



# Cluster Lifecycle

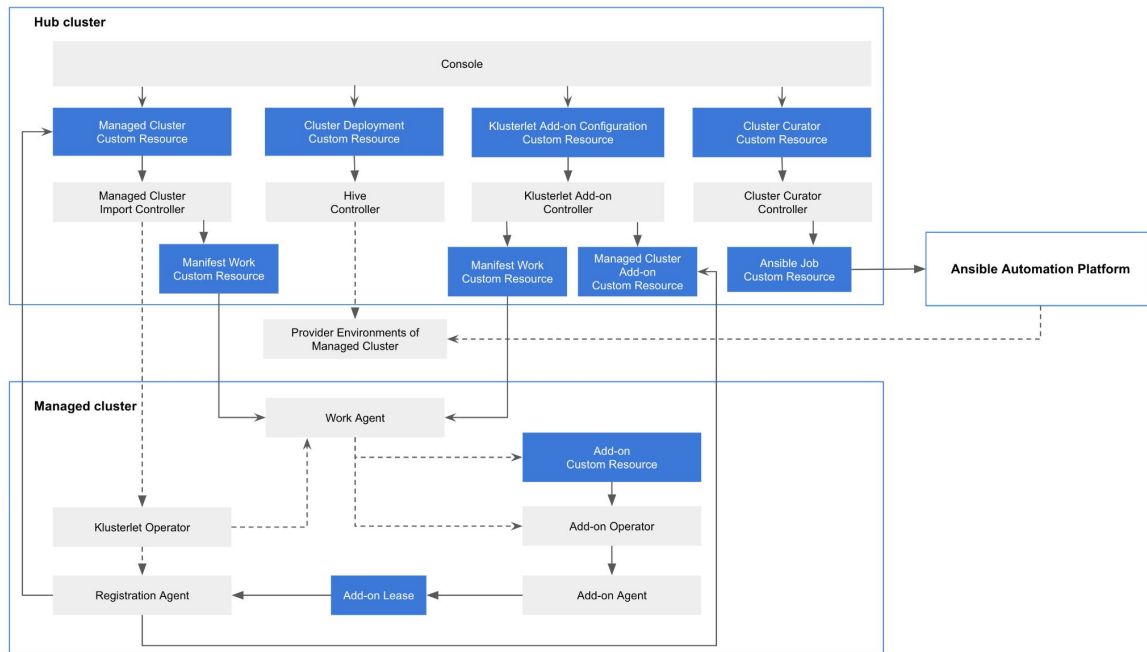
ACM Deep Dive



## Architecture

### Key features:

- Cluster lifecycle management
- Ansible automation



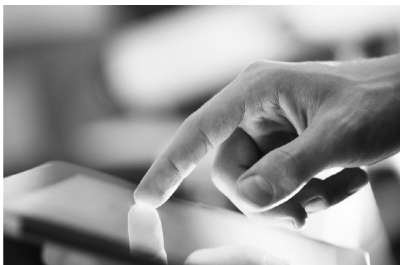
## Use case: OCP cluster lifecycle management

- Cluster provisioning/deprovisioning



Hive

Provision OCP cluster in the public cloud and on-premises.



Assisted Installer (AI)

Provision OCP cluster in a bare metal environment.



Hypershift

Provision HyperShift cluster

- Cluster upgrading

## Use case: Importing an existing cluster

- Import mode
  - Manually
  - Automatically
- Also can import other K8s Clusters
  - \*KS
  - ROSA
  - OSD

Clusters > Import an existing cluster

Import an existing cluster ⓘ ☐ YAML

1 Details  
2 Automation  
3 Review

**Details**

**Name \***

Enter cluster name

**Cluster set**

Select a cluster set

[Manage cluster sets](#)

**Additional labels**

Enter key=value, then press return, space, or comma

**Import mode \***

Run import commands manually

Run import commands manually

Enter your server URL and API token for the existing cluster

Kubeconfig

## Use case: Running Ansible jobs on managed cluster

ACM is integrated with APP automation so that you can create prehook and posthook AnsibleJob instances that occur before or after creating or upgrading your clusters.

Pre-hook

Create/upgrade cluster

Post-hook

Run Ansible jobs before creating, importing or upgrading your cluster.

