

IBM Cloud Private

Multi Cloud Manager



IBM Cloud

IBM provides a choice of cloud adoption models



Choice with consistency



Hybrid integration



DevOps productivity



Powerful, accessible data and analytics



Cognitive solutions



PUBLIC

Maximize on
cloud agility
and
economics



DEDICATED

Public cloud
benefits, with
dedicated
infrastructure



PRIVATE

Behind the
firewall for the
most demanding
workloads

Seamless Experience

Regardless of which combination you choose, you get a single, seamless experience.

Multi-cloud is the key to organizational agility

8 out of 10 committing to Multi-Cloud

71% use 3 or more clouds



Getting new value from
third parties



Extracting value from
your entire business

Containers adoption drives the need for Kubernetes

According to Forrester

2/3

Proportion of organizations who adopted containers that experienced accelerated developer efficiency

3/4

Ratio of companies achieving a moderate to significant increase in application deployment speed

>70%

The amount organizations saved on dev / test costs due to adopting containers

40%

on production costs, while operating

80%

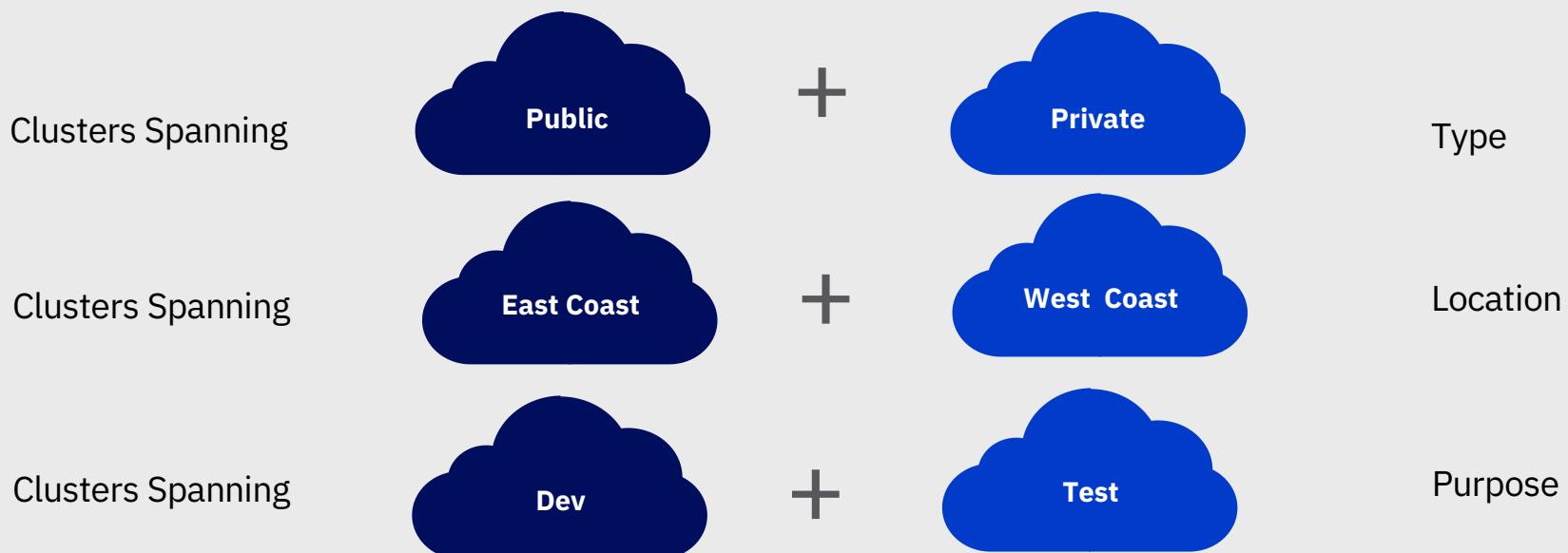
fewer servers

77%

of containers are managed by Kubernetes

Enterprises are deploying multiple Kubernetes clusters

9 out of 10 enterprises adopting Kubernetes, have already deployed multiple clusters



Challenges in managing Multiple Clusters

Visibility

- Where are the failed components?
- Where are my application services running?
- How can I monitor my application across these clusters and clouds?
- How can I manage all these clusters as if they were one big consistent environment?
- How do I monitor usage across clouds?

Governance

- How do I set consistent security policies across these environments ?
- Which clusters are compliant to the regulations and which are not? How can I correct compliance issues?
- How can I manage configuration across this large environment ?
- How can I place workloads based on capacity, policy?

Automation

- How do I deploy applications across these environments?
- How do I move workloads across these environments?
- How can I backup my application running across these environments?
- How do I do Disaster Recovery ?

IBM Cloud Private | Multi Cloud Manager



Simplified
Multi-Cluster
Management



Policy Based
Role &
Compliance
Management



Multi-Cluster
Application
Management



Works across
Public &
Private
Environments



Event &
Service
Management



Integrated
Operational
Tools

Content / Services

App runtimes, Data, Analytics, AI, IoT, Blockchain, Industry services



IBM Watson, IoT, Blockchain

Cloud enabled cognitive services, Internet of Things, Blockchain



IBM Middleware, Data, Analytics and Developer Services

Cloud enabled middleware, messaging, databases, analytics.



