
- See all **unhealthy** pods
- See related application models to those pods
- See related Persistent Volumes
- See related secrets
- See related ***any*** kube resource object category



Red Hat

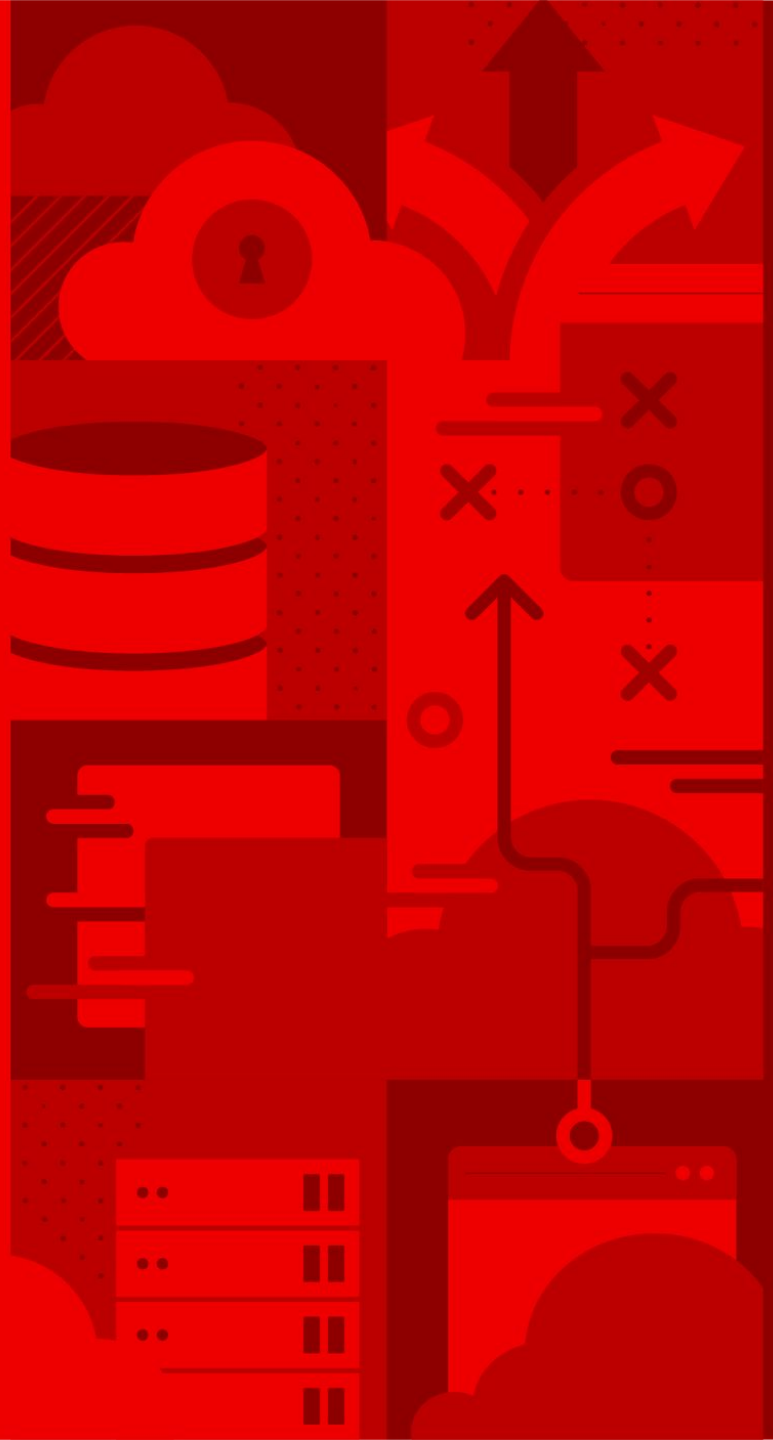
Multi-cluster Observability

Overview

- Enhanced multi-cluster **OCP** metric aggregation with customized allowlist
  - Enhanced multi-cluster metric aggregation
  - Custom metrics and pre defined metrics

- **Customize** your own Grafana dashboards for fleet management
  - Optimized set of metrics collected from managed clusters
  - Focused on Cluster Management
  - Unlimited Data Retention
  - Set Alert Patterns

