

IBM

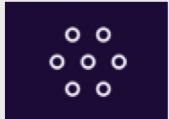
# IBM Cloud Private

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

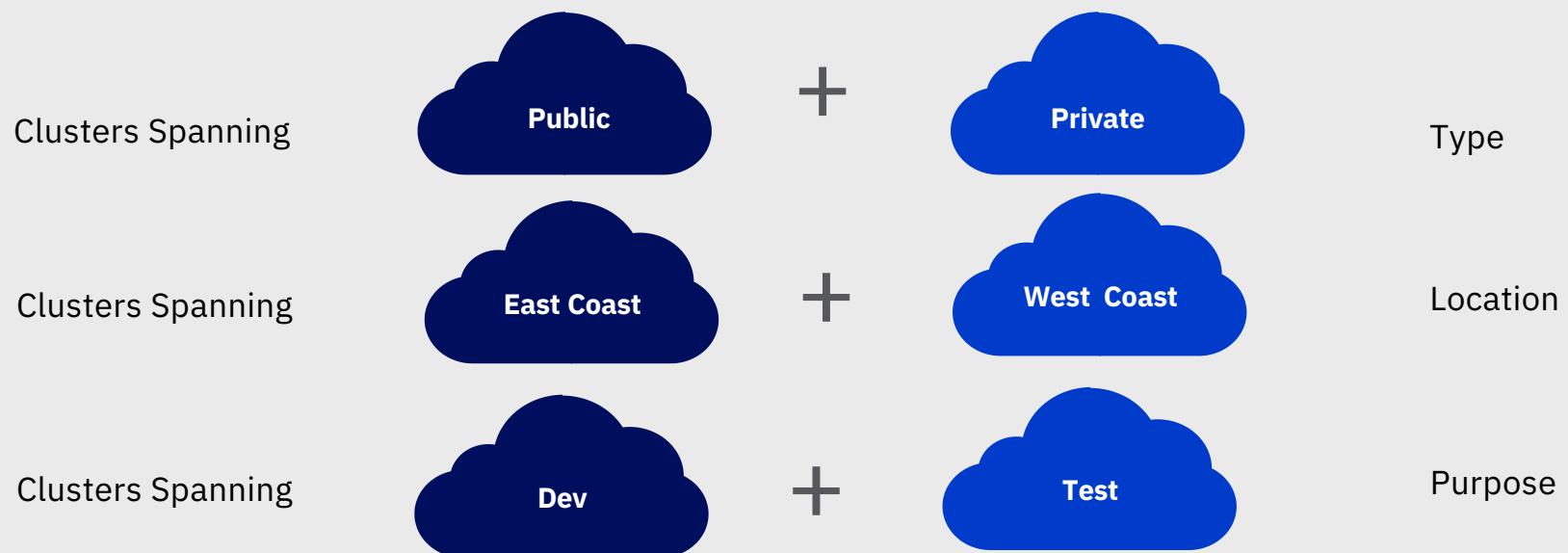
**80%** fewer servers

**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



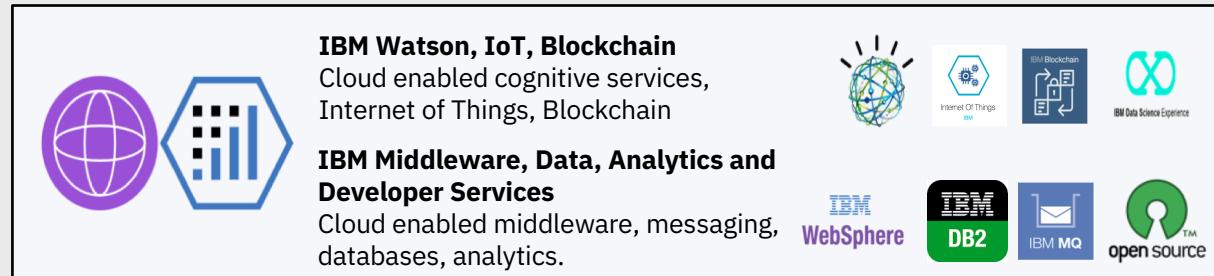
Event &  
Service  
Management



Integrated  
Operational  
Tools

## Content / Services

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



## 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

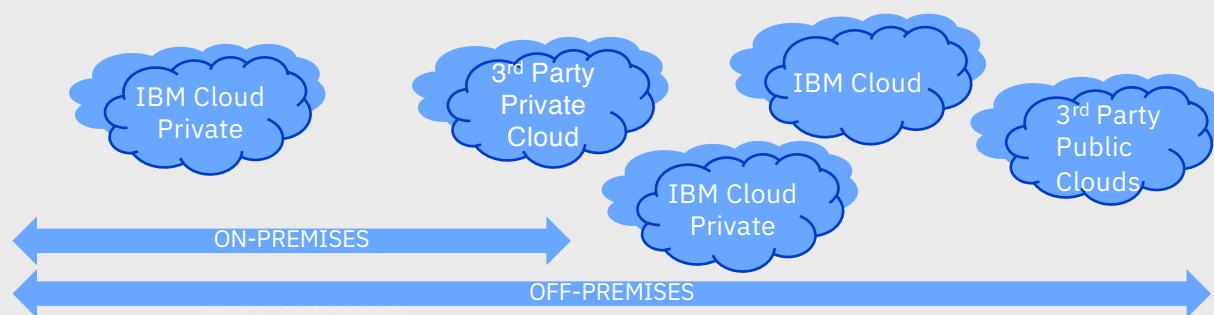
## Multi Cloud Manager

Application-centric management across clouds and clusters



## Multi Cloud & Multi-Cluster environments

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