Multi Cloud Management Control Plane

- Visibility across clouds and clusters
- Application Centric Management across clouds and clusters (policy, deployments, health, operations)
- Policy based compliance
- Security management

Multi Cloud Manager

Application-centric management across clouds and clusters



Application/Workload Management



Container Management



Infrastructure Management

Multi Cloud & Multi-Cluster environments

- On-Premises
- On Public Cloud IaaS
- On Public Cloud Container Services

IBM Cloud Private

3rd Party Private Cloud

IBM Cloud

3rd Party Public Clouds

ON-PREMISES

OFF-PREMISES

Multicloud Management

Containerized workload is transforming the enterprise

Orchestration is a requirement and Kubernetes is the go-to solution

As adoption of Kubernetes accelerates, a multicloud control plane for management becomes essential

Multi Cloud Manager (MCM) provides **visibility** and **application-centric management** across clouds and Kubernetes clusters

MCM allows control of **cluster sprawl**

Helps ensure your clusters are **secure**, **operating efficiently** and delivering the service levels that applications expect

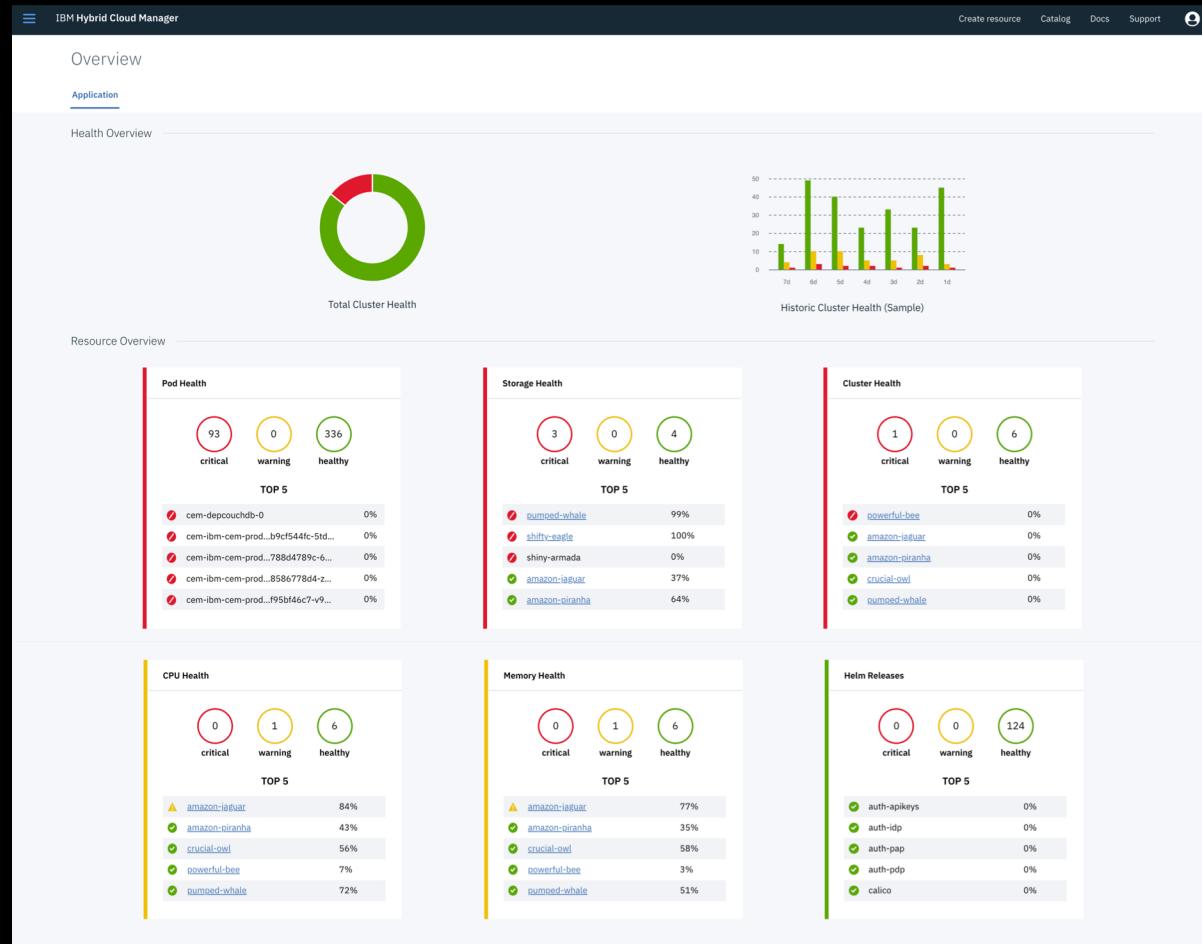
Drives new topologies and landscapes of adoption

Multi Cloud Manager

Overview

Cluster Overview

Quickly view current and historic health and resource statistics for the managed clusters



Cluster Inventory

Using the MCM GUI or CLI query information about all managed clusters

Organize the clusters using labels: cloud providers, geographic regions, data centers, functional purpose

View the health status of pods, nodes, persistent volumes and applications running in those clusters