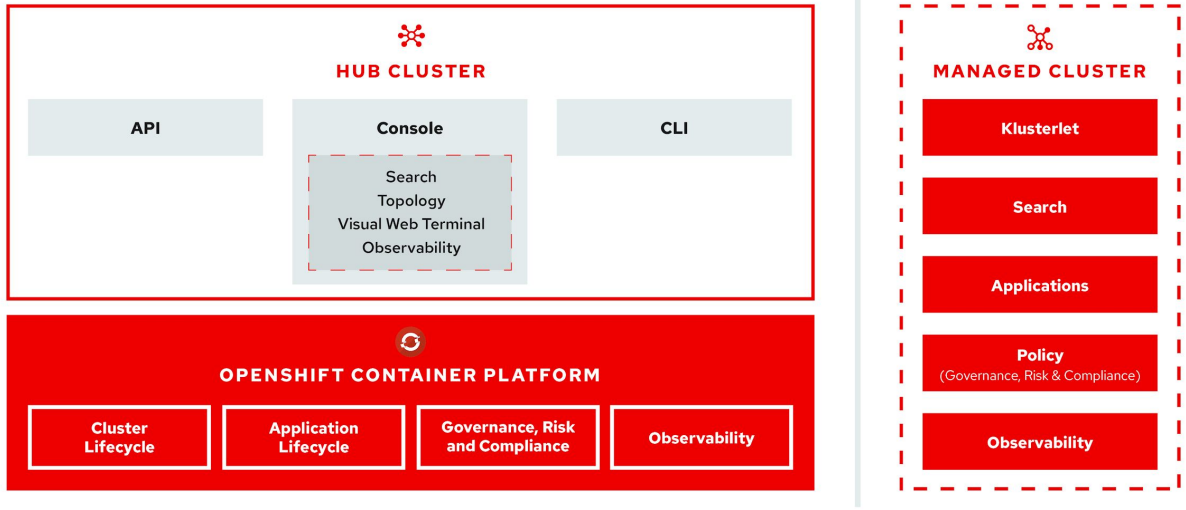
Red Hat



Architecture

Architecture overview

IT Operations



Hub architecture and components

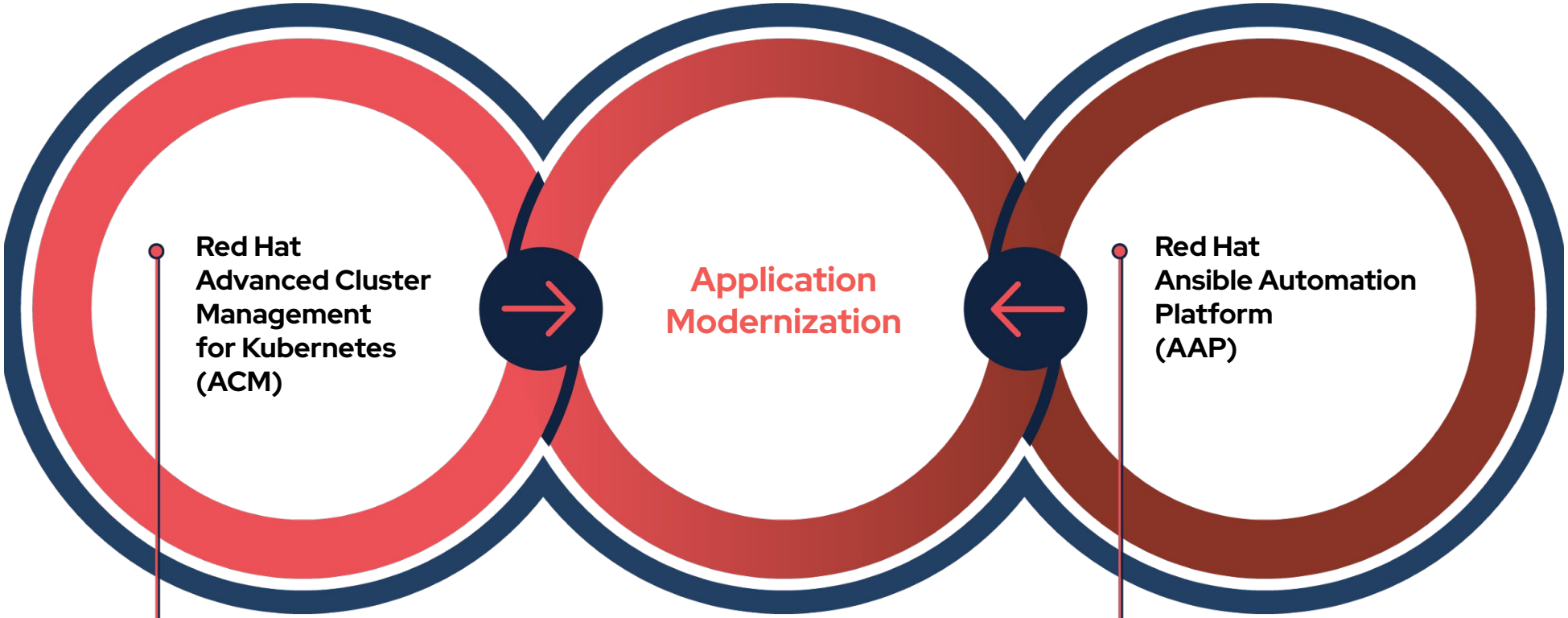
Red Hat Advanced Cluster Management uses the **multicluster-hub** operator and runs in the **open-cluster-management** namespace