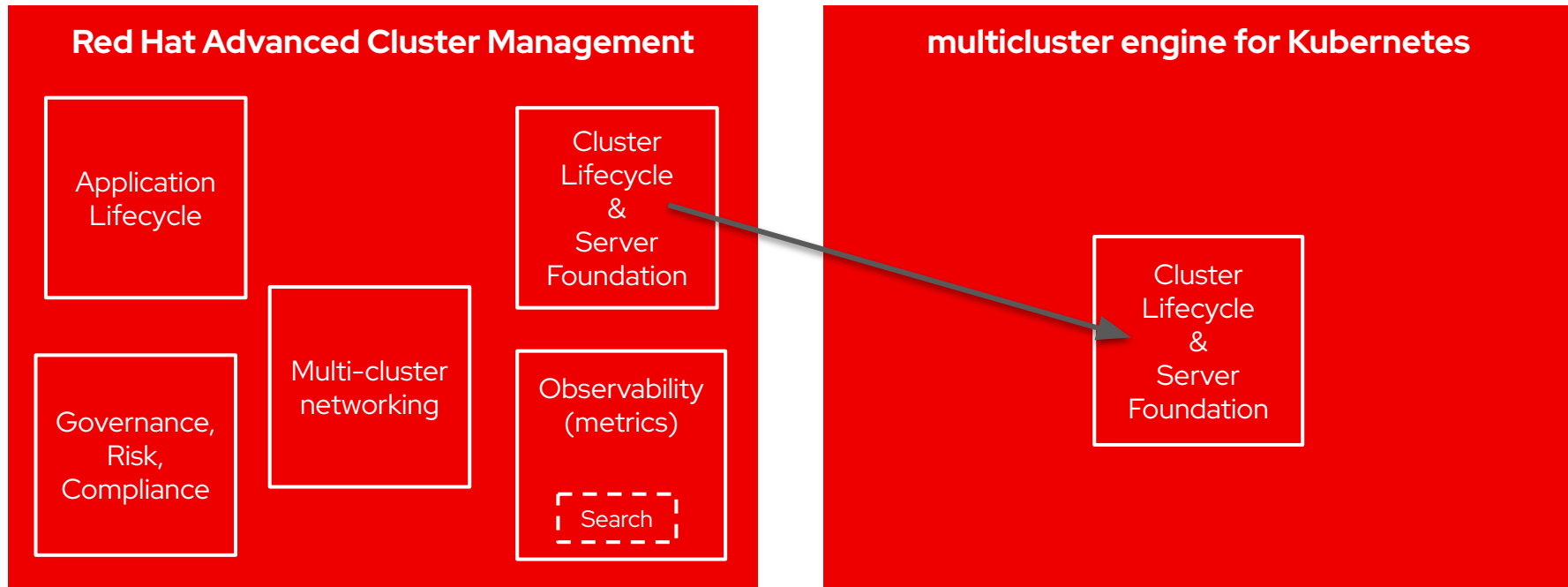
Run Ansible jobs after creating, importing or upgrading your cluster.