NAME	LABELS	ENDPOINT	STATUS	NODES	STORAGE	MEMORY
amazon-jaguar	cloud=AWS clusterip=54.219.134.208 datacenter=us-east-1 environment=staging region=US vendor=ICP	launch	✓ Healthy	1	175 GiB	15.57 GiB
amazon-piranha	cloud=AWS clusterip=13.56.155.250 datacenter=us-west-1 environment=dev region=US vendor=ICP	launch	✓ Healthy	1	102 GiB	15.57 GiB
crucial-owl	cloud=IBM clusterip=169.53.167.21 datacenter=toronto environment=test owner=marketing region=CA runtime=kubernetes vendor=ICP	launch	✓ Healthy	3	487 GiB	46.72 GiB
powerful-bee	cloud=IBM clusterip=169.45.195.169 environment=prod location=raleigh region=US vendor=ICP	launch	✗ Failed	3	65 GiB	31.62 GiB
pumped-whale	cloud=IBM clusterip=108.168.204.171 datacenter=dallas environment=prod region=US vendor=ICP	launch	✓ Healthy	1	157 GiB	15.57 GiB
shifty-eagle	cloud=IBM clusterip=9.21.58.11 datacenter=toronto environment=test region=CA vendor=Redhat-OpenShift	launch	✓ Healthy	3	5 GiB	46.25 GiB
shiny-armada	cloud=IBM datacenter=tor-1 environment=dev region=CA vendor=IKS	-	✓ Healthy	3	0 B	44.65 GiB

True Multi-Cloud, Multi-Cluster capability



Works across clouds

- Seamlessly manage clusters across multiple Private Datacenters, Public IaaS, Cloud Kubernetes services
- Consistent firewall traversal methodology
- Common management policies across environments



Integrated Views across all your clusters and environments

- Look at cluster health, capacity, pods running/failed, app versions across clusters
- Quickly see where the problems are
- Organize clusters— e.g. dev/prod/location/org

The screenshot shows the 'Clusters' page of the IBM Cloud Private interface. It displays a table with columns for NAME, LABELS, ENDPOINT, STATUS, NODES, STORAGE, MEMORY, PODS, DEPLOYMENTS, and SERVICES. There are five entries listed:

NAME	LABELS	ENDPOINT	STATUS	NODES	STORAGE	MEMORY	PODS	DEPLOYMENTS	SERVICES
crucial-owl	clusterip=9.37.239.99,location=toronto,provider=IBM,purpose=test,runtime+kubernetes	launch	healthy	6	377 GiB	46.19 GiB	127	47	63
howling-wolf	location=toronto,provider=IBM,purpose=prod	launch	healthy	3	65 GiB	46.72 GiB	74	31	50
pumped-white	clusterip=9.37.219.208,location=raleigh,provider=IBM,purpose=test,runtime+kubernetes	launch	healthy	6	377 GiB	46.19 GiB	161	41	57
roaring-lion	location=toronto,provider=IBM,Redhat,purpose=prod	launch	healthy	6	102 GiB	164.88 GiB	96	43	72
soaring-eagle-os	datacenter=markham,location=toronto,provider=openshift,purpose=dev	launch	healthy	3	5 GiB	46.25 GiB	23	9	17

The screenshot shows the 'Pods' page of the IBM Hybrid Cloud Manager interface. It displays a table with columns for NAME, LABELS, STATUS, NAMESPACE, and CLUSTER. There are 13 entries listed, many of which are highlighted in blue, indicating they belong to the 'stocktrader' namespace. The table includes several annotations for specific pods:

NAME	LABELS	STATUS	NAMESPACE	CLUSTER
db2-stock-trader-lbm-db2oltp-dev-5077c4d4-pr2w	app=db2-stock-trader-lbm-db2oltp-dev	Running	stocktrader	crucial-owl
db2-stock-trader-lbm-db2oltp-dev-5077c4d4-qquw5	app=db2-stock-trader-lbm-db2oltp-dev	Running	stocktrader	pumped-white
loyalty-level-699c94958e-79g88	app=loyalty-level solution=ibm-advanced-server-dev-1.1.0 version=v1	Running	stocktrader	pumped-white
messaging-8577fc46c-kn7nx	app=messaging solution=ibm-advanced-server-dev-1.1.0	Running	stocktrader	pumped-white
mq-stock-trader-lbm-mq-0	QM_IDENTITYER-mq app=ibm-advanced-server-dev-1.1.0 chart=ibm-advanced-server-dev-1.1.0 heritage-Tiller mq solution=ibm-advanced-server-dev-1.1.0 version=v1	Running	stocktrader	crucial-owl
mq-stock-trader-lbm-mq-0	standard.kubernetes.io/pod.name=ibm-mq ibm-mq solution=ibm-advanced-server-dev-1.1.0 version=v1	Running	stocktrader	pumped-white
mq-stock-trader-lbm-mq-0	app=ibm-mq chart=ibm-advanced-server-dev-1.1.0 heritage-Tiller mq solution=ibm-advanced-server-dev-1.1.0 version=v1	Running	stocktrader	pumped-white
notification-twitter-75b7c6cd5-46nc6	app=notification solution=ibm-advanced-server-dev-1.1.0 version=v1	Running	stocktrader	pumped-white
portfolio-8f7c5757d-sndbc	app=portfolio solution=ibm-advanced-server-dev-1.1.0 version=v1	Running	stocktrader	pumped-white
redis-stock-trader-7cb6bf6cf-2mf5h	app=redis-stock-trader	Running	stocktrader	crucial-owl
redis-stock-trader-7cb6bf6cf-d4kg2	app=redis-stock-trader	Running	stocktrader	pumped-white
stock-quote-6d7c7abc5-c5mdhn	app=stock-quote solution=ibm-advanced-server-dev-1.1.0 version=v1	Running	stocktrader	pumped-white
trader-564995f46d-2zqj	app=trader solution=ibm-advanced-server-dev-1.1.0 version=v1	Running	stocktrader	pumped-white
tradr-7978dc44c5-6cdv7	app=tradr solution=ibm-advanced-server-dev-1.1.0 version=v1	Running	stocktrader	pumped-white

