



KubeCon



CloudNativeCon

Europe 2020

Virtual

Provider IBM Cloud Subproject of Kubernetes SIG Cloud Provider

*Sahdev Zala
Khalid Ahmed*

Agenda



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❑ Overview

- SIG Cloud Provider
- Provider IBM Cloud

❑ Structure

❑ Activities

❑ Cluster API Provider IBM Cloud

❑ IBM Cloud Provider

❑ Hybrid Cloud Ecosystem

- ❑ Owns K8s Cloud Provider Interface (CPI) code and related work
 - CPI is responsible for running all the cloud-provider specific control loops
 - Repository that defines CPI - <https://github.com/kubernetes/cloud-provider>
- ❑ Owns all the subprojects formerly owned by SIG-AWS, SIG-AZURE, SIG-GCP, SIG-IBM Cloud, SIG-Openstack, SIG-Vmware
- ❑ Provider IBM Cloud
 - Subproject of the Cloud Provider SIG
- ❑ Ensures that the Kubernetes ecosystem is evolving in a way that is neutral to cloud providers
- ❑ Ensure a consistent and high-quality user experience across providers
- ❑ Chairs of the SIG
 - No more than 1 chair from a single company

<https://github.com/kubernetes/community/tree/master/sig-cloud-provider>



- ❑ Subproject of Cloud Provider SIG for building, deploying, maintaining, supporting, and using Kubernetes on IBM Cloud
- ❑ Many developers and leaders from IBM Cloud work openly in this group to determine the future of IBM Cloud team's involvement in the Kubernetes community
- ❑ You can follow the evolution of the IBM Cloud platforms with respect to Kubernetes and related CNCF projects
- ❑ You interact directly with the team that builds and operates IBM Cloud



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❑ Co-leads

- Khalid Ahmed (MCM)
- Richard Theis (IKS and ROKS)
- Sahdev Zala (OSS)

❑ Mailing List

<https://groups.google.com/forum/#!forum/kubernetes-provider-ibmcloud>

❑ Slack discussions

#provider-ibmcloud on kubernetes.slack.com

❑ More about the project

<https://github.com/kubernetes/community/tree/master/sig-cloud-provider#provider-ibmcloud>

❑ Meet every month

- Last Wednesday at 14:00 EST
- Meeting recordings - <https://bit.ly/sig-ibmcloud-videos>

❑ Participation in the SIG Cloud Provider general activities

❑ Subprojects and upstream contributions

- Cluster-api-provider-ibmcloud
 - Implementation of Cluster API project of Kubernetes
 - Provides optional, additive functionality on top of core Kubernetes to manage the lifecycle of a Kubernetes cluster
 - <https://github.com/kubernetes-sigs/cluster-api-provider-ibmcloud>
- Support for out-of-tree IBM Cloud Provider (WIP)

IBM Cloud Kubernetes Service is a **managed offering** to create your own Kubernetes cluster of compute hosts to deploy and manage containerized apps on IBM Cloud. As a certified Kubernetes provider, IBM Cloud Kubernetes Service provides intelligent scheduling, self-healing, horizontal scaling, service discovery and load balancing, automated rollouts and rollbacks, and secret and configuration management for your apps.

Supported?	Version	IBM Cloud Kubernetes Service release date	IBM Cloud Kubernetes Service unsupported date
✓	1.18	11 May 2020	May 2021 
✓	1.17	10 Feb 2020	Feb 2021 
✓	1.16	04 Nov 2019	Nov 2020 
!	1.15	05 Aug 2019	29 Aug 2020 
✗	1.14	07 May 2019	31 May 2020

<https://www.ibm.com/cloud/container-service>



Red Hat OpenShift on IBM Cloud is a **managed offering** to create your own OpenShift cluster of compute hosts to deploy and manage containerized apps on IBM Cloud. Red Hat OpenShift on IBM Cloud provides intelligent scheduling, self-healing, horizontal scaling, service discovery and load balancing, automated rollouts and rollbacks, and secret and configuration management for your apps.