# Introduction to ACM's multicluster engine for Kubernetes operator

Sho Weimer

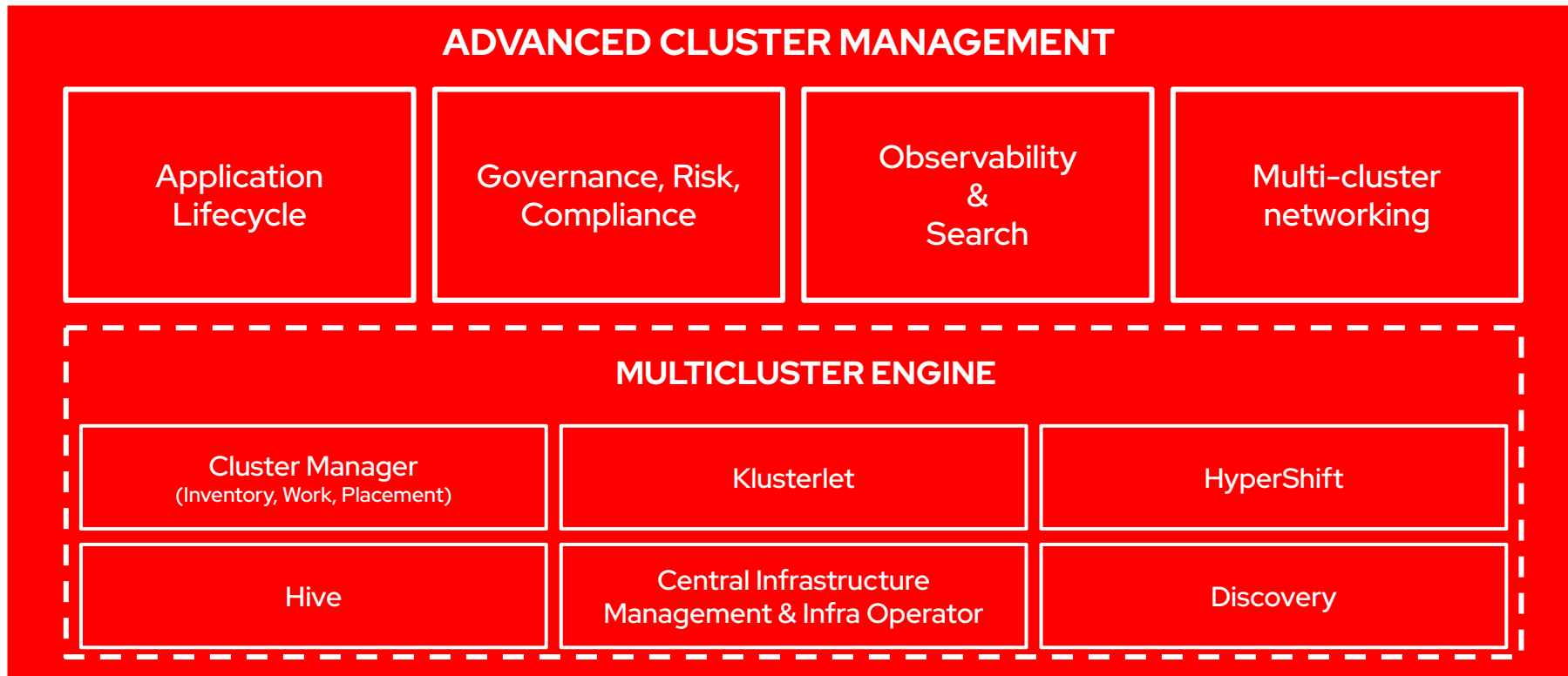
# RHACM is packaging core multi-cluster functionality into a new operator

The new **multicluster engine for Kubernetes** operator will be entitled with OpenShift



# ACM Architecture

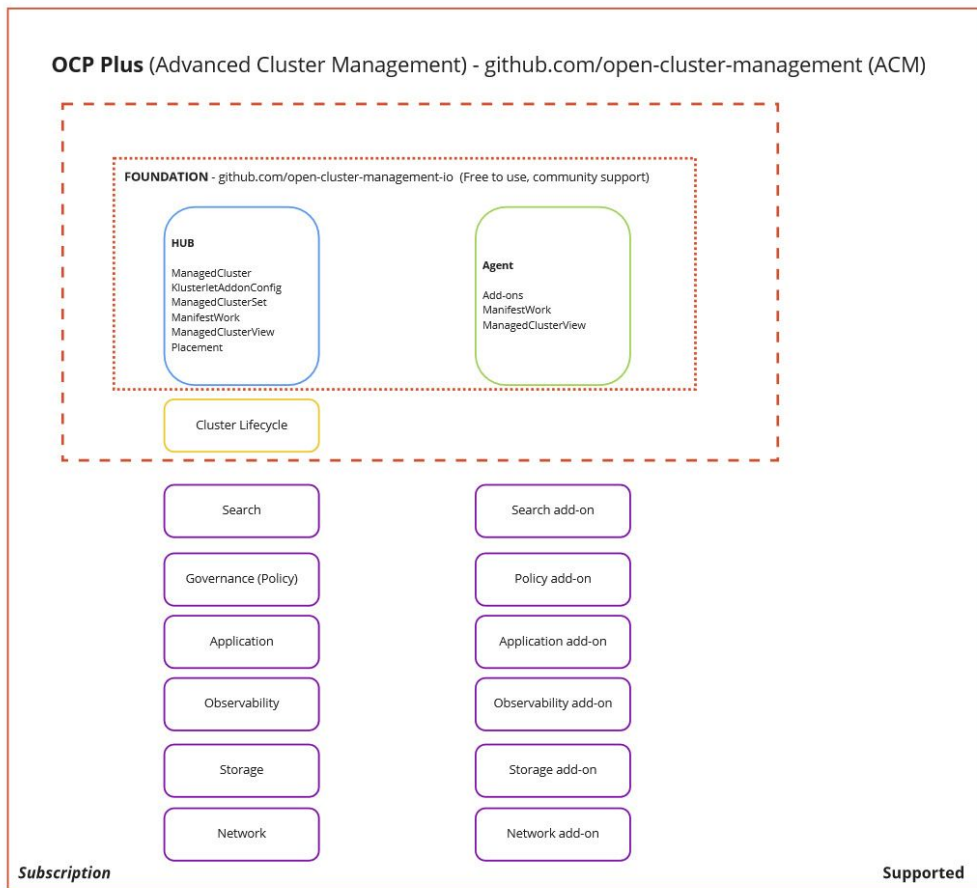
ACM is built with the  
multiclustere engine operator