The only platform with Policy, Compliance and Application Management



Policy Based Role & Compliance Management

- Set and enforce policies for Security, Applications, infrastructure (Auto enforcement at cluster level)
- Check compliance against deployment parameters, configuration and policies
- Automatically remediate violations

```
$ mcmctl get compliance -f policies/comp2.yaml --show-evidence --override-autoremediate
COMPLIANCE RESULTS
1: Cluster:          bxrcluster
Compliance Check Name: complianceTemplate
Compliance Item: CheckPodLimits Status: FAILED
Description: All Pods must have resource limits
1  Compliance Rule Set Name: CheckPodLimits
2  Compliance Subject: pod
3  Compliance will be checked for v1 namespaces: default,
...
16  Compliance will be checked for v1 pods: nginx-deployment-569477d6d8-pt756-default,
    nginx-deployment-569477d6d8-m7wdq in namespace - default : is compliant for Labels
17  ***Container - nginx : is not compliant for ImageName
18  Container - nginx : is compliant for ImagePullPolicy
19  ***Container - nginx : is not compliant for Resource Specs
20  Pod - nginx-deployment-569477d6d8-pt756 in namespace - default : is compliant for Labels
21  ***Container - nginx : is not compliant for ImageName
22  Container - nginx : is compliant for ImagePullPolicy
23  ***Container - nginx : is not compliant for Resource Specs
24  ...
25  Pods in the compliance scope were NOT REMEDIATED. AutoRemediate Option: informational
```



Multi-Cluster Application Management

- Deploy applications across clusters based on policy
- Automatically update monitoring dashboard based on deployment
- Understand failure dependencies – identify system affected if a component (shared) fails

The screenshot shows the IBM Hybrid Cloud Manager interface with the 'Applications' tab selected. At the top, there's a search bar and navigation links for 'Create resource', 'Catalog', 'Docs', and 'Support'. Below the header is a table listing six application components:

NAME	COMPONENTS	DEPENDENCIES	LABELS	ANNOTATIONS	DASHBOARD	ACTION
fundtrader	fundsrv(pumped-whale) redis(pumped-whale)	odm(pumped-whale) mq(pumped-whale) db2(pumped-whale)	Application="fundtrader" instance="fundtrader"	description=Fund Trader Application type=instance	Launch Grafana	Generate Dashboard
futurestrader	futurressrv(crucial-owl) redis(futures(crucial-owl))	odm(pumped-whale) mq(crucial-owl) db2(pumped-whale)	Application="futurestrader" instance="futurestrader"	description=Futures Trader Application type=instance	Launch Grafana	Generate Dashboard
players	player(crucial-owl) player1(crucial-owl)	redis(stock-trader(crucial-owl)) mq(stock-trader(crucial-owl)) db2(stock-trader(crucial-owl))	Application="players" instance="players"	description=Sample Application for deploy type=instance	Launch Grafana	Generate Dashboard
stapp	trader(crucial-owl)	redis(stock-trader(crucial-owl)) mq(stock-trader(crucial-owl)) db2(stock-trader(crucial-owl))	Application="stapp" instance="stapp"	description=Stock Trader Application type=instance	Launch Grafana	Generate Dashboard
warrantstrader	warrantssrv(pumped-whale) redis-warrants(pumped-whale)	odm(pumped-whale) mq(pumped-whale) db2(pumped-whale)	Application="warrantstrader" instance="warrantstrader"	description=Warrants Trader Application type=instance	Launch Grafana	Generate Dashboard

Application Centric Management

Modelling of an application topology such that it can represent the different components and dependencies an application has and the relationship among those components and dependencies

Application Instance consists of topology nodes of different kinds and expresses the relationships between these nodes: Application, ApplicationService, DatabaseService, MessageQueue, CacheService...

A node in the topology has a scope which defines which cluster this node is associated with, a set of properties and can optionally describe a set of relationships with other nodes

Deploying Workload

Extends the ICP Catalog to be able to target multiple clusters for deployment and through this capability complements existing CI/CD

