COMMON
ROMANDIE
Webinar

OpenShift on POWER
La plateforme conteneurisée pour les environnements Hybrid–Cloud

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Creating value depends on your ability to deliver applications faster

Cloud-native applications	AI & machine learning	Analytics	Internet of Things	Innovation culture

Containers, Kubernetes, and hybrid cloud are key ingredients.
OpenShift is the best platform to deliver container-based applications.

Red Hat

With OpenShift you can deliver all your applications in a whole new way

VMs, Traditional apps

Cloud-native apps

AI/ML, Functions...

VM | A | A

A | A | A | A

A | A | A

Container & DevOps Platform

certified
kubernetes

Edge   **Datacenter**   **Hybrid & Multi-Cloud**

Red Hat

More than 2,000 Red Hat OpenShift customers

Modernize apps — OPTUM, CATHAY PACIFIC, DELTA

Web apps — helvetia, BBVA, elo

Cloud-native dev — LOCKHEED MARTIN, SCHOLASTIC, unicef INNOVATION, MACQUARIE

Multicloud — amadeus, Schiphol Amsterdam Airport, Deutsche Bank

Mobile — SBB, Hilton, Emirates NBD

Big data | Analytics — Ford, HCA Healthcare, bp

AI | ML — ExxonMobil, UPS, KBTG KASIKORN BUSINESS-TECHNOLOGY GROUP

IoT — BMW GROUP, VORWERK

Red Hat

OpenShift leads the Kubernetes application platform market

Red Hat OpenShift customers
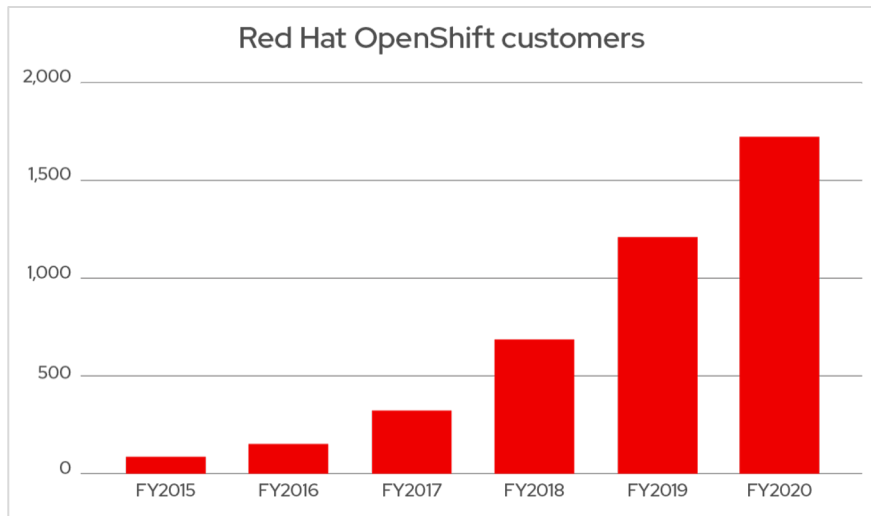
+70% customer growth YoY in 2019

Container market share (%)

- Other 22%
- Canonical 2%
- Rancher Labs 3%
- VMware/Pivotal 6%
- Docker 23%
- Red Hat OpenShift 44%
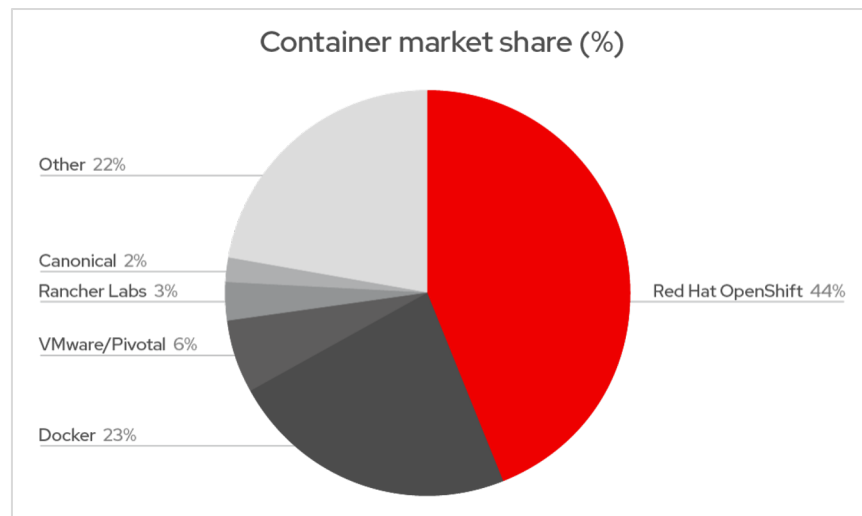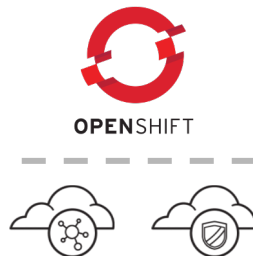
Why customers choose Red Hat OpenShift
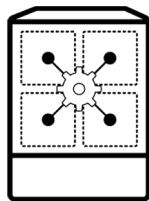
Trusted enterprise Kubernetes