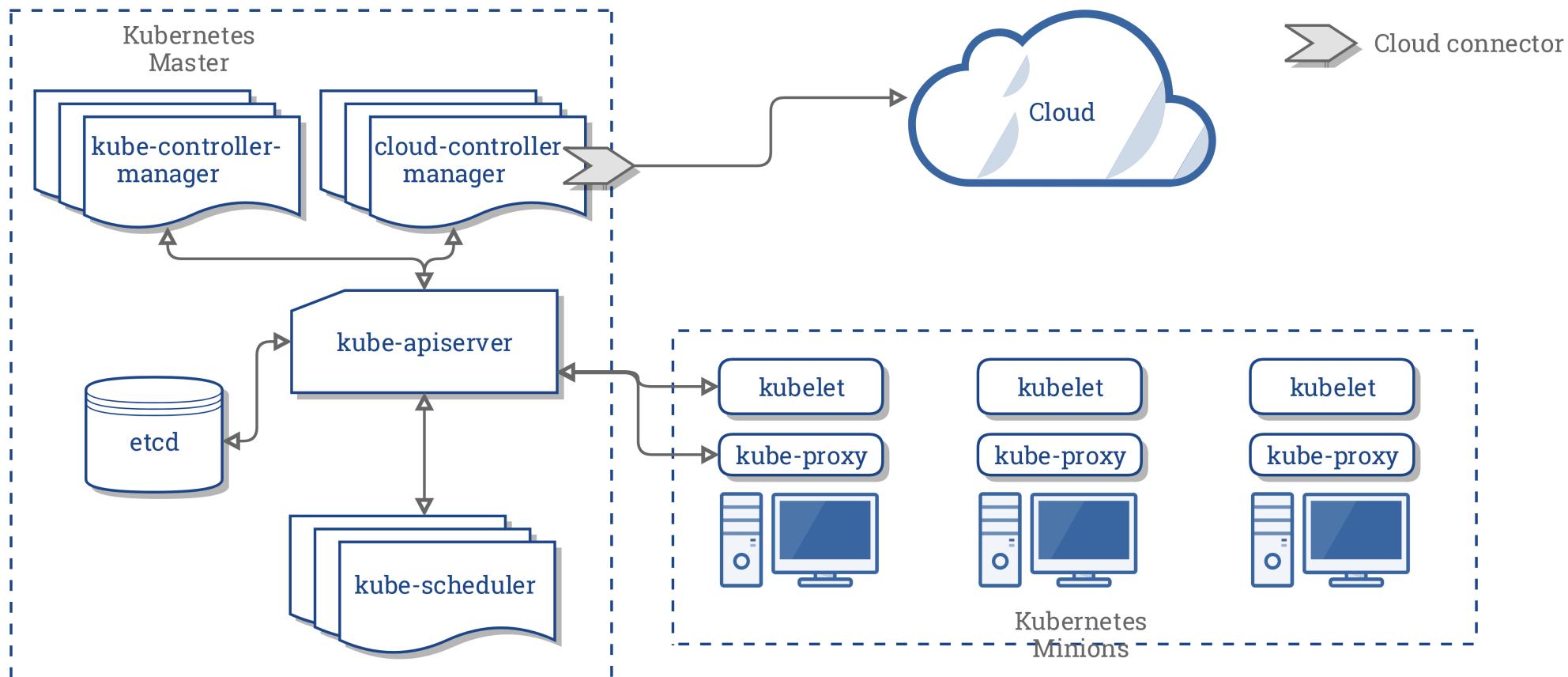
<https://www.ibm.com/cloud/openshift>

Supported?	OpenShift / Kubernetes version	Red Hat OpenShift on IBM Cloud release date	Red Hat OpenShift on IBM Cloud unsupported date
✓	4.3 / 1.16	20 Apr 2020 at 12:00 UTC	April 2021 ↑
!	3.11 / 1.11	1 Aug 2019 at 0:00 UTC	June 2022 ↑



IBM Cloud Provider: CCM

Kubernetes cluster architecture **with** cloud controller manager



Interfaces

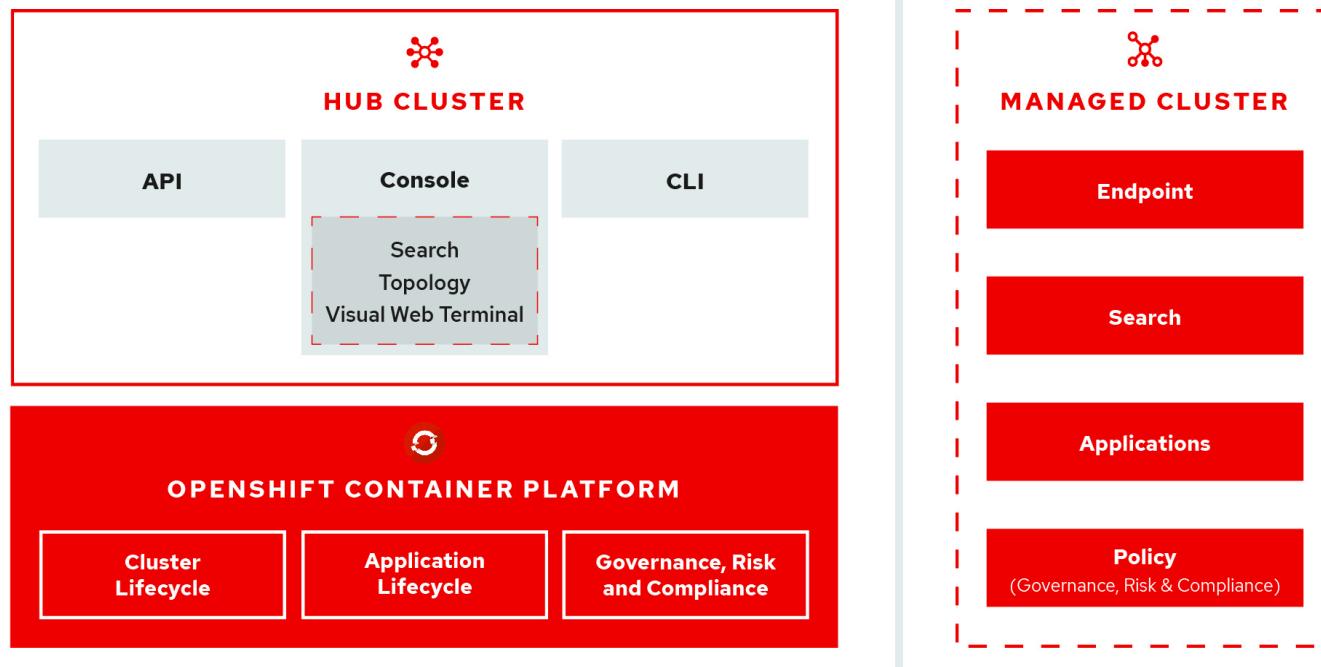
- Load Balancer
 - NLB version 1.0, iptables based, in-cluster network load balancer
 - NLB version 2.0 (beta), IPVS based, in-cluster network load balancer
 - **New:** VPC layer 7 LB
- Instances (i.e. Nodes) and InstancesV2 (new in 1.19)
 - Relies on node bootstrap to setup node labels
- Zones
 - Relies on node bootstrap to setup node labels
- Clusters
 - Not implemented.
- Routes
 - Not implemented. Calico provides routing.