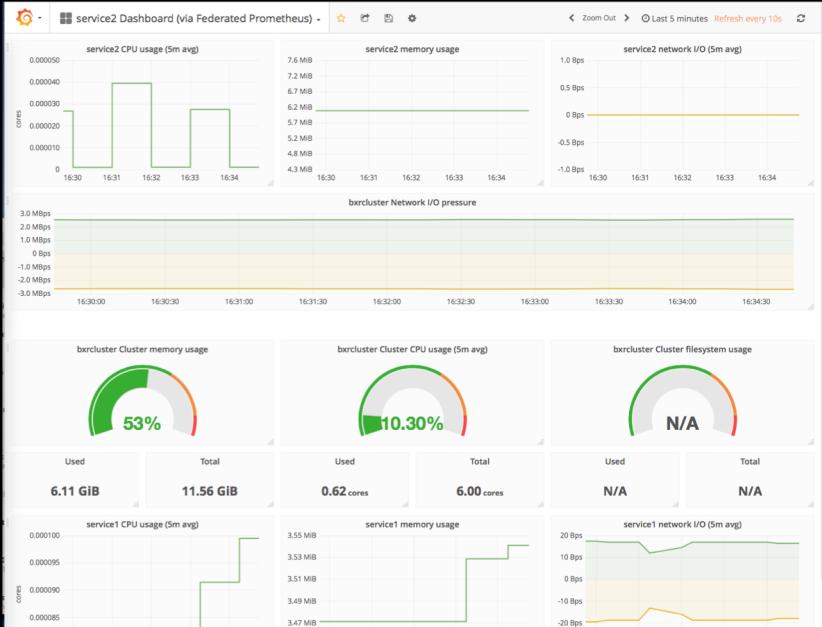
The screenshot shows the IBM Hybrid Cloud Manager interface. In the top navigation bar, there are links for 'Create resource', 'Catalog', 'Docs', and 'Support'. On the left, there's a sidebar with a menu icon and the text 'Helm Charts'. Below it, there's a search bar labeled 'Search items' and a section titled 'Deploy your applications and install software' with a 'hybrid-cluster-manager' card. The card has a 'default' button. A modal window titled 'INSTALL HELM CHART' is open, showing the 'trader' chart. Inside the modal, there are fields for 'Release Name' (set to 'trader-monkey') and 'Target Clusters'. The 'Target Clusters' dropdown contains three options: 'amazon-jaguar', 'amazon-piranha', and 'crucial-owl'. At the bottom of the modal are 'Cancel' and 'Install' buttons.

Dynamically build management dashboards for your microservice applications



Integrated Operations Management Tools

- Logging, Monitoring and Event across applications and infrastructure
- Integration with Service Management tools
- Automated dashboard creation for applications based upon deployment across clusters
- Automatically update monitoring dashboard based on deployment