Managed cluster architecture and components

Red Hat Advanced Cluster Management managed clusters use the **multicluster-endpoint** operator which runs in the **open-cluster-management** namespace

Red Hat

Application modernization driven by Automation of Kubernetes and beyond....



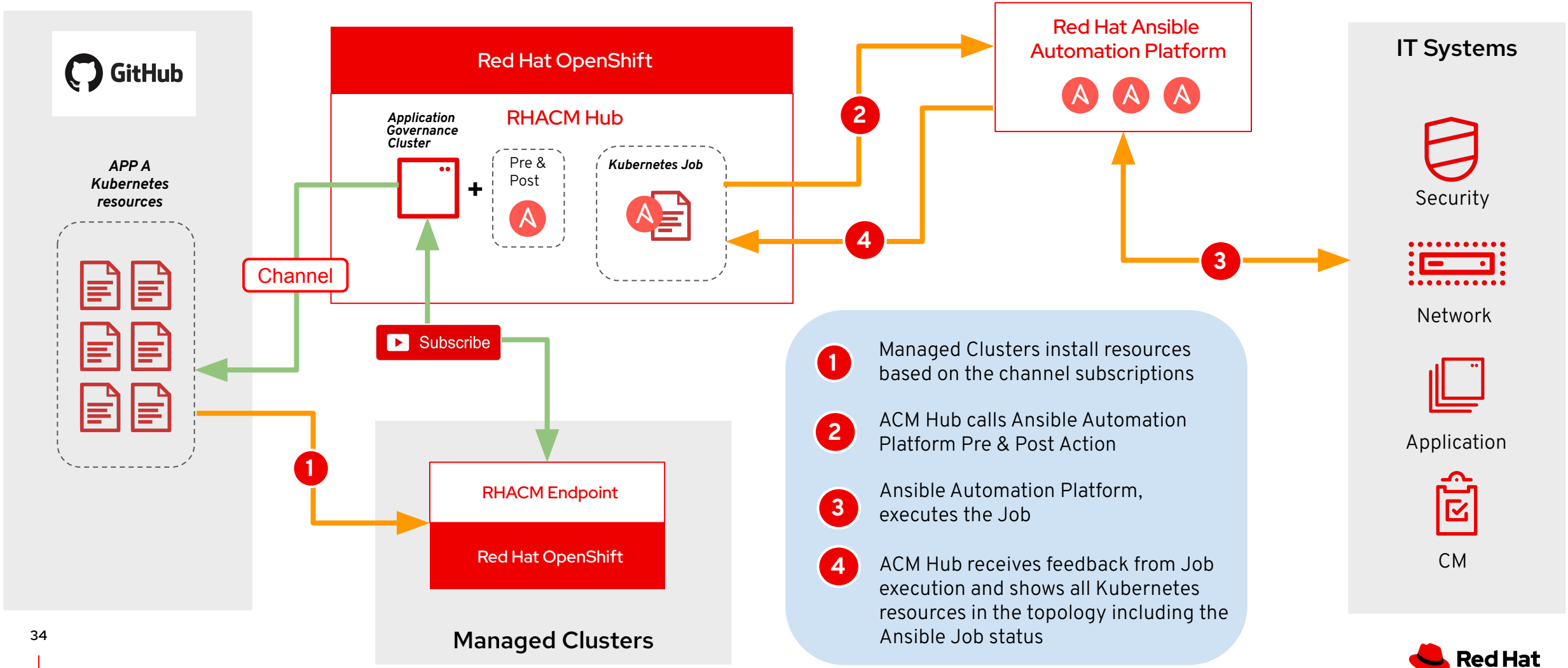
Automate the deployment and management of OpenShift cluster, applications, control policy compliance, and enforcement

Automating everything outside of Kubernetes: Configuration of networking, databases, load balancers, firewall, etc.