Roadmap

- Open source IBM Cloud Provider
- Improve documentation
- Align build, test and release processes with community

Open-cluster Management

<https://github.com/open-cluster-management/deploy>

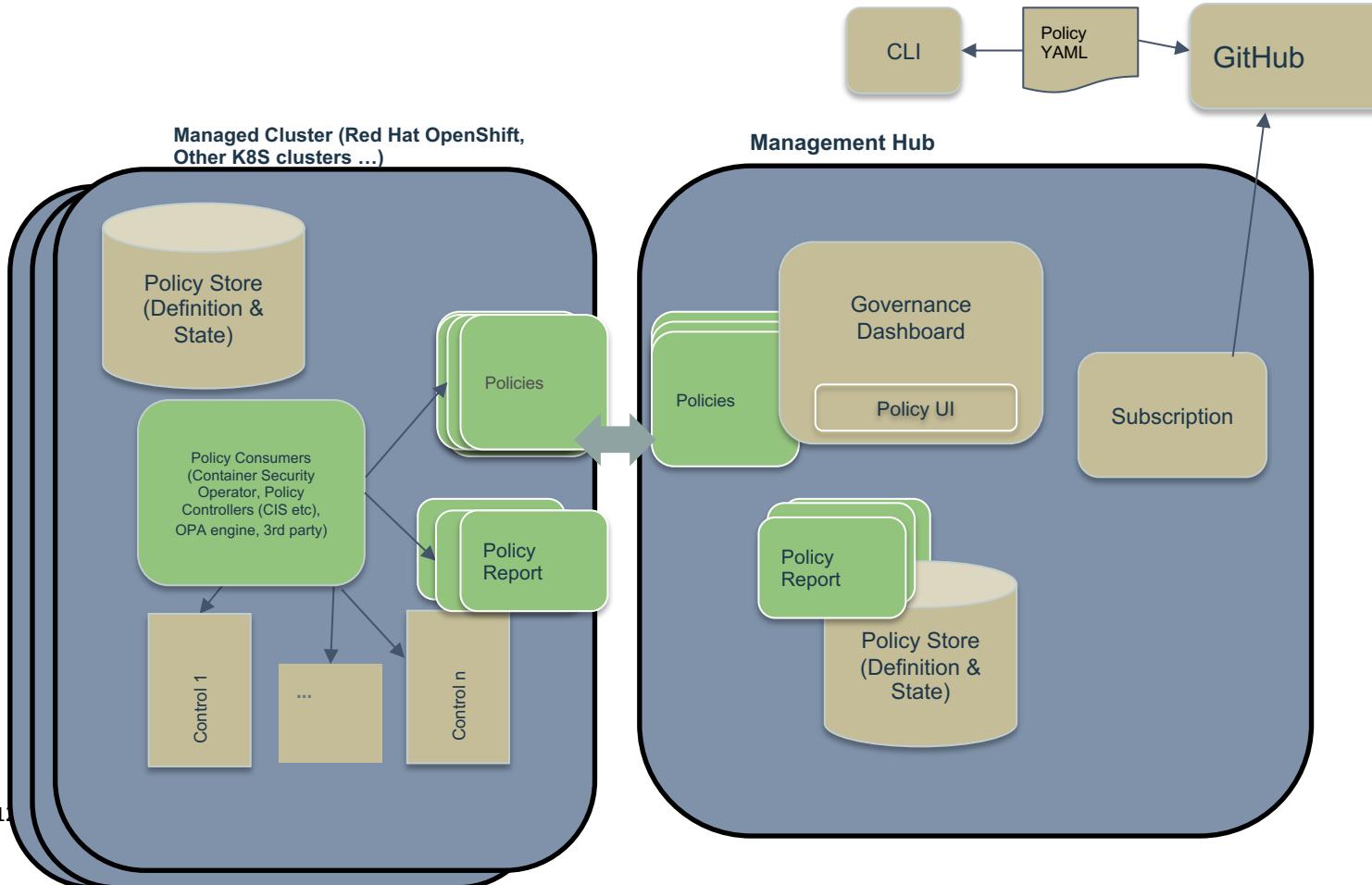


 **Red Hat**
Advanced Cluster
Management
for Kubernetes

- Work across a range of environments, including multiple data centers, private clouds and public clouds that run Kubernetes clusters.
- Easily create Kubernetes clusters and offer cluster lifecycle management in a single console.
- Enforce policies at the target clusters using Kubernetes-supported custom resource definitions.
- Deploy and maintain day-two operations of business applications distributed across your cluster landscape.
- Delivered as part of Redhat Advanced Cluster Management (RHACM) for Kuberenetes - <https://access.redhat.com/products/red-hat-advanced-cluster-management-for-kubernetes/>