# RHACM continues to be powered by the Multicluster Engine

The **multicluster engine** for **Kubernetes** operator is still part of the **ACM** install



# Klusterlet Pattern

## ADVANCED CLUSTER MANAGEMENT(HUB)

MULTI-CLUSTER  
ENGINE

- ACM's kube-native way of cluster management
- Real-time management from single Hub location
- Active feedback from managed cluster
- Auto-deployed & configured to clusters created via ACM
- Recommended pattern for internal products

Klusterlet

## Klusterlet(Managed Cluster)

Policy

IAM

Monitoring

Search

Advanced  
Cluster  
Security

ServiceMesh

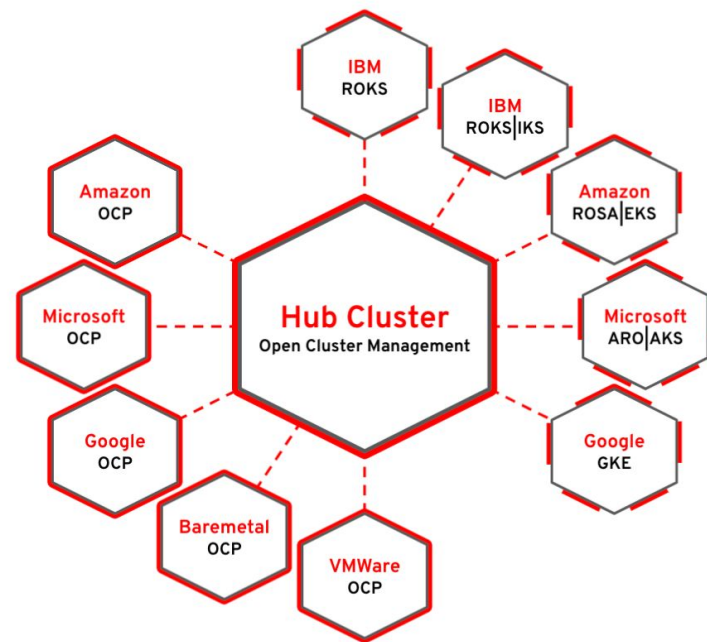
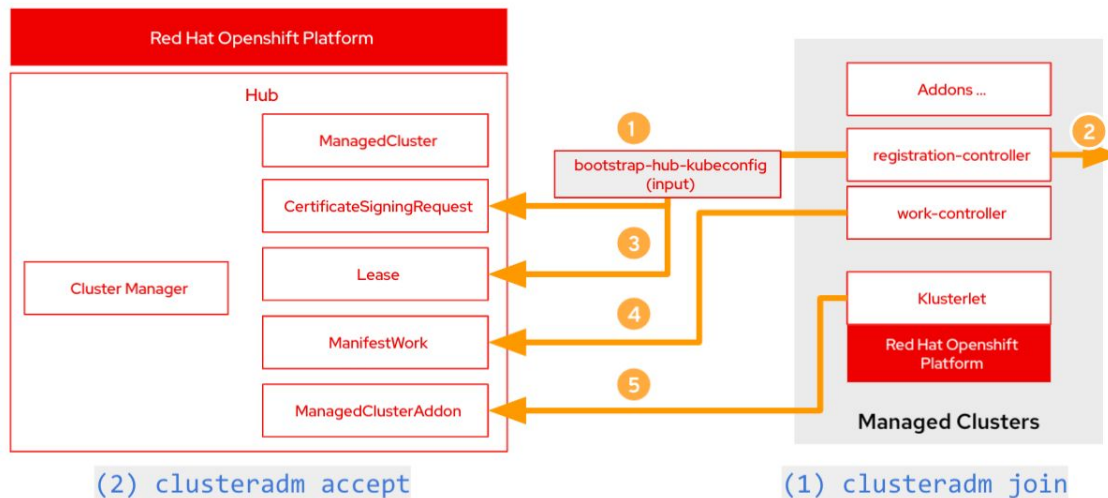
Storage

Add-on...

# What's in the multicluster engine operator?

# Cluster Manager & Klusterlet

Open Cluster Management  
upstream community APIs



This is what makes the Hub-Spoke model possible

Hub - Cluster Manager (Control Plane)

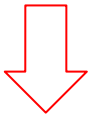
Spoke (ManagedCluster) - Klusterlet (Agent)

# Cluster Manager & Klusterlet

This is the foundation needed to make any operator multi-cluster aware

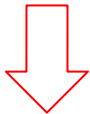
## Making Kubernetes services multi-cluster aware

The service must have an API to discover the inventory of available clusters.



