Red Hat
Advanced Cluster Management
for Kubernetes

Red Hat Advanced Cluster Management for Kubernetes

Presenter's Name
Title

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Why Red Hat Advanced Cluster Management is important

Why you should care

- App modernization is a top industry priority.
- Kubernetes is platform modernization.
- Enterprises are rapidly adopting Kubernetes.
- There is intense competition for Kubernetes.
- Not all Kubernetes solutions are equal.
- Kubernetes management is complicated.

Key solutions

Move quickly and win the platform

Use the best, most complete solution - OpenShift

Differentiate and win Red Hat OpenShift Container Platform

Recognize VMware as the biggest threat

But Hybrid Multi-Cloud 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:
DC 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

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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

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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 Scale 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 topologies

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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

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Multicluster management challenges

How do I normalize and centralize key functions across environments?

Management requirements

Developer

Build and deploy a container 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

Clusters deployed across public, private clouds, edge, in different geographies

- Single pane of glass visibility
- Deploying and distributing applications at scale
- Auditing and compliance

Single cluster → Multicluster growth → Distributed multicluster

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Introducing Red Hat Advanced Cluster Management For Kubernetes

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Robust. Proven. Award winning.

Multicluster lifecycle management

Policy driven governance, risk, and compliance

Advanced application lifecycle management

Multicluster observability for health and optimization

Unified Multi-Cluster Management

Single Pane for all your Kubernetes Clusters

- **Centrally** create, update and delete Kubernetes clusters **across multiple** private and public clouds
- Search, find and modify **any** kubernetes resource across the **entire** domain.
- **Quickly** troubleshoot and resolve issues across your **federated** domain

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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
- Built-in compliance policies and audit checks
- **Immediate** visibility into your compliance posture based on **your** defined standards

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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)
- Quickly **visualize** application relationships **across** clusters and those that **span** clusters

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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.

Architecture

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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

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Tech preview

Architecture Overview

for Application Lifecycle

Red Hat Advanced Cluster Management for Kubernetes

1. Managed Clusters install resources based on the channel it subscribed
2. RHACM Hub calls Red Hat Ansible Automation Platform with Template Job ID defined in Application Pre & Post Action
3. Red Hat Ansible Automation Platform executes the Job
4. RHACM Hub receives feedback from Job execution and shows all Kubernetes Resources in topology, including Ansible Job status

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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.

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How ACM works with OpenShift

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Supporting application modernization

Run
- Cluster services: metrics, chargeback, registry, logging
- Advanced infrastructure functionality
- Dev services: dev tools, automated builds, CI/CD, IDE

Manage
- Multicluster and Kubernetes lifecycle management
- Policy-based governance, risk, and compliance
- Application lifecycle management

Automate
- Configuration management
- Workflow orchestration
- Network and security automation
- Automation analytics
- Certified content
- Automation services catalog

Observe
- Red Hat Insights
- Cost management
- Connected customer experience
- Subscription watch

Draw Me a Picture!

Advanced Cluster Management

Multi-cluster Management

Creation ⁝ Discovery ⁝ Policy ⁝ Compliance ⁝ Configuration ⁝ Workloads

OpenShift Container Platform

Manage Workloads | Build Cloud-Native Apps | Developer Productivity

Platform Services

Service Mesh ⁝ Serverless
Builds ⁝ CI/CD Pipelines
Full Stack Logging
Chargeback

Application Services

Databases ⁝ Languages
Runtimes ⁝ Integration
Business Automation
100+ ISV Services

Developer Services

Developer CLI ⁝ VS Code extensions ⁝ IDE Plugins
Code Ready Workspaces
CodeReady Containers

OpenShift Kubernetes Engine

Cluster Services

Automated Ops ⁝ Over-The-Air Updates ⁝ Monitoring ⁝ Registry ⁝ Networking ⁝ Router ⁝ KubeVirt ⁝ OLM ⁝ Helm

Kubernetes

Red Hat Enterprise Linux & RHEL CoreOS

Physical | **Edge** | **Virtual** | **Private cloud** | **Public cloud** | **Managed cloud** (Azure, AWS, IBM, Red Hat)

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Red Hat Insights

Installation

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Installation and Foundation

Operator Install for Hub

IT Operations

Hub Cluster

- Operator based installation
- Available on OperatorHub
- Requires OCP 4.5.x - **Latest**

Full Management of OCP clusters

- OpenShift 3.11*, 4.1.x - **Latest**
- Public cloud hosted: OCP

Limited Support for Public cloud managed Kubernetes

- EKS, AKS, GKE, IKS,ROKS

High Availability

- Supports OCP Availability Zone
- Limitation for Search component based on RedisGraph

Resource Requirements

- **Test**: 3 master, 3 workers, 6 vCPU and 16GB RAM
- **Production**: 3 masters, 3 workers, 16 vCPU and 24GB RAM*

  * Production requirements vary based on number of clusters in the management domain and types of workloads being run.

  * vCPU/RAM Numbers are per node.

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Installation and foundation

Operator install for managed cluster

IT Operations

Managed cluster

The **multicluster-endpoint** operator controls the deployment of components on the managed cluster.

List of included components:

- Application manager
- Connection manager
- Work manager
- Policy controller
- Search collector
- Service registry
- IAM policy controller
- Certificate policy controller
- CIS policy controller

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Role Based Access Control

How to control User Access

Security Ops

- RBAC in RHACM is based on kubernetes concepts and is enforced through openshift.
- Cluster-Admin Role is an Openshift super-user role and can perform all actions cluster-wide.
- Additional Roles are available out of the box to assign users Admin, Edit or View level access to RHACM artifacts, for more please see the documentation

Role	**Description**
open-cluster-management:cluster-manager-admin	A user with cluster-wide binding to this role, is an RHACM super user can perform any action on RHACM resources
open-cluster-management:admin:managed-cluster-x	A user with cluster binding to this role, has admin access to ManagedCluster “X” resource
open-cluster-management:view:managed-cluster-x	A user with cluster-wide binding to this role, has view access to ManagedCluster “X” resource
OCP Default admin / edit / view roles	A user with namespace binding to these roles has access to resources like policies, applications etc in that namespace or ManagedCluster. A user with cluster-wide binding to these roles has access to resources like policies, applications etc in all namespaces or for all ManagedClusters.

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Thank you

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