Open-Cluster Management – Governance Policies

<https://github.com/open-cluster-management/policy-collection>



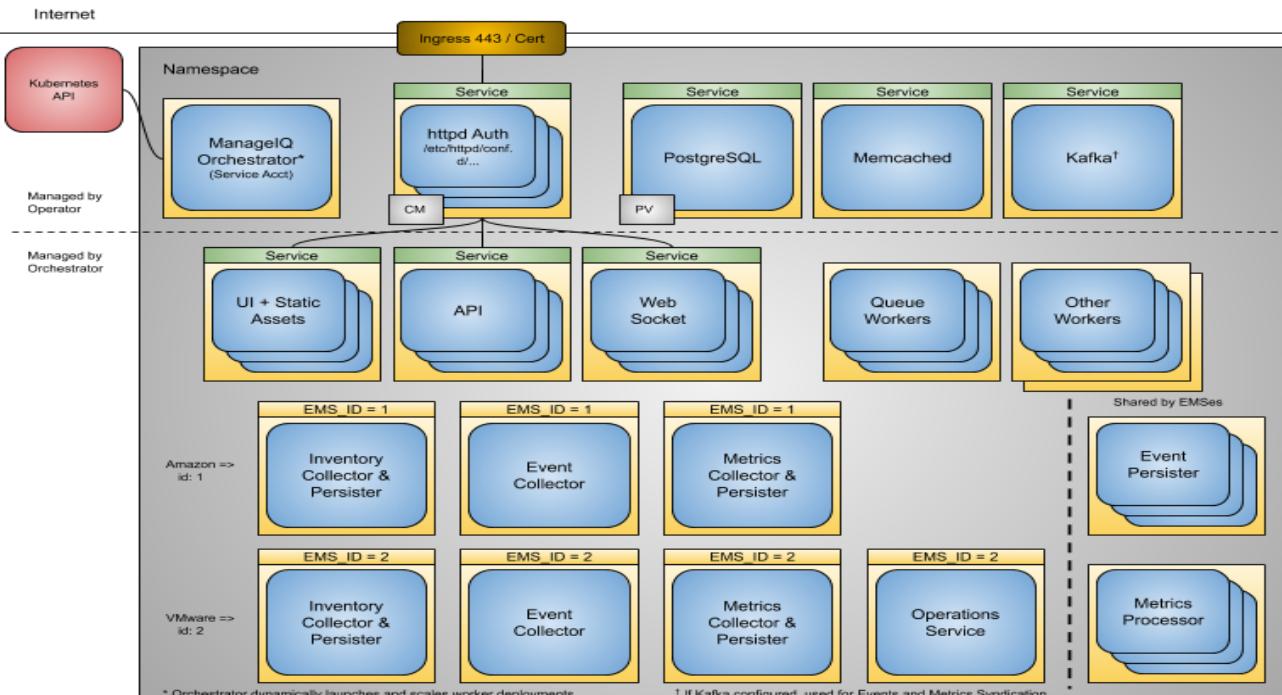
Collaborative Development of Policies

- Open source policy framework, sample policy controllers, and sample policies - Open Cluster Management and ComplianceAsCode community projects
- Customizable annotations within policies to specify one or more compliance standards, control categories and control for each policy
- Ability to integrate policies for controls provided by customers or 3rd party vendors
- Ability to integrate various policy languages including OPA
- Ability to develop policies for all layers of the stack e.g. VMs, containers, middleware, applications, hardware root of trust

ManageIQ – Infrastructure Management

<https://www.manageiq.org/>

ManageIQ is an open source management platform for Hybrid IT. It can manage small and large environments, and supports multiple technologies such as virtual machines, public clouds and containers.



History

- 2006 - ManageIQ Founded
- 2012 - Acquired by Redhat
- 2013 - Red Hat ships CloudForms based on ManageIQ
- 2014 – ManageIQ open-source project launched
- 2019 - IBM acquires Redhat, includes CloudForms in CP4MCM (Virtual Appliance)
- 2020 –
 - Podified Implementation Running on K8S
 - IBM building “blue branded” ManageIQ as a component of CP4MCM