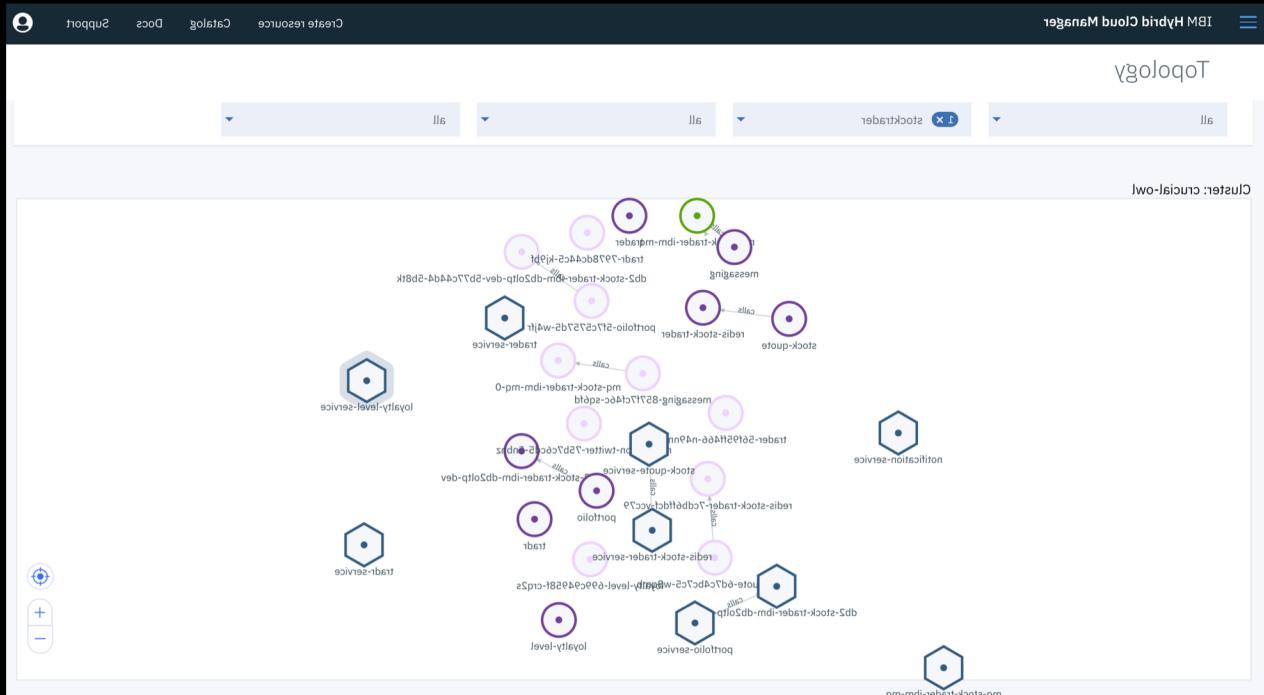
Multi-cluster Operations and Visibility

Aggregate and filter data across clusters

Understand how pods inter-communicate

View application topologies

Navigate into individual clusters consoles for more detailed views



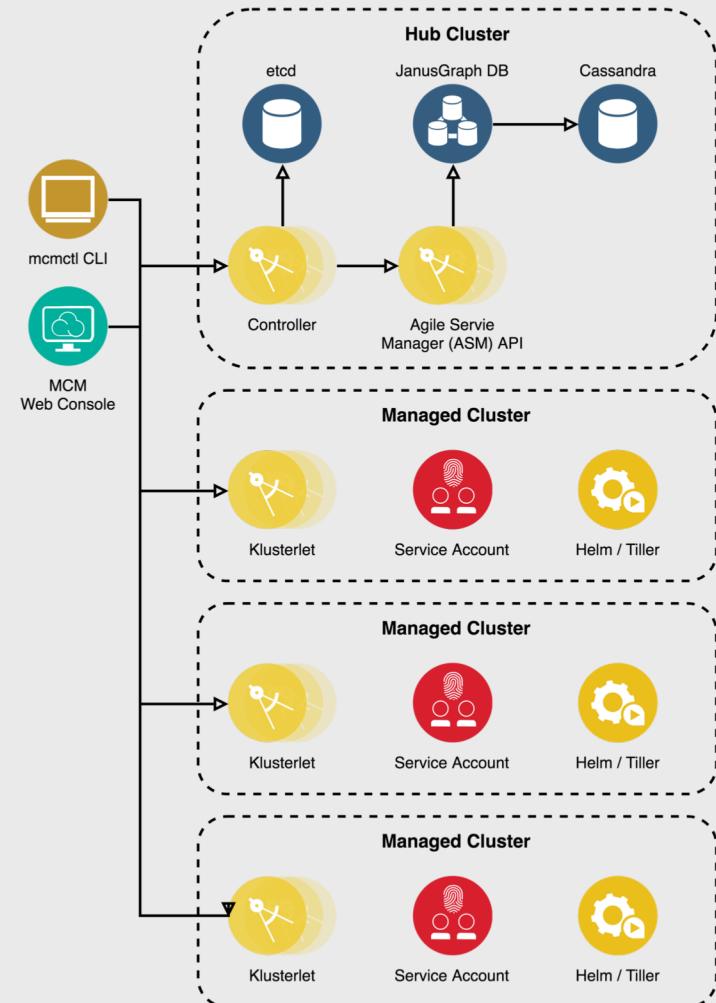
Multi Cloud Manager

Architecture

Multi Cloud Manager Architecture

MCM Controller (MCMM)

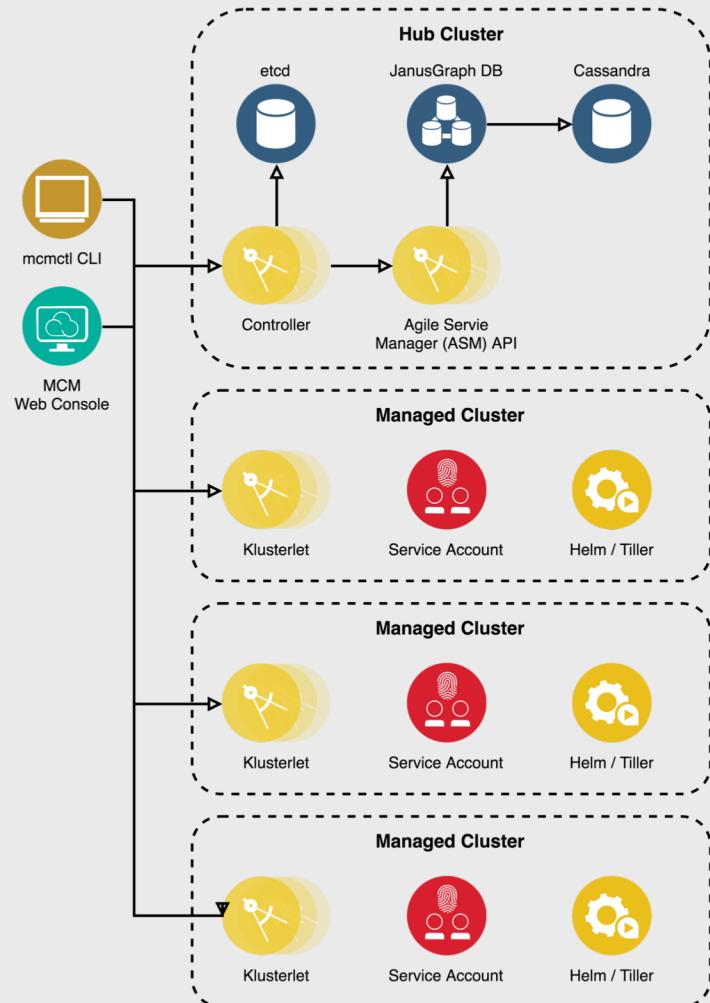
- Central Manager
- Must be run in an ICP 2.1.0.3 (or higher) cluster
- Aggregates information from multiple clusters using asynchronous work request model
- Maintains cluster and application in the JanusGraph DB
- Uses etcd to store state of work requests and results from multiple clusters
- Provides a set of REST APIs



Multi Cloud Manager Architecture (continued)

MCM Klusterlet (MCMK)