# 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

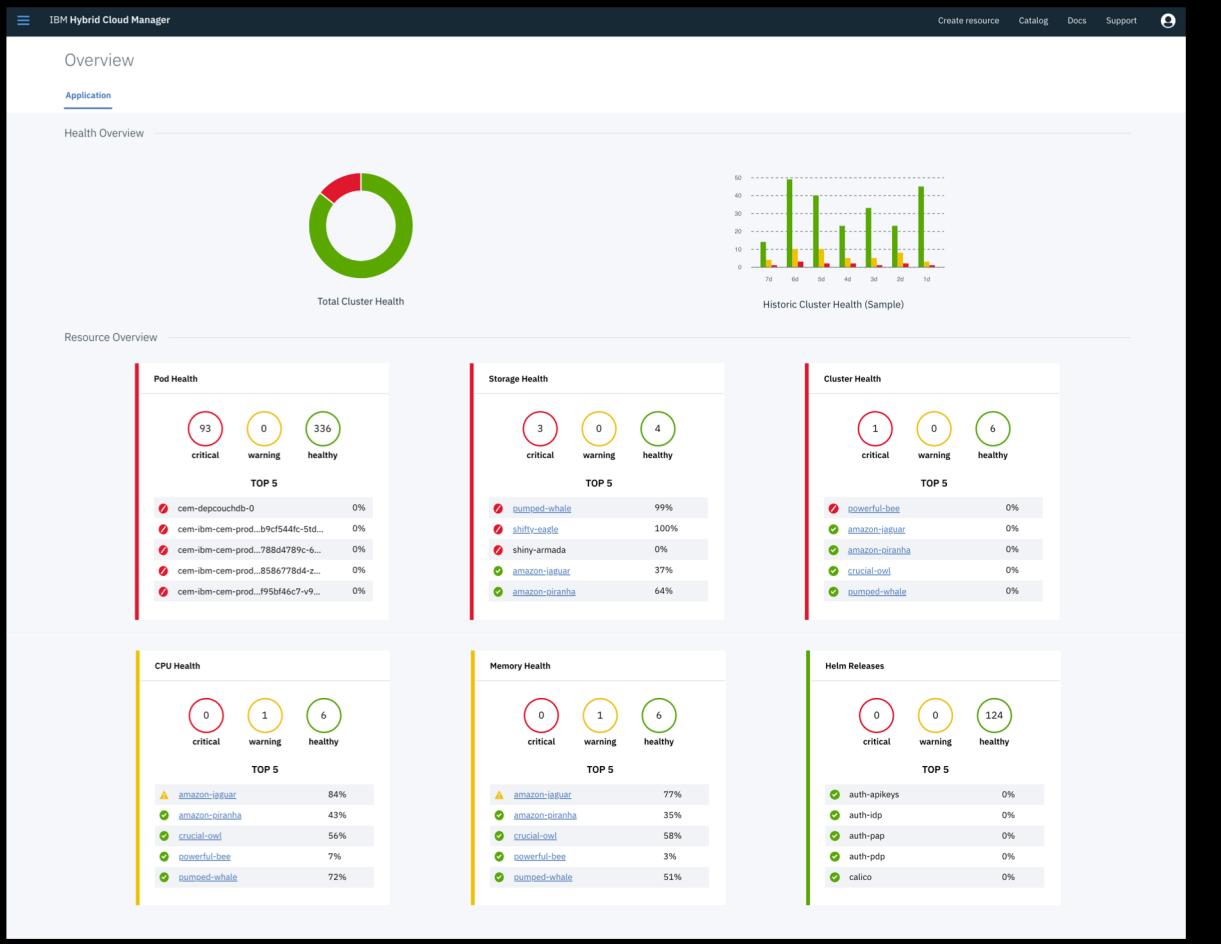
Drives new topologies and landscapes of adoption

# **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

The screenshot shows the 'Clusters' page in the IBM Hybrid Cloud Manager interface. The page title is 'Clusters' and the top navigation bar includes links for 'Create resource', 'Catalog', 'Docs', 'Support', and a user icon.

The main content area displays a table of cluster details. The table has columns: NAME, LABELS, ENDPOINT, STATUS, NODES, STORAGE, and MEMORY. A search bar at the top left of the table allows filtering by items per page (set to 20) and provides a search function.