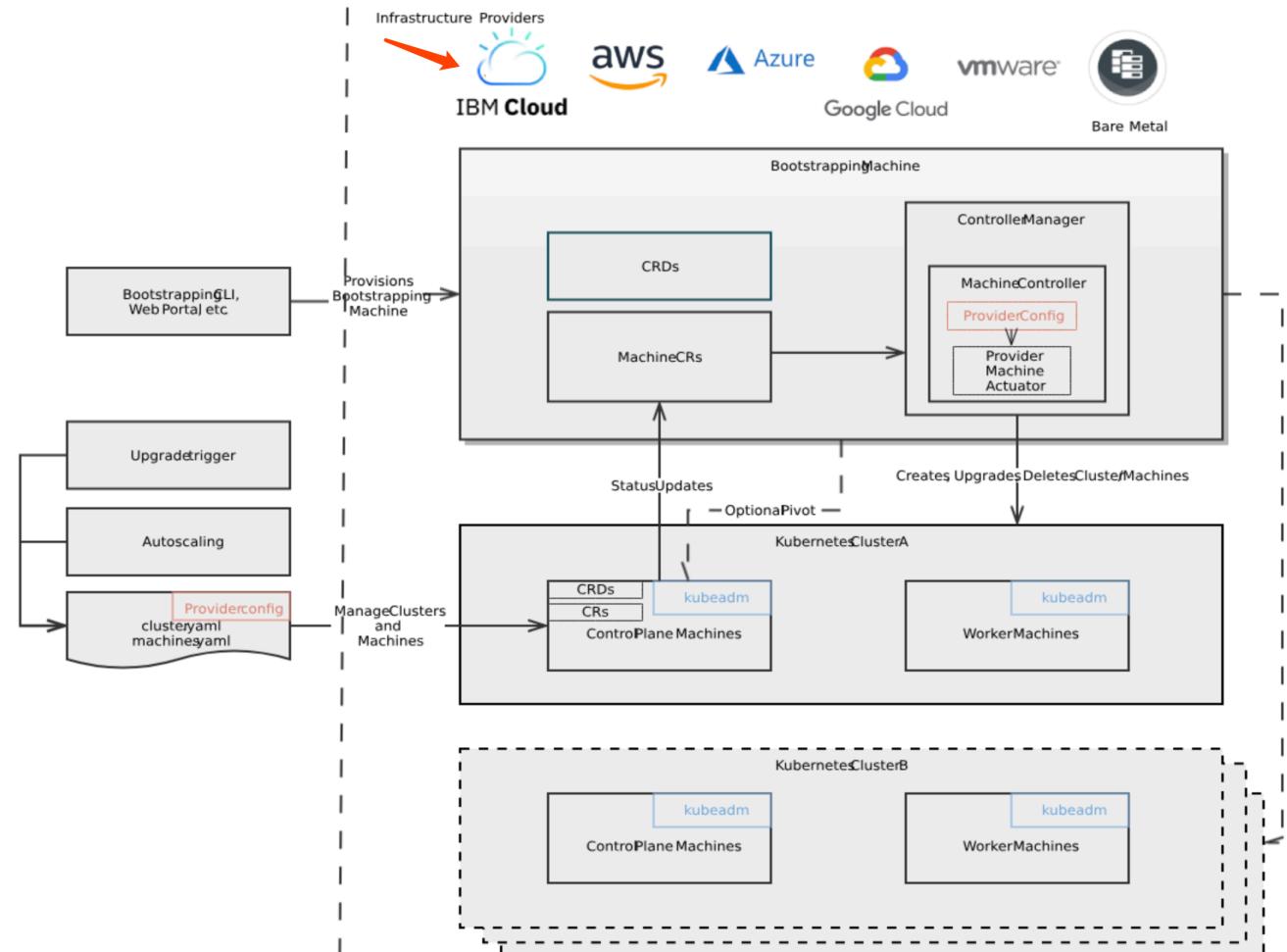
Supported Providers:



SIG Subproject – cluster-api-provider-ibmcloud

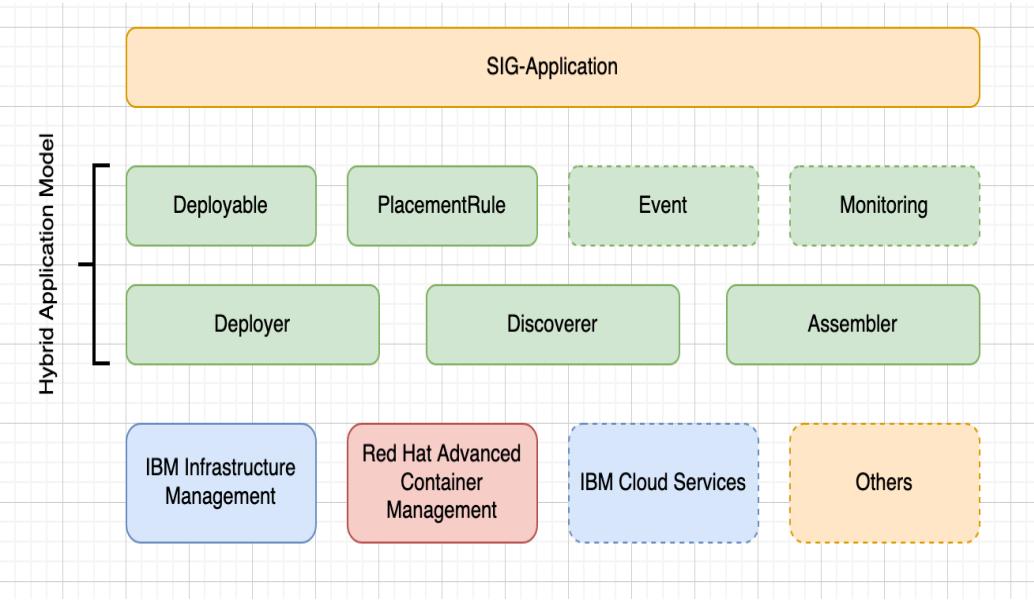
<https://github.com/kubernetes-sigs/cluster-api-provider-ibmcloud>

- Target cluster
 - The declared cluster we intend to create and manage
- Bootstrap/Management cluster
 - The cluster that manages the target cluster
 - Possibly the same cluster
- `clusterctl`
 - Community CLI tool that favors a provider implementation for creating and managing a cluster
- Provider implementation
 - An implementation of the API specific to a cloud (IBM Cloud, Google, OpenStack, etc)