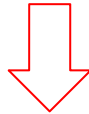
**ManagedCluster**

The service must have a way to schedule and assign Kubernetes API manifests to a selected set of clusters.



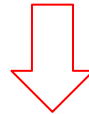
**Placement**

The service must have a way to deliver desired Kubernetes API manifests to a selected set of clusters.



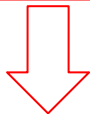
**ManifestWork**

The service must have a way to govern how users access available clusters or groups of clusters in the fleet.



**ManagedClusterSet**

The service may need to extend the mgmt agent with additional built-in controllers that run on managed clusters.



**ManagedClusterAddon**



# Provisioning (Hive)

Kubernetes API driven OCP provisioning, reshaping, deprovisioning and configuration at scale. It leverages the OpenShift 4 installer to deploy clusters across different environments in the public cloud and on-premises.

Managed clusters > Create cluster

Create cluster ?

☐ YAML: Off

1 Infrastructure provider

2 Cluster details

3 Master node

4 Worker pools

5 Networking

6 Automation

7 Review

## Infrastructure provider

Select the type of Kubernetes distribution to use for your cluster.



Red Hat OpenShift Container  
Platform

Select an infrastructure provider to host your Red Hat OpenShift Container Platform cluster.



Amazon Web Services



Google Cloud



Microsoft Azure



VMware vSphere



Red Hat OpenStack Platform



Bare Metal

# Central Infrastructure Management & Assisted Installer

Manage the infrastructure (physical or virtual) on which OCP clusters will be provisioned independently of cluster provisioning itself.

Infrastructure environments

Refresh every 15s  
Last update: 10:34:24 AM

Create Infrastructure Environment

Infrastructure Environments

Find items

Name	Label	Location
InfrastructureEnvironment000	building=east3 <a href="#">4 more</a>	San Francisco
InfrastructureEnvironment001	building=north1	Asgard
InfrastructureEnvironment002	level=prod <a href="#">3 more</a>	Westford
InfrastructureEnvironment003	Label1 Label2	Prague
InfrastructureEnvironment008	building=south2	Berlin

Add Hosts

Host name \*

Enter the name for the Host

Baseboard Management Controller Address \*

Enter an address

Boot NIC Mac address

Enter an address

Username \*

Enter a username for the BMC

Password \*

Enter a password for the BMC

Provisioning Network \*

Select a network type to configure

NMState

Drag a file here or browse to upload

Browse

Start from scratch

Mac to interface name mapping

MAC address	NIC
DF:5D:78:8E:B5:E7	Canowickakte
A0:53:EC:98:D9:2C	Hevovtastamultso

Add more

Add host Cancel

Cluster management > Create

Create cluster ☐ YAML: Off

- Cluster infrastructure provider
- Cluster details
- Operators
- Hosts selection**
- Install configuration
- Review and create

Hosts selection

Number of hosts

3

☒ Run workloads on control plane (master) hosts

Labels

☒ Auto-select control plane (master) hosts

Location

Type or select location

Labels matching hosts

key=value

Please provide as many labels as you can to find the relevant hosts.

Next Back Cancel

Allowing to auto allocate control plane (master) hosts based on the matched labels.

Enable a persona without administrator permissions (cluster creator) to easily self service deploy clusters based on capacity and location requirements on infrastructure prepared and managed by an administrator (infra owner).

# Discovery

Connect to OpenShift Cluster Manager (OCM) to discover and import available OpenShift clusters.

The screenshot displays the OpenShift Cluster Manager (OCM) interface. On the left, the 'Clusters' tab is active, showing a table of discovered clusters. The 'Discovered clusters' sub-tab is highlighted. The table lists various OpenShift clusters with details such as ID, age, connection status, platform, version, and provider. A red box highlights the 'Import cluster' button in the table's rightmost column. An arrow points from this button to the 'Add credentials' dialog on the right. The dialog shows the 'Add credentials' step, with 'Credentials type' set to 'Review'. The 'Datacenter credentials' section lists 'Red Hat OpenStack Platform' and 'VMware vSphere'. The 'Bare Metal' section lists 'Red Hat OpenShift Cluster Manager', which is highlighted with a red box and an arrow pointing to it from the 'Import cluster' button.