The table lists seven 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	<a href="#">launch</a>	<span>Healthy</span>	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	<a href="#">launch</a>	<span>Healthy</span>	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	<a href="#">launch</a>	<span>Healthy</span>	3	487 GiB	46.72 GiB
powerful-bee	cloud=IBM clusterip=169.45.185.169 environment=prod location=raleigh region=US vendor=ICP	<a href="#">launch</a>	<span>Failed</span>	3	65 GiB	31.62 GiB
pumped-whale	cloud=IBM clusterip=108.168.204.171 datacenter=dallas environment=prod region=US vendor=ICP	<a href="#">launch</a>	<span>Healthy</span>	1	157 GiB	15.57 GiB
shifty-eagle	cloud=IBM clusterip=9.21.58.11 datacenter=toronto environment=test region=CA vendor=Redhat-Openshift	<a href="#">launch</a>	<span>Healthy</span>	3	5 GiB	46.25 GiB
shiny-armada	cloud=IBM datacenter=tor-1 environment=dev region=CA vendor=IKS	-	<span>Healthy</span>	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

Clusters										
IBM Cloud Private										
Search items										
NAME	LABELS	ENDPOINT	STATUS	NODES	STORAGE	MEMORY	PODS	DEPLOYMENTS	SERVICES	
crucial-owl	cluster-type=37.239.99.location=toronto.provider=IBM,purpose=test,run-time=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-whale	cluster-type=37.239.208.location=raleigh.provider=IBM,purpose=test,run-time=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	166.88 GiB	96	43	72	
soaring-eagle-0s	datacenter=markham,location=toronto.provider=openshift,purpose=dev	launch	healthy	3	5 GiB	46.25 GiB	23	9	17	

Pods			
IBM Hybrid Cloud Manager			
Create resource Catalog Docs Support			
Search items			
NAME	LABELS	STATUS	NAMESPACE
db2-stock-trader-ibm-db2oltp-dev-5b77c44d6-prn2w	app=db2-stock-trader,ibm-db2oltp-dev	Running	stocktrader
db2-stock-trader-ibm-db2oltp-dev-5b77c44d4-qwd5	app=db2-stock-trader,ibm-db2oltp-dev	Running	stocktrader
loyalty-level-699f94058b-79g88	app=loyalty-level,solution=stock-trader,version=v1	Running	stocktrader
messaging-6577c44dc-kn7rx	app=messaging,solution=stock-trader,version=v1	Running	stocktrader
mq-stock-trader-ibm-mq-0	QM_IDENTIFIER=ibm-mq-stock-trader,app=ibm-mq-stock-trader,chart=ibm-mqadvanced-server-dev-1.1.0,heritage=Tiller,release=ibm-mq-stock-trader,storage=ibm-mqadvanced-server-dev-1.1.0	Running	stocktrader
mq-stock-trader-ibm-mq-0	QM_IDENTIFIER=ibm-mq-stock-trader,app=ibm-mq-stock-trader,chart=ibm-mqadvanced-server-dev-1.1.0,heritage=Tiller,release=ibm-mq-stock-trader,storage=ibm-mqadvanced-server-dev-1.1.0	Running	stocktrader
notification-twitter-75b7cbedf9-46nc6	app=notification,solution=stock-trader,version=v1	Running	stocktrader
portfolio-5f75757bf5-ndzdc	app=portfolio,solution=stock-trader,version=v1	Running	stocktrader
redis-stock-trader-7cd8bfdfc2-mf5h	app=redis-stock-trader	Running	stocktrader
redis-stock-trader-7cd8bfdfc2-d4kg2	app=redis-stock-trader	Running	stocktrader
stock-quote-6d7c4bc7c5-zmdbn	app=stock-quote,solution=stock-trader	Running	stocktrader
trader-5af95f8464-s2djq	app=trader,solution=stock-trader,version=v1	Running	stocktrader
trade-7978c644c5-6cdv7	app=trade,solution=stock-trader,version=v1	Running	stocktrader