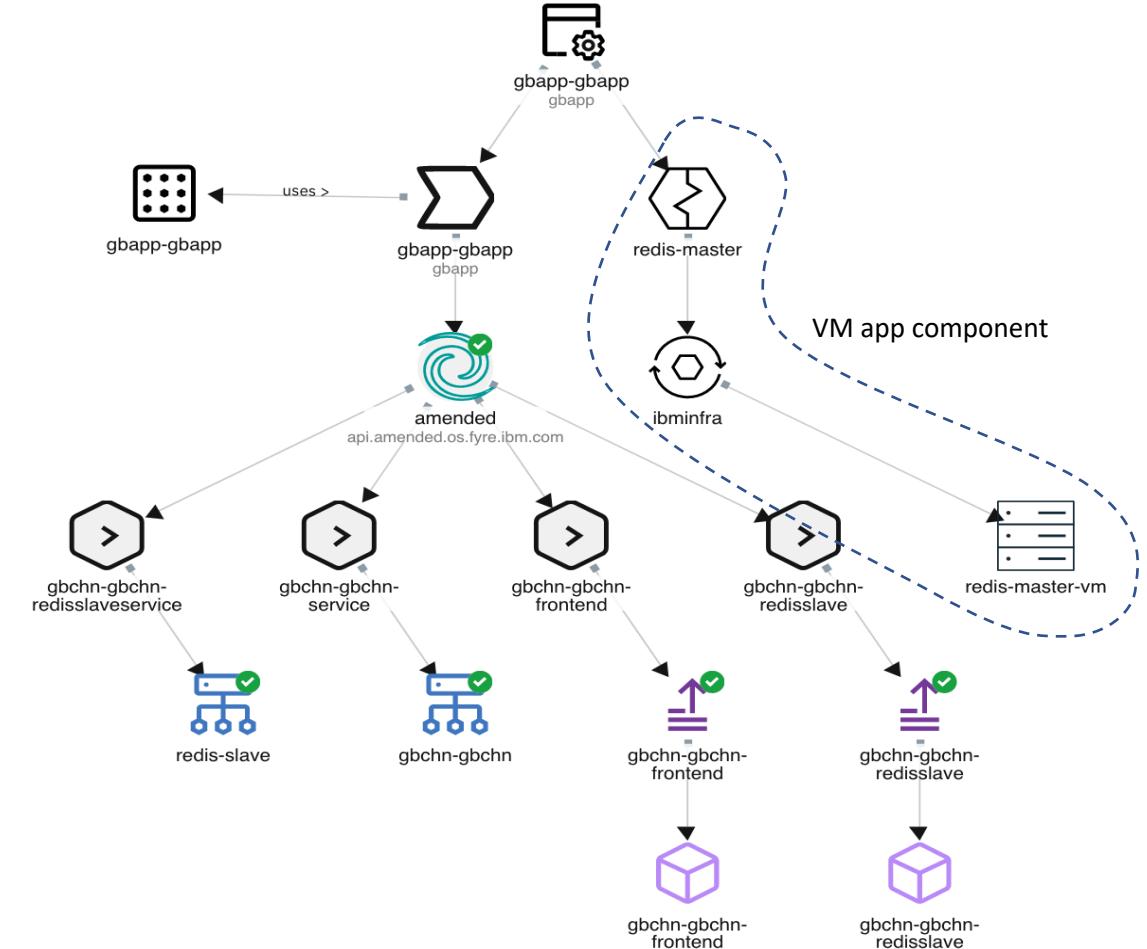


Open Hybrid App Model

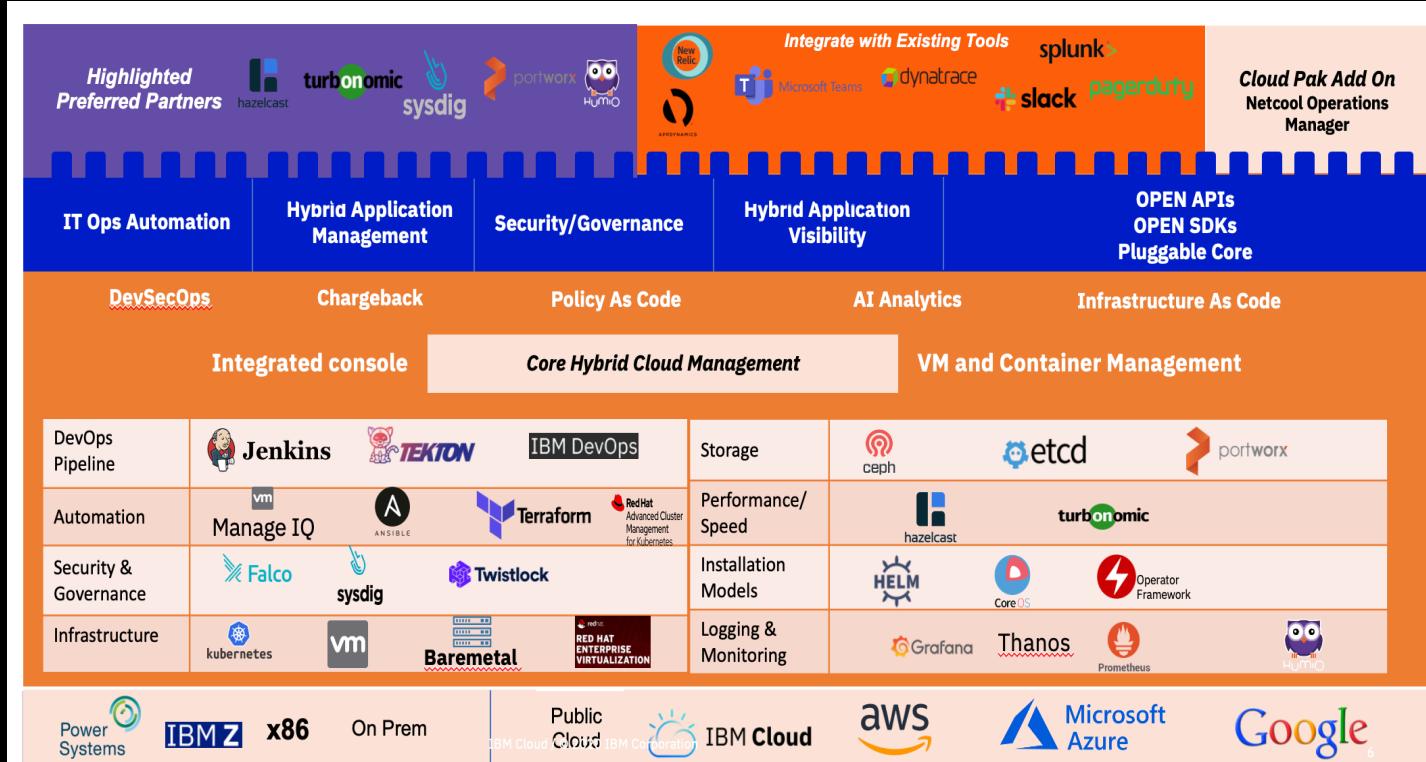
<https://github.com/hybridapp-io>
<https://github.com/hybridapp-io/ham-docs>