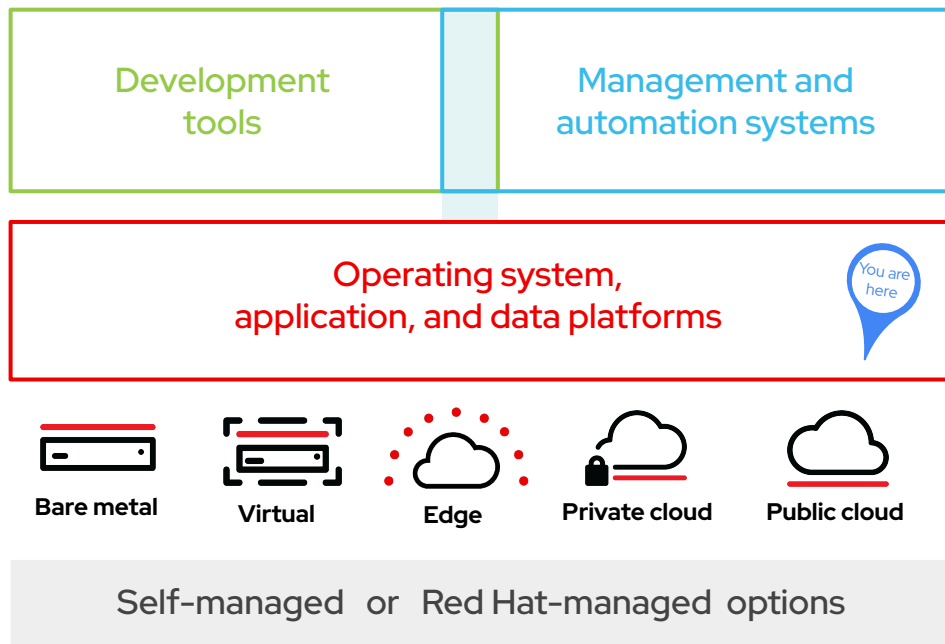
Cluster ID	Age	Connections	Platform	Version	Provider	Import Status	Actions
05671ed0-baf3-4832-9053-82e148dcc20a	44 minutes	connections	OpenShift Container Platform	-	-	4 hours 3 hours	⋮
05aea233-f26b-40f4-9534-25b4830910e9	an hour	connections	OpenShift Container Platform	4.7.8	-	5 months 3 hours	⋮
0832d31d-4c43-487c-899e-d5b9456aab81	10 minutes	connections	OpenShift Container Platform	-	Microsoft Azure	10 minutes 6 minutes	⋮
08d42752-fd62-4ca2-b174-02587e6f083c	22 minutes	connections	OpenShift Container Platform	-	Other	a month 3 hours	⋮
10bf2bb7-6bb7-4307-9422-c812cb34c20c	4 hours	connections	OpenShift Container Platform	-	-	12 hours 3 hours	⋮
191edce8-e268-4d4a-8870-7a89cae9c08b	31 minutes	connections	OpenShift Container Platform	4.7.0	VMware vSphere	6 months 3 hours	⋮
1a0b0303-d4dd-4d04-8ab9-66bccbf52e5	6 hours	connections	OpenShift Container Platform	4.8.0-rc.0	-	14 days 3 hours	⋮
2077f6b4-9ca0-4dc4-97c7-006e9cb2b4a1	2 days	connections	OpenShift Container Platform	4.8.0-0.ci.test-2021-07-06-205812-ci-in-x2hrt5b-latest	-	2 days 3 hours	⋮



Why are we doing this?

# Red Hat's Open Hybrid Cloud

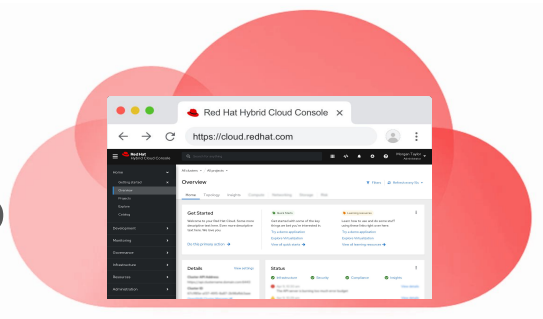
Open hybrid cloud is Red Hat's strategy for **architecting**, **developing**, and **operating** a hybrid mix of applications, delivering a **truly flexible** cloud experience with the speed, stability, scale, and **support** required for digital business transformation.