# 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

```
$ mmctl get compliance -f policies/comp2.yaml --show-evidence --override-autoremediate

COMPLIANCE RESULTS
1: Cluster: bxcluster
Compliance Check Name: complianceTemplate1
Compliance Item: CheckPodLimits Status: FAILED
Compliance Item: All Pods must have resource limits
Compliance Subject: pod
Compliance will be checked for v1 namespaces: default,
.....
m7wdq:default,
16 Compliance will be checked for v1 pods: nginx-deployment-569477d6d8-
nginx-deployment-569477d6d8-pt756:default
17 Pod = nginx-deployment-569477d6d8-m7wdq in namespace = default : is compliant for Labels
18 Container = nginx : is compliant for ImageName
19 Container = nginx : is compliant for ImageFullPolicy
20 ****Container - nginx : is not compliant for Resource Specs
21 Pod = nginx-deployment-569477d6d8-pt756 in namespace = default : is compliant for Labels
22 Container = nginx : is not compliant for ImageName
23 Container = nginx : is compliant for ImageFullPolicy
24 ****Container - nginx : is not compliant for Resource Specs
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 dashboard. The top navigation bar includes 'Create resource', 'Catalog', 'Docs', and 'Support'. The main area displays a table of applications with columns: NAME, COMPONENTS, DEPENDENCIES, LABELS, ANNOTATIONS, DASHBOARD, and ACTION. The table lists six applications: fundtrader, futuretrader, players, stapp, and warrantstrader. Each application has associated components like 'redis-pumped-whale' and 'db2-pumped-whale', and dependencies like 'redis-stock-trader[crucial-owl]'. The 'DASHBOARD' column contains links to 'Launch Grafana' and 'Generate Dashboard' (which is highlighted with a blue box). The 'ACTION' column contains three-dot menu icons.

NAME	COMPONENTS	DEPENDENCIES	LABELS	ANNOTATIONS	DASHBOARD	ACTION
fundtrader	fundsrv[pumped-whale] redis-fund[pumped-whale]	odm[pumped-whale] mq[pumped-whale] db2[pumped-whale]	Application="fundtrader" instance="1"	description=Fund Trader Application type=instance	<a href="#">Launch Grafana</a>	<a href="#">⋮</a>
futuretrader	futuresrv[crucial-owl]	odm[pumped-whale] mq[crucial-owl]	Application="futuretrader" instance="1"	description=Futures Trader Application type=instance	<a href="#">Launch Grafana</a>	<a href="#">⋮</a>
players	player2[crucial-owl] player1[crucial-owl]		Application="players" instance="1"	description=Sample Application for deploy type=instance	<a href="#">Launch Grafana</a>	<a href="#">⋮</a>