- Develop open hybrid application model that bridges containers, VMs, cloud services
- Enable contribution of deployers for other systems (e.g Ansible, PaaS, other Clouds)
- Collaborate to extend to other day-2 hybrid app operations (monitoring, governance, HA/DR)
- Incorporated into CP4MCM as part of offering



IBM Cloud Pak for Multicloud Management



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.



- Cloud Native Kubernetes Implementation
- Use, Contribute and Lead Open Source Projects, no vendor lock-in
- Integrate with Market leading function and vendors
- Leveraging AI for bringing in higher levels of Automation and Intelligence (AIOps)
- Integrated Dev Sec Ops control plane for the Enterprise

Scheduler Extender: Reward-biased learning agent



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<https://github.com/IBM/kube-safe-scheduler>

Problem #1: Certain types of **pods** always fail to be placed on certain **nodes**

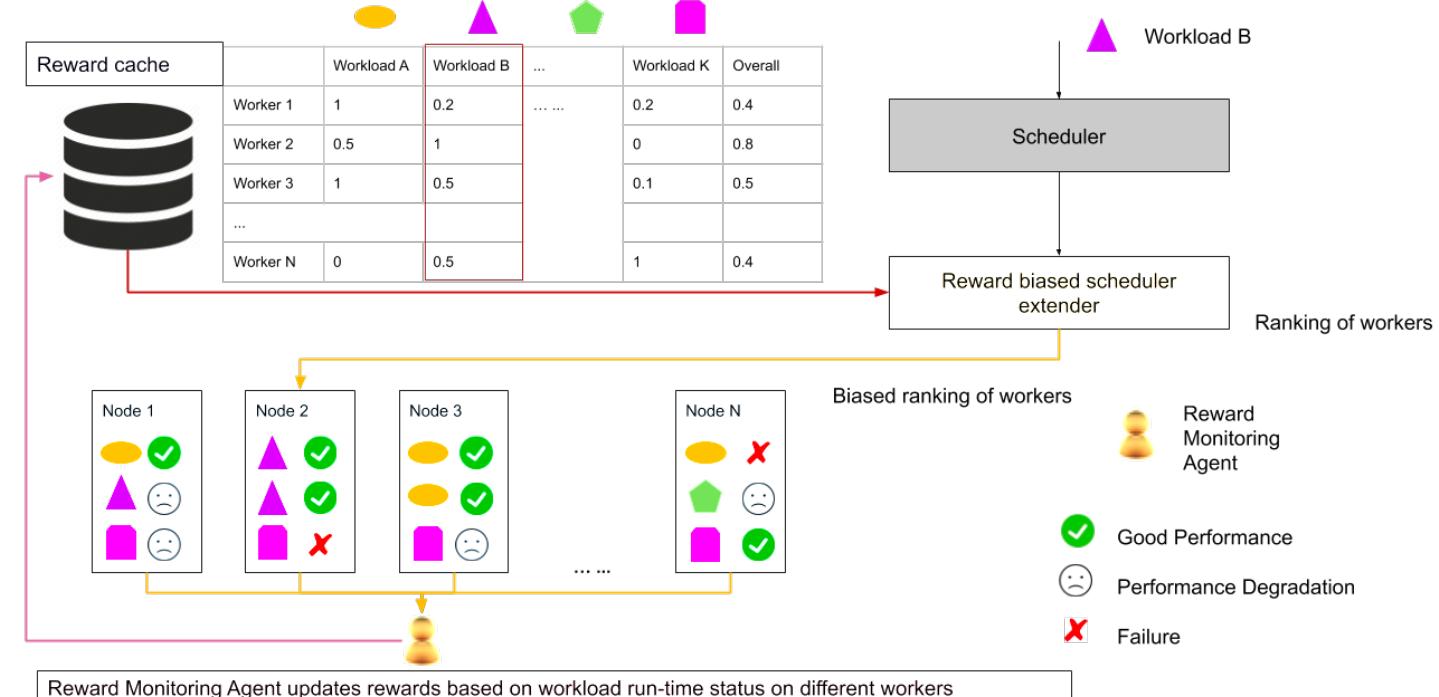
- Cause: Resources needed by pods are not available on nodes (PVC not bound, NAS access revoked, NVIDIA GPU device plugin not installed properly)

Problem #2: Certain types of **pods** always have poor performance on certain **nodes**

- Cause: worker node info impacting the workload performance are not exposed to the scheduler (CPU architecture, clock speed, cache, Network bandwidth, NAS latency, bandwidth , GPU, memory, L2 cache, model, etc.)