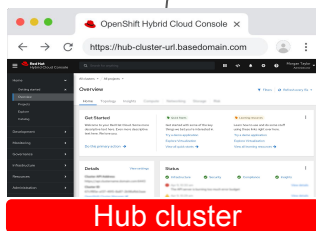
# The new OpenShift Hybrid Console: Breadth meets Depth

Your whole “cloud” fleet at a glance; *scale as needed*

  
Global “OCM” Hub  
cloud.redhat.com



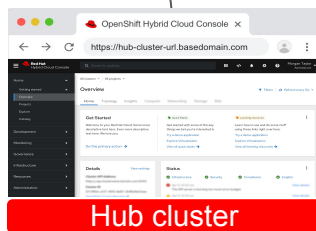
Regional “ACM” Hubs  
hub-console-1.domain.com  
...  
hub-console-n.domain.com



Spoke API

Spoke API

Spoke API



Spoke API

Spoke API

Spoke API

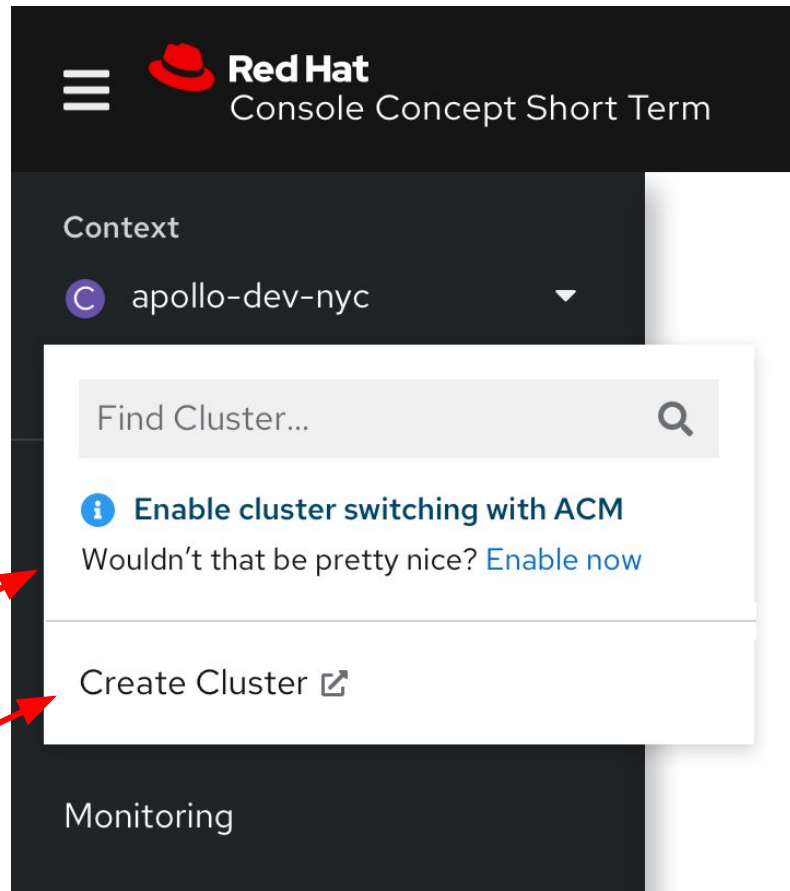
## Guide users from single cluster to a fleet management experience

Reduce the friction from starting with a single cluster to expanding into management of a fleet of clusters.

Create a more guided, gradual discovery process for users to become aware of how to transform a cluster into a hub and then how to simplify providing access to new clusters or offer more self service options for cluster creation from their team or other teams.

Takes Admin to OperatorHub to install the multi-cluster engine operator

Easy cluster creation in OCM is a great transition into needing multi-cluster engine and then ACM



## Multi-cluster all of the “things”

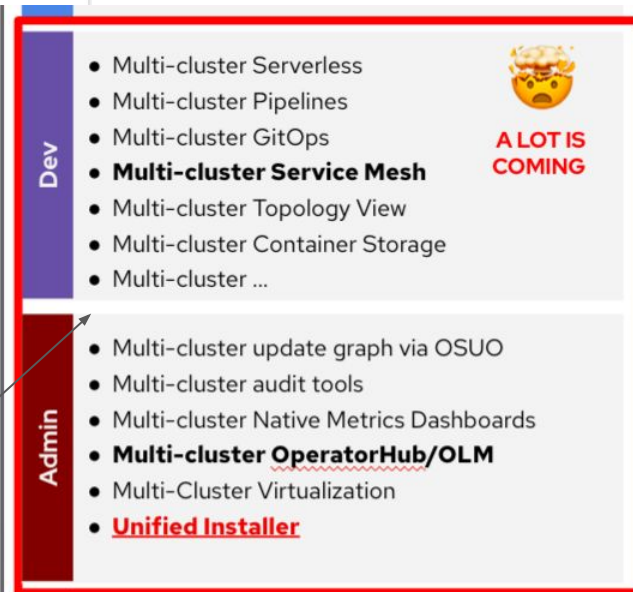
OpenShift must become multi-cluster aware.  
Every screen must be multi-cluster aware.