stapp	trader[crucial-owl]	redis-stock-trader[crucial-owl] mq-stock-trader[crucial-owl] db2-stock-trader[crucial-owl]	Application="stapp" instance="1"	description=Stock Trader Application type=instance	<a href="#">Launch Grafana</a>	<a href="#">⋮</a>
warrantstrader	warrantsrv[pumped-whale] redis-warrants[pumped-whale]	odm[pumped-whale] mq[pumped-whale] db2[pumped-whale]	Application="warrantstrader" instance="1"	description=Warrants Trader Application type=instance	<a href="#">Launch Grafana</a>	<a href="#">⋮</a>

# Application Centric Management

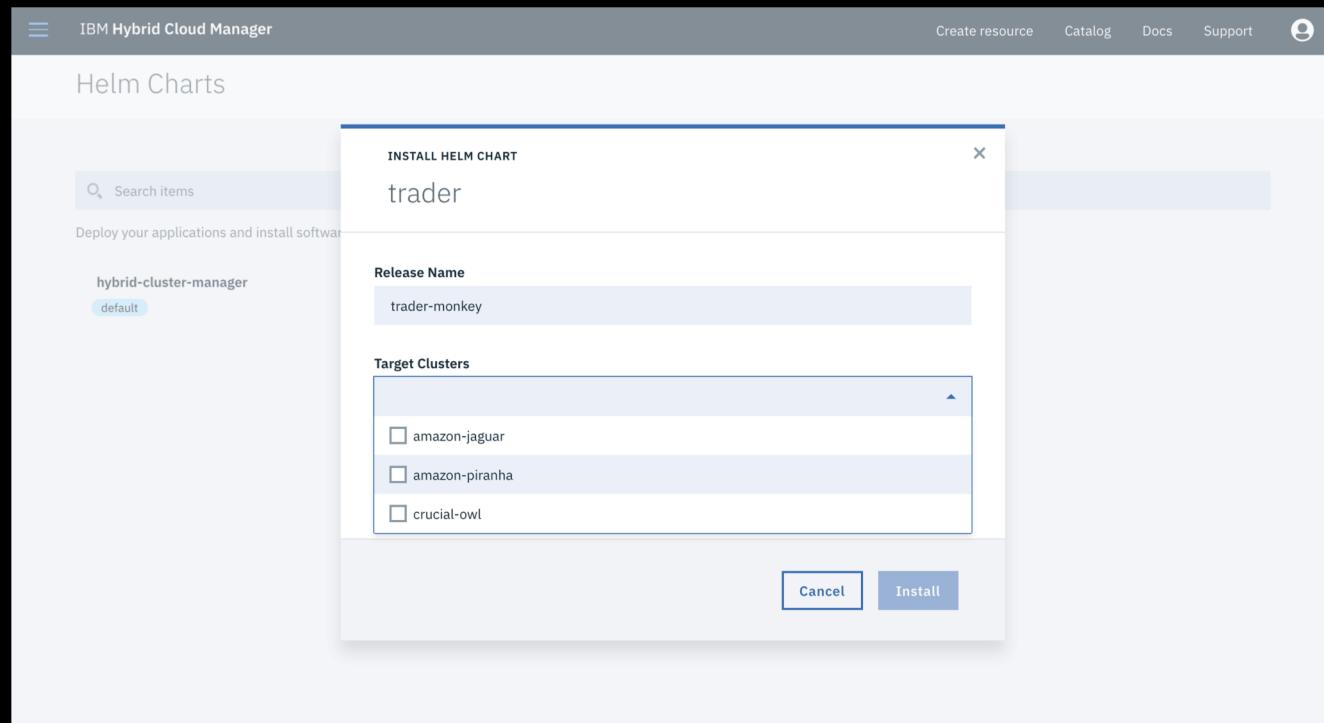
Modelling of an application topology such that it can represent the different components and dependencies an application has and the relationship among those components and dependencies

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

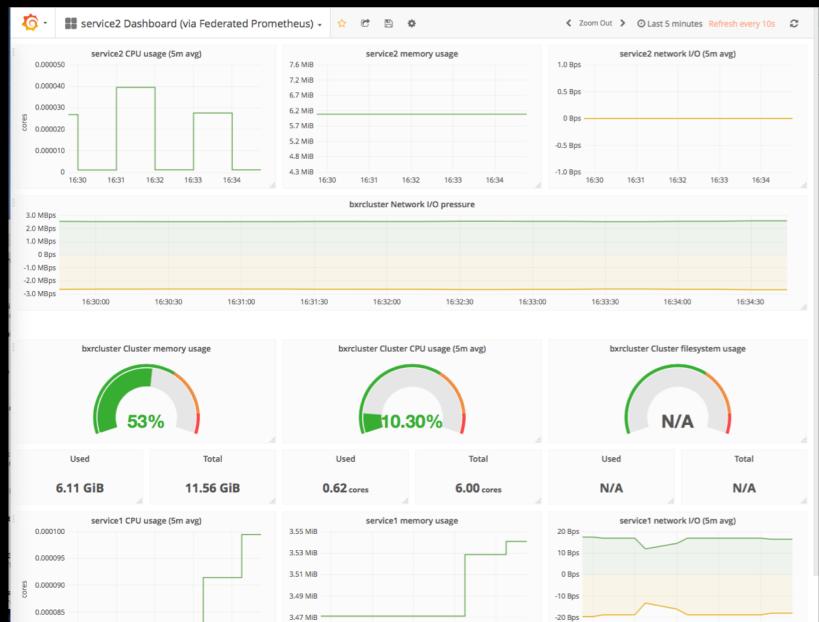


## Dynamically build management dashboards for your microservice applications



### 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



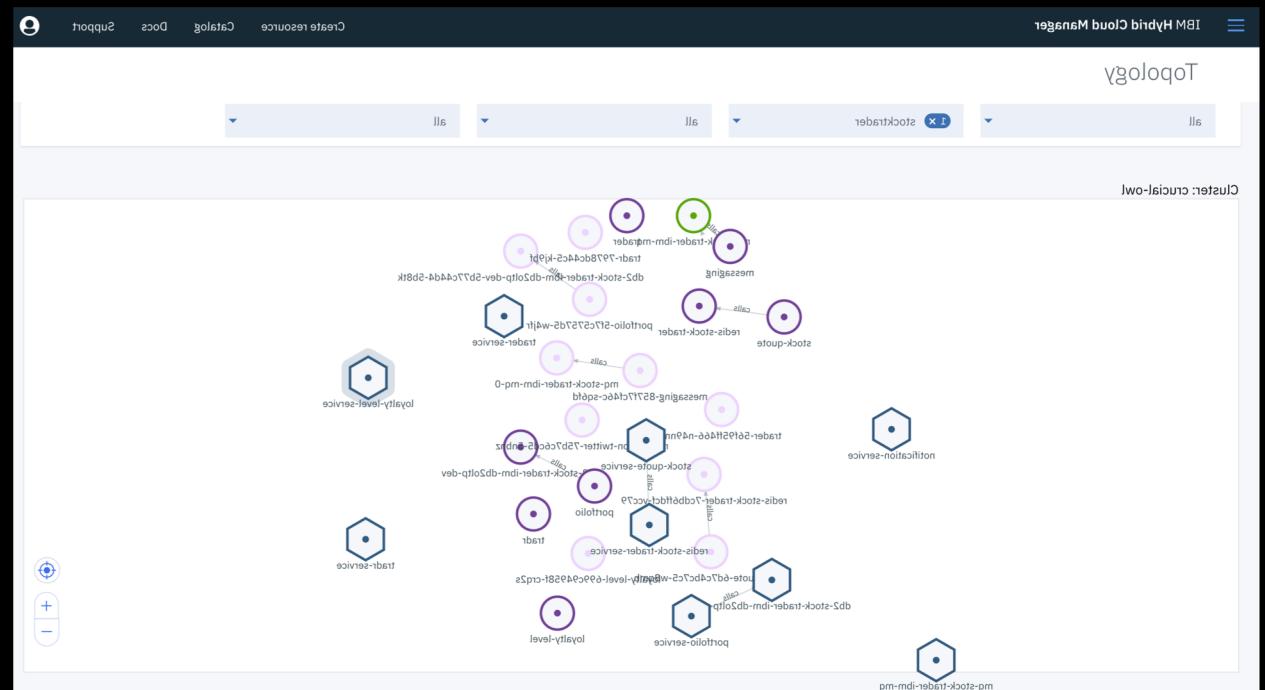
# Multi-cluster Operations and Visibility

Aggregate and filter data across clusters