- Serves as the agent or klusterlet
- Deployed to each managed cluster
- Functions similarly to the Kubernetes kubelet that manages the nodes inside of a cluster
- Manages its cluster on behalf of the MCMM receiving requests and returning results
- Communication is unidirectional with the connection originating from the MCMK
- Connects to various services within the cluster in order to perform operations including the Kubernetes API service, the Helm/Tiller Service, and WeaveScope for container topology



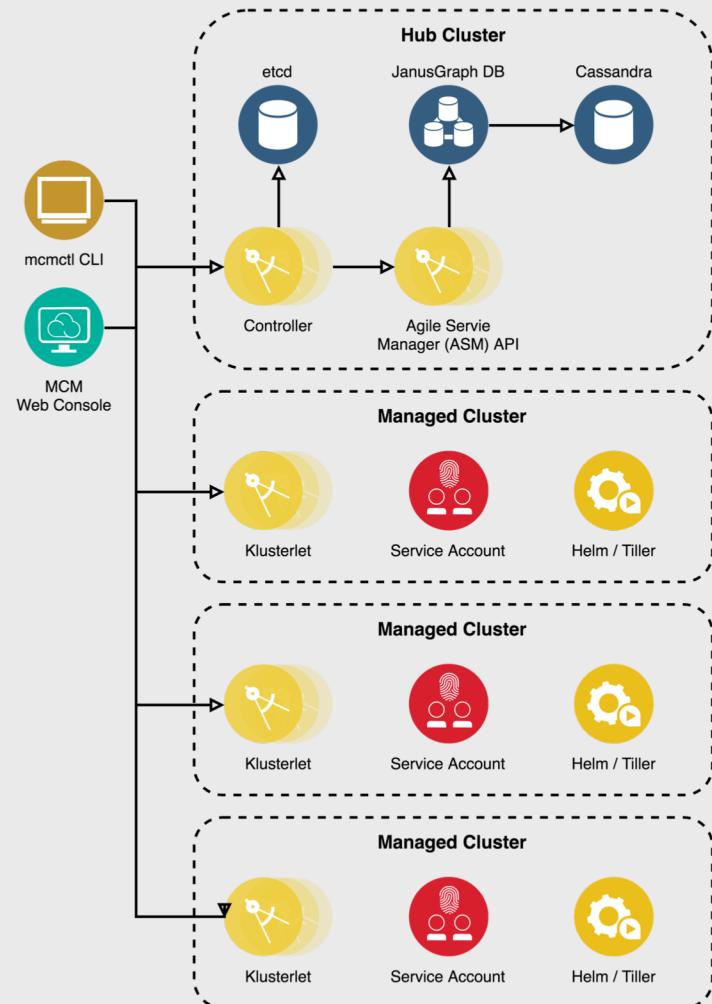
Multi Cloud Manager Architecture (continued)

mcmctl

- CLI for MCM
- Provides access to the functions of the MCM including interacting with clusters, pods or other cluster resources, deploying helm charts, and initiating policy checks

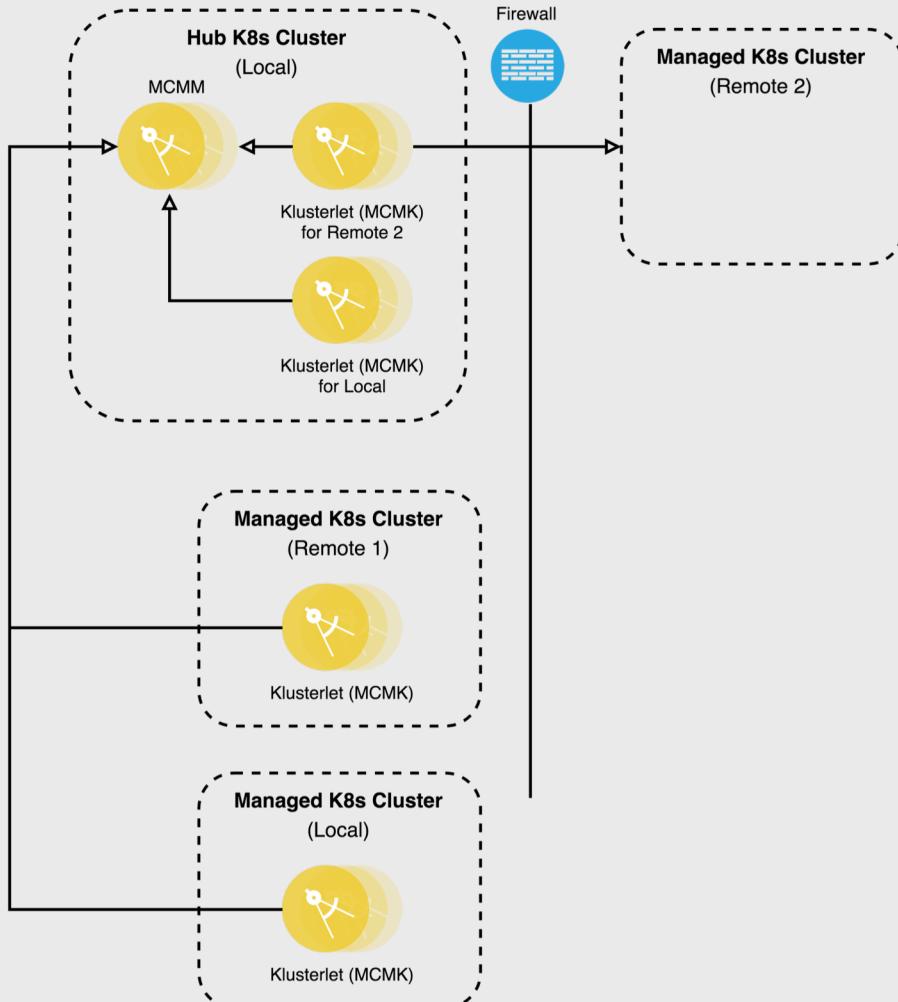
MCM Web Console

- Integrated with the IBM Cloud Private Console on the central management ICP cluster
- Contains a separate GUI API (not drawn) that provides a flexible query layer on top of the MCMM REST APIs