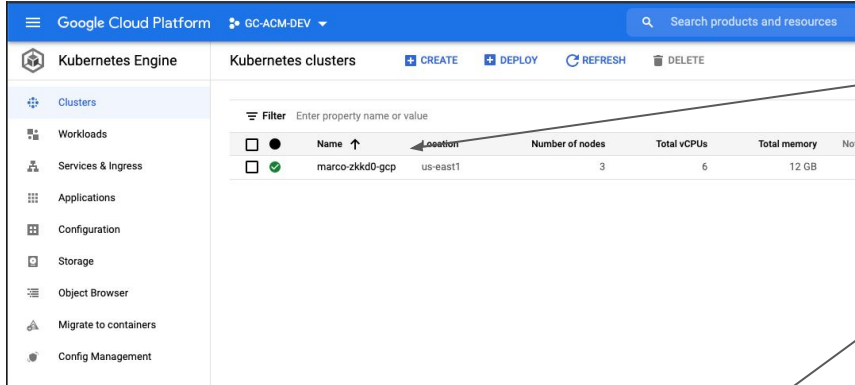
### This is a big shift in thinking:

Every admin or developer flow now starts at the fleet-level.  
You no longer log into a single cluster.  
You start from **one** URL – your Hub.  
You get a **single pane of glass**.

OpenShift needs to level up to multi-cluster



# Hyperscalers already offer a slice of the multi-cluster experience

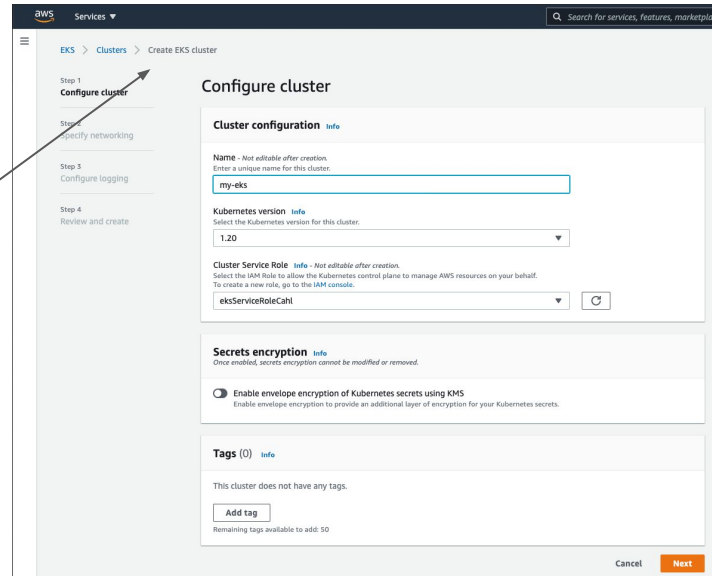


The screenshot shows the Google Cloud Platform interface for Kubernetes Engine. The left sidebar lists navigation options: Clusters, Workloads, Services & Ingress, Applications, Configuration, Storage, Object Browser, Migrate to containers, and Config Management. The main panel displays a table of Kubernetes clusters. A filter bar at the top allows searching by property name or value. The table has columns for Name, Location, Number of nodes, Total vCPUs, and Total memory. One cluster is listed: 'marco-zkkd0-gcp' located in 'us-east1' with 3 nodes, 6 vCPUs, and 12 GB of memory.

Name	Location	Number of nodes	Total vCPUs	Total memory
marco-zkkd0-gcp	us-east1	3	6	12 GB

Cluster list on Google Cloud Platform for GKE clusters

Creation of EKS clusters on Amazon Web Services



The screenshot shows the AWS Management Console 'Create EKS cluster' wizard. The left sidebar shows the navigation path: EKS > Clusters > Create EKS cluster. The main panel is titled 'Configure cluster' and shows the 'Cluster configuration' step. The 'Name' field is set to 'my-eks'. The 'Kubernetes version' is set to '1.20'. The 'Cluster Service Role' is set to 'eksServiceRoleCahi'. The 'Secrets encryption' section shows 'Enable envelope encryption of Kubernetes secrets using KMS' is selected. The 'Tags' section shows 'This cluster does not have any tags.' and an 'Add tag' button. The bottom right has 'Cancel' and 'Next' buttons.

# Thank you

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