Red Hat

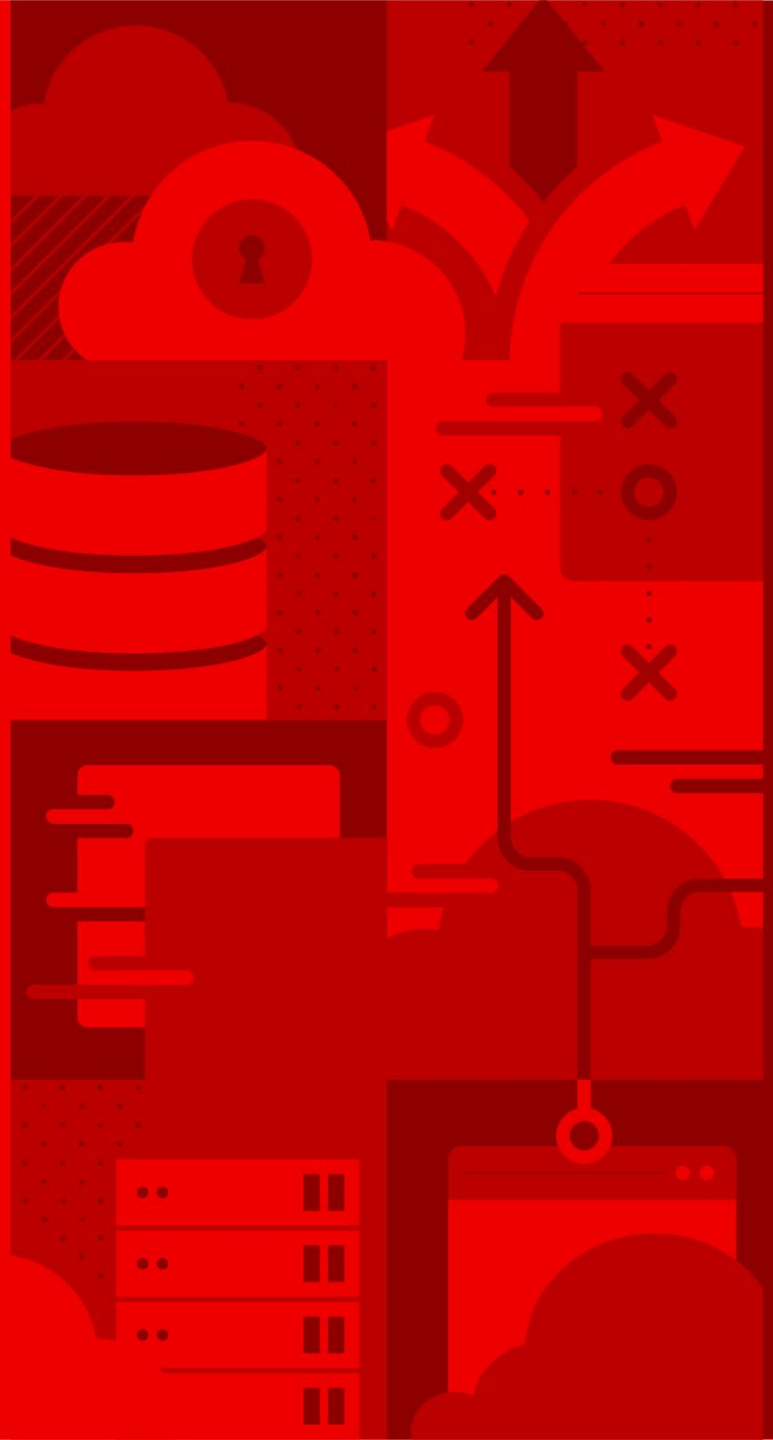
Complete Automation Platform

ACM – Ansible Automation Platform Integration through all the use-cases

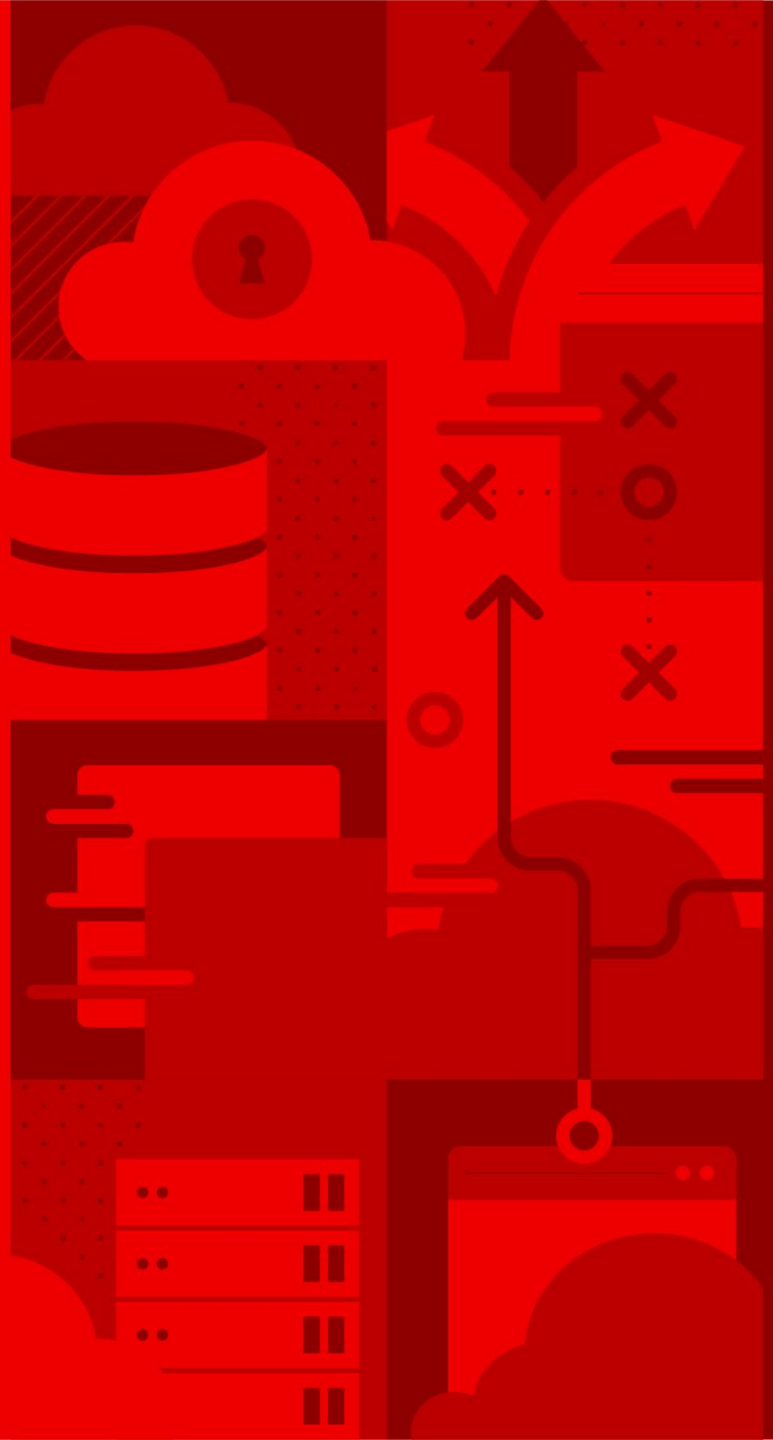


1. Managed Clusters install resources based on the channel subscriptions
2. ACM Hub calls Ansible Automation Platform Pre & Post Action
3. Ansible Automation Platform, executes the Job
4. ACM Hub receives feedback from Job execution and shows all Kubernetes resources in the topology including the Ansible Job status

Red Hat



Q & A



Resources and Next Steps

Resources

External Resources

Webpage

YouTube Playlist

Datasheet

Twitch Playlist

Infographic

External FAQ

Ebook: Managing your Kubernetes clusters for Dummies'

Checklist: 5 considerations for managing your Kubernetes clusters

IDC paper: Digital business success depends on effective multicluster Kubernetes management

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

youtube.com/user/RedHatVideos

facebook.com/redhatinc

twitter.com/RedHat

Red Hat