Multi Cloud Manager Secure Connections

- MCMM components must be deployed into an IBM Cloud Private Cluster (2.1.0.3 or newer)
- MCMK is ideally deployed as a pod inside the managed cluster
- MCMK auto-discovers the connection to Kubernetes API server or Helm/Tiller API
- If outbound connection to the MCMM is not allowed it is possible to run the MCMK in the as the MCMM (or any other node) and connect remotely to the managed cluster
- Remote management is drawn in the diagram for the Remote 2 cluster



Learn More

Get insights into how private cloud meets the evolving needs of computing
→ Register for the IBM Cloud Private for Dummies eBook

Speed app development and modernization with IBM Cloud Private
IBM Cloud Private is a private cloud platform for developing and running workloads locally. It is an integrated environment that enables you to design, develop, deploy and manage on-premises, containerized cloud applications behind your firewall. It includes the container orchestrator Kubernetes, a private image repository, a management console and monitoring frameworks.

Watch the video (4:04)

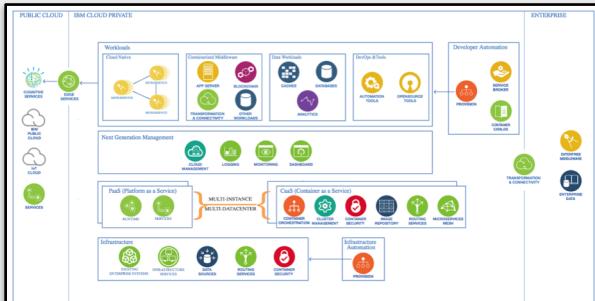
What is private cloud?
Private cloud is a cloud-computing model run solely for one organization. It can be managed internally or externally by a third party. Private cloud offers the benefits of a public cloud, including rapid deployment and scalability, ease of use and elasticity, but also provides greater control, increased performance, predictable costs, tighter security and flexible management options. Customize it to your unique needs and security requirements.

Watch the video (3:03)

Home Page

- Private cloud overview
- Intro videos
- IBM Cloud Private for Dummies book

<http://ibm.biz/ICP-Home>



Garage Method

- Reference architectures
- Best practices

<http://ibm.biz/ICP-Garage>

Management and Platform
IBM Cloud Private
Fast. Flexible. Enterprise-grade.

IBM Cloud Private is a private cloud platform for developing and running workloads locally. You can quickly experience the power and ease of IBM Cloud Private with demo videos and a guided, interactive test drive. Or, you can reserve your own instance and test it out with one of two in-depth tutorials. The first tutorial will walk you through deploying a microservices application, and the second will show you how to use Jenkins to continuously integrate and deliver Kubernetes deployments on IBM Cloud Private.

Test Drive IBM Cloud Private ↓
Deep Dive into IBM Cloud Private ↓

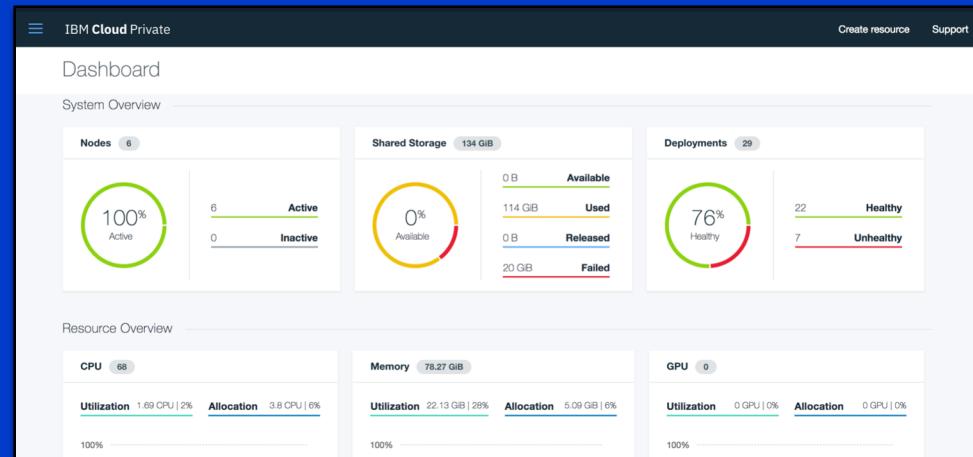
Digital Technical Engagement

- Guided demos
- Proof of Technology

<http://ibm.biz/ICP-DTE>

Try IBM Cloud Private

Free Community Edition



<http://ibm.biz/Try-IBMCLOUDPRIVATE>