Understand how pods inter-communicate

View application topologies

Navigate into individual clusters consoles for more detailed views



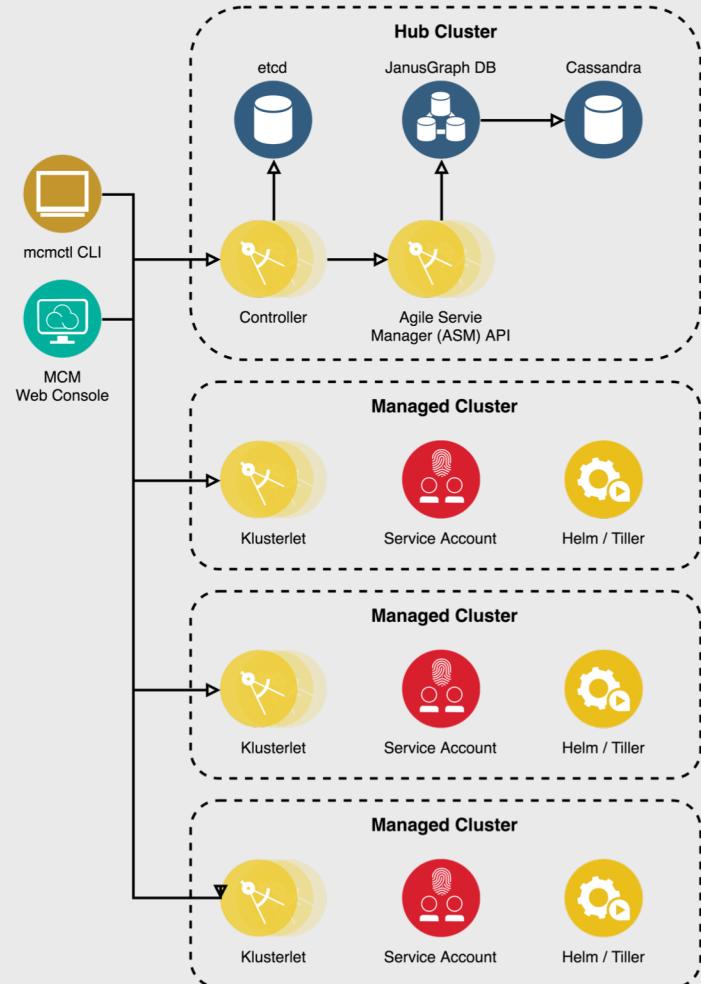
# **Multi Cloud Manager**

Architecture

# Multi Cloud Manager Architecture

## MCM Controller (MCMM)

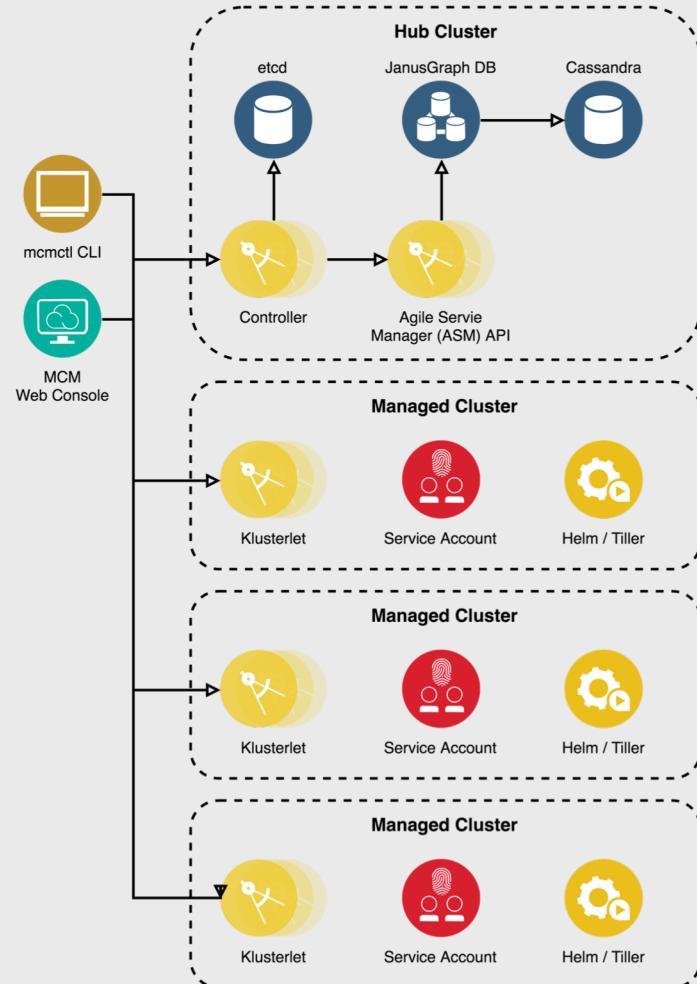
- Central Manager
- Must be run in an ICP 2.1.0.3 (or higher) cluster
- Aggregates information from multiple clusters using asynchronous work request model
- Maintains cluster and application in the JanusGraph DB
- Uses etcd to store state of work requests and results from multiple clusters
- Provides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



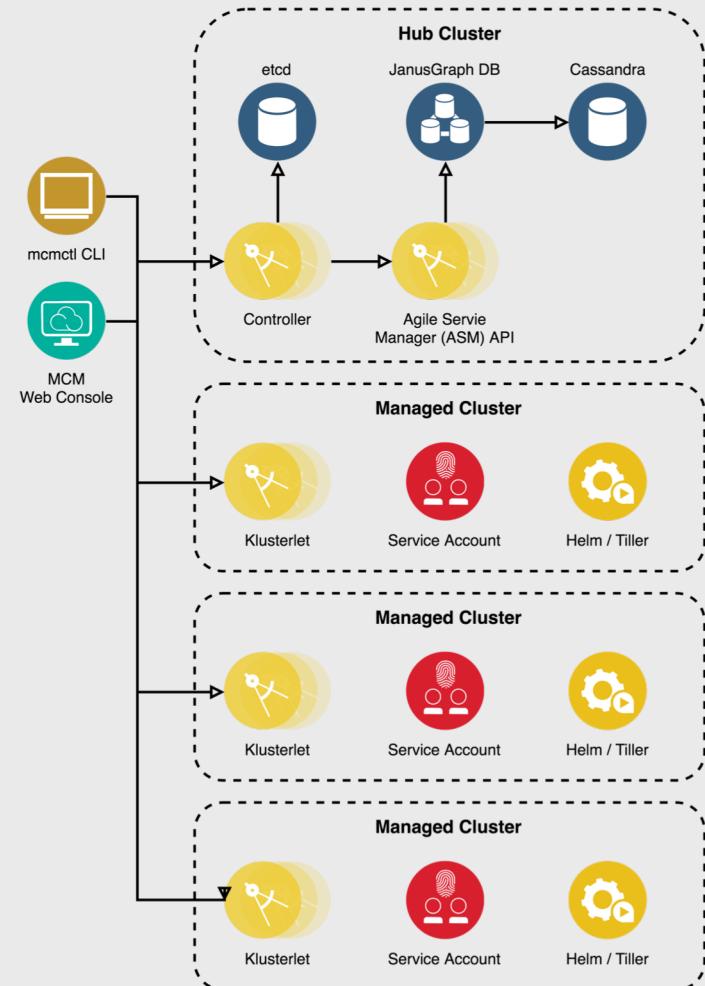
# Multi Cloud Manager Architecture (continued)

## 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

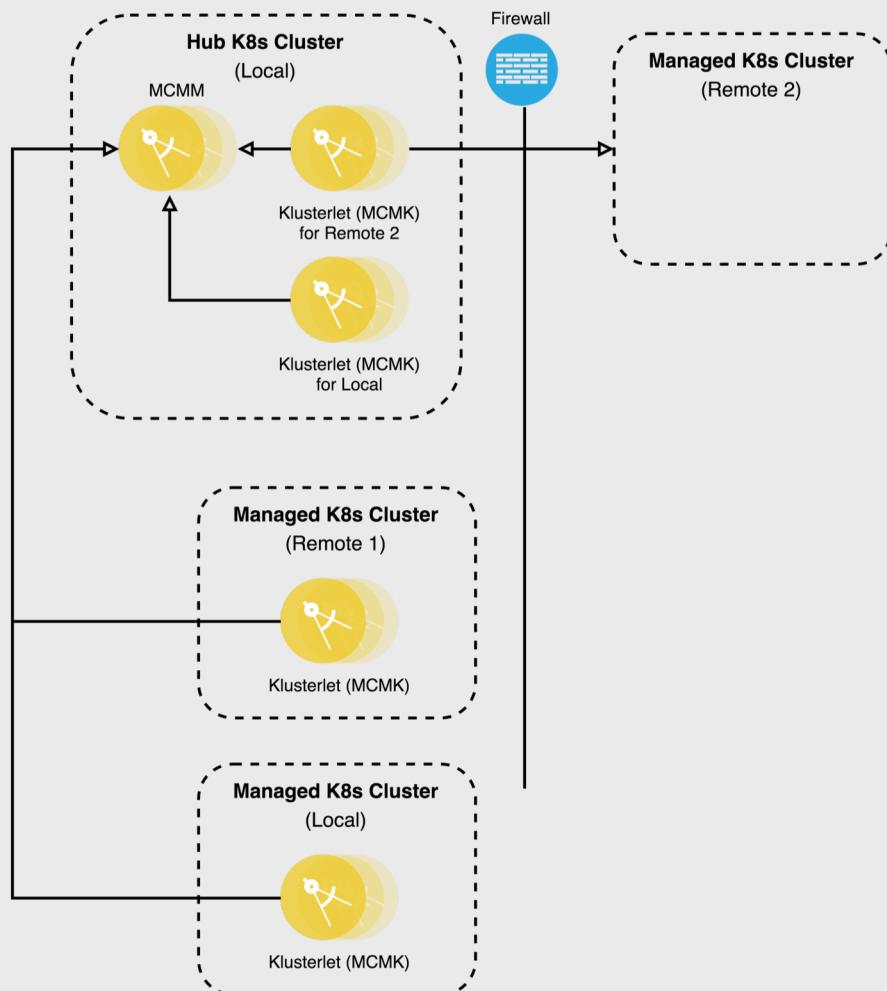
## MCM Web Console

- 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

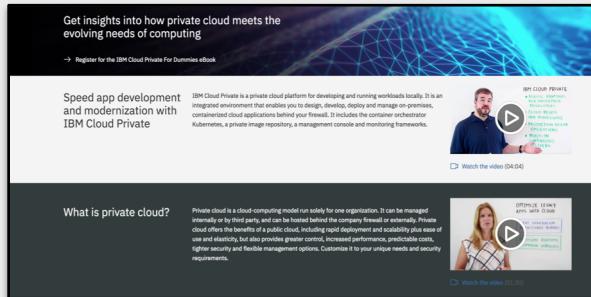


# Multi Cloud Manager Secure Connections

- 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

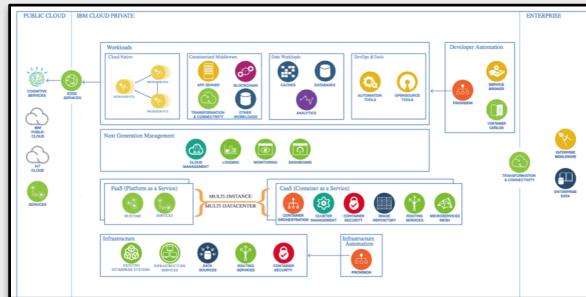