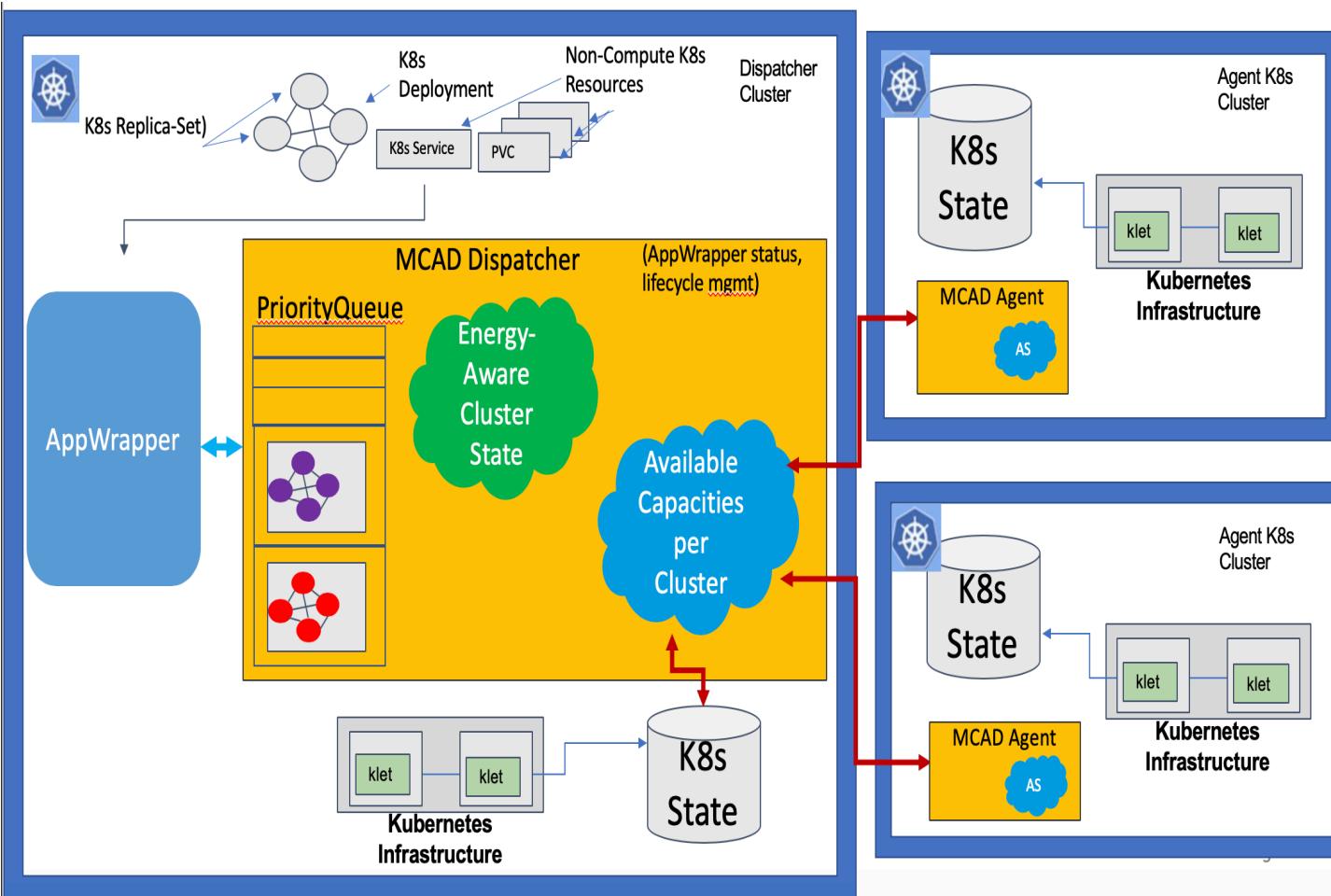
Approach:

- Software framework implementing a reward-biased scheduler extender
- Adopt an idea from reinforcement learning to adaptively learn the failures and/or performance issues of containers and model their runtime performance on nodes as rewards
- Adaptively prevent scheduling pods on nodes that give low rewards



Multi-cluster Dispatcher

<https://github.com/IBM/multi-cluster-app-dispatcher>



- Address challenges of running complex and heterogeneous workloads efficiently on Kubernetes clusters
 - Special focus on **Batch workloads**
 - Provide provisioning and dispatching policies to
 - Maximize the utilization of resources
 - Maximize the performance of applications
 - Provide service differentiation and meet QoS demands of the end customers
- Address resource management gaps at the Kubernetes layer, close to the managed resources
 - Strive to make new capabilities as extensions to Kubernetes, e.g., CRDs and controllers, which can be deployed on top of any Kubernetes cluster



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