Cloud-like experience everywhere
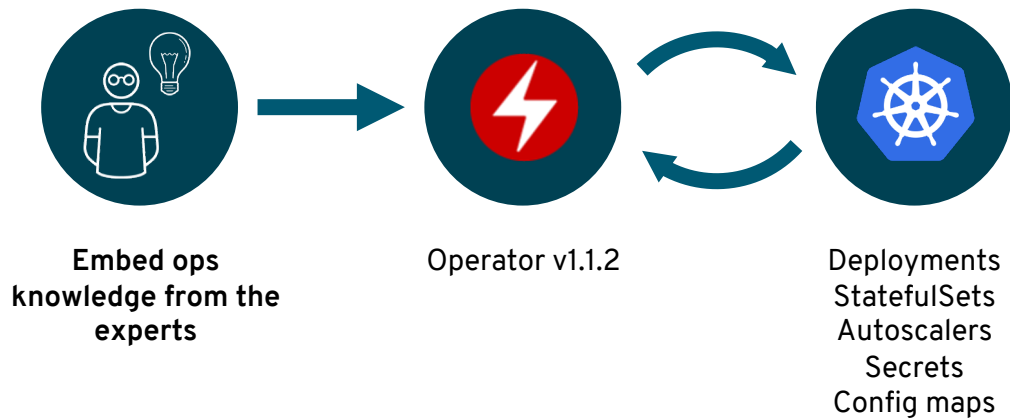
Empowering developers to innovate

Open source innovation

Operators give OpenShift users access to managed applications in a **cloud-like experience, wherever their cluster runs**

How does an Operator offer managed services ?

Embed ops knowledge from the experts

Operator v1.1.2

Deployments
StatefulSets
Autoscalers
Secrets
Config maps

Operators codify operational knowledge and workflows to automate life-cycle management of containerized applications with Kubernetes