What is private cloud? Private cloud is a cloud-computing model run solely for one organization. It can be managed internally or by third party, and can be hosted behind the company firewall or externally. Private cloud offers the benefits of a public cloud, including rapid deployment and scalability plus ease of use and management. It also provides the security and control of a dedicated environment, plus the right security and flexible management options. Customize it to your unique needs and security requirements.

Watch the video [04:04]

## Home Page

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

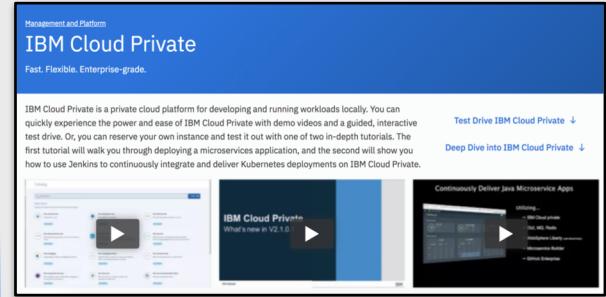
<http://ibm.biz/ICP-Home>



## Garage Method

- Reference architectures
- Best practices

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



Management and Platform  
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Continuously Deliver Java Microservice Apps

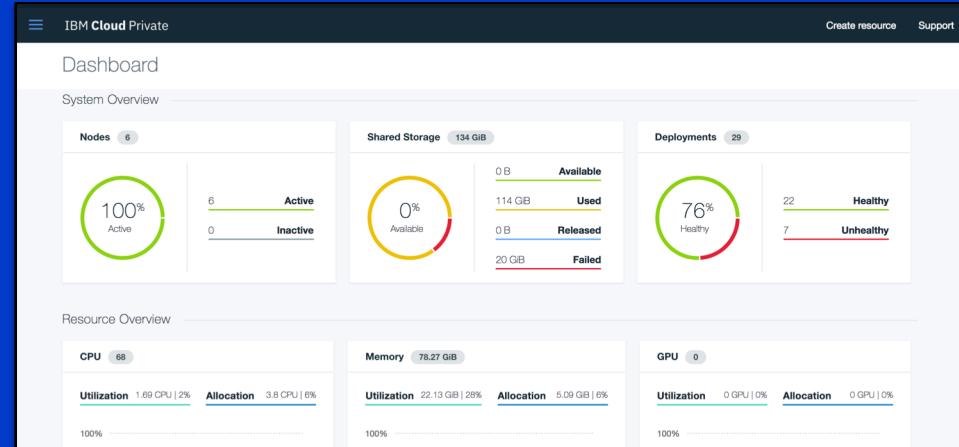
## Digital Technical Engagement

- Guided demos
- Proof of Technology

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

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# Free Community Edition



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