OperatorHub and certified Operators

- OperatorHub.io launched by Red Hat, AWS, Microsoft and Google

- OpenShift Operator Certification

- OperatorHub integrated into OpenShift 4

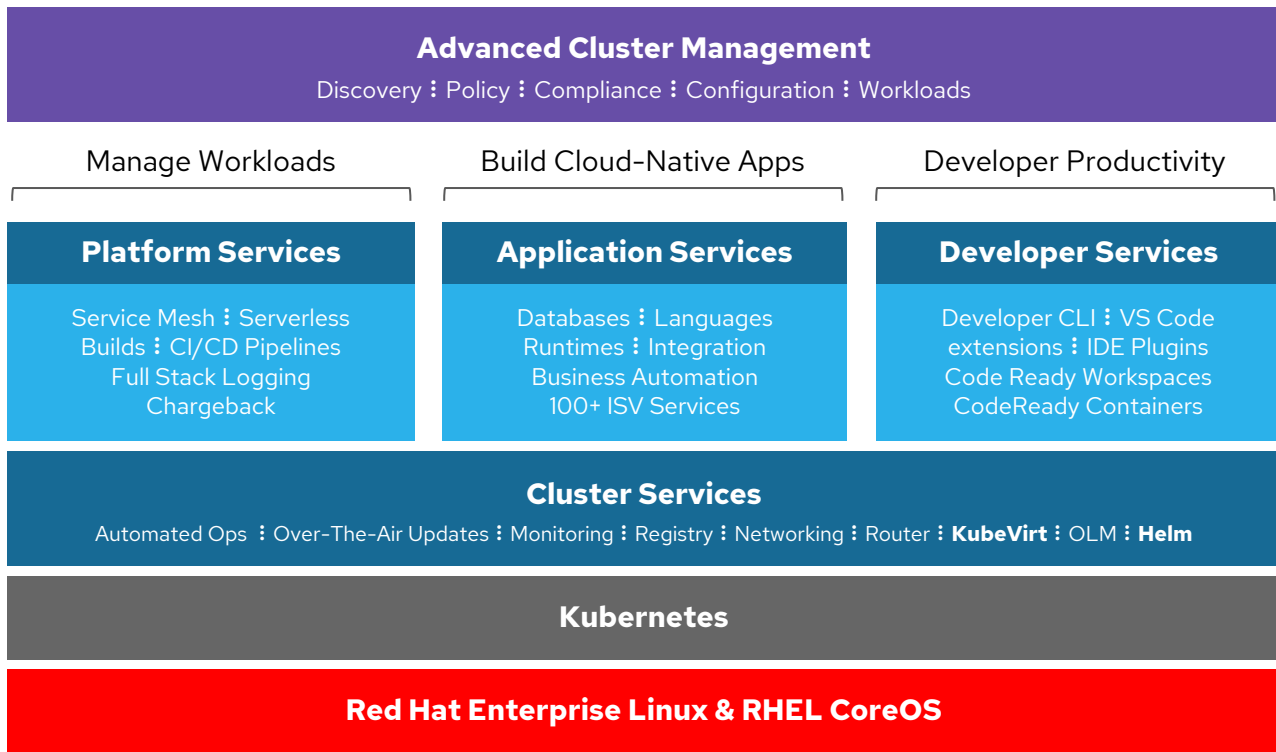**COMMUNITY OPERATORS**

OPENSHIFT CERTIFIED OPERATORS
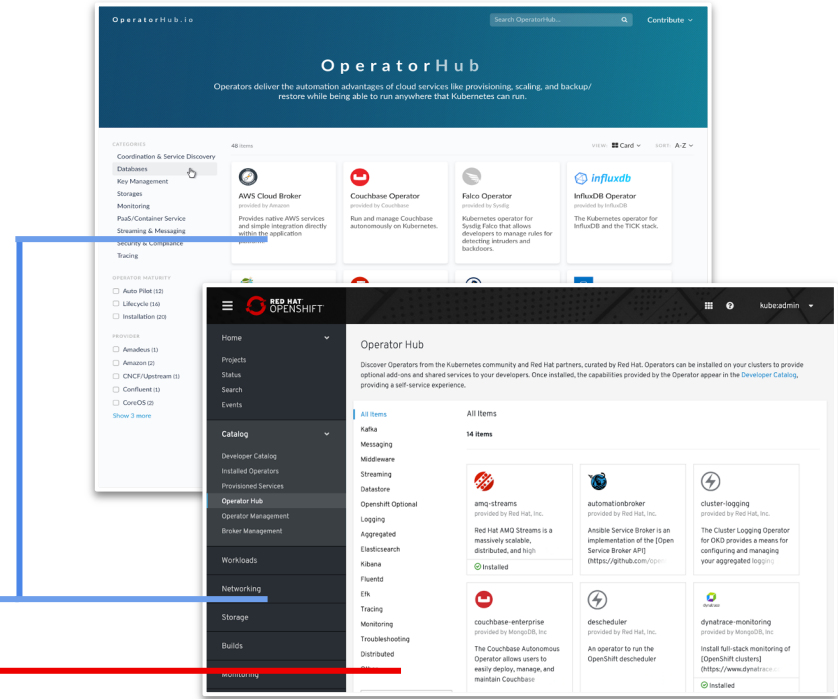
THE INDUSTRY IS ALIGNING BEHIND THE KUBERNETES OPERATOR FRAMEWORK

150+ Certified ISV Operators

OpenShift Container Platform

Advanced Cluster Management
Discovery : Policy : Compliance : Configuration : Workloads

OpenShift Container Platform

Manage Workloads	Build Cloud-Native Apps	Developer Productivity
Platform Services	**Application Services**	**Developer Services**
Service Mesh : Serverless Builds : CI/CD Pipelines Full Stack Logging Chargeback	Databases : Languages Runtimes : Integration Business Automation 100+ ISV Services	Developer CLI : VS Code extensions : IDE Plugins Code Ready Workspaces CodeReady Containers

Cluster Services
Automated Ops : Over-The-Air Updates : Monitoring : Registry : Networking : Router : **KubeVirt** : OLM : **Helm**

Kubernetes

Red Hat Enterprise Linux & RHEL CoreOS

Quay
Enterprise Registry

OpenShift Container Storage

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

Red Hat

Be ready to be hybrid/multi cloud

Consistency across disparate platforms

Dev

Ops

A consistent developer experience: Code, build, deploy

A consistent operational interface with automated operations

A cloud-agnostic application and data infrastructure platform

DevOps tooling compatible across clouds

A single, more secure Linux operating system in all clouds

aws Microsoft Azure Google Cloud IBM vmware® openstack.

Red Hat

OpenShift offers the broadest set of hybrid cloud services

Developer Experience   Productivity   Enterprise Readiness

Red Hat OpenShift

aws

Azure

Google Cloud

IBM Cloud
IBM Power Systems

On-premises
IBM Power Systems

Red Hat OpenShift Dedicated or Amazon Red Hat OpenShift (AMRO)	**Azure Red Hat OpenShift**	**Red Hat OpenShift Dedicated**	**Red Hat OpenShift on IBM Cloud**	**OpenShift Container Platform**

Red Hat

Écosystème logiciel de conteneur étendu sur IBM Power Systems

Linux Images

Web and Middleware

Cloud and DevOps

Languages and Runtimes

Databases

Analytics and AI
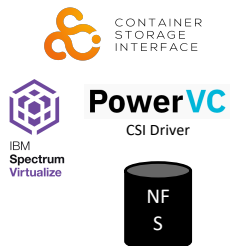
Storage

Networking and Monitoring

References:

Red Hat OpenShift Catalog: https://catalog.redhat.com/software/containers/search?p=1&architecture=ppc64le

Docker Hub (ppc64le): https://hub.docker.com/r/ppc64le/

Docker Hub (ibmcom): https://hub.docker.com/r/ibmcom/

Power Systems Ecosystem: https://github.com/ppc64le/build-scripts

Entitled registries as appropriate for licensed software (e.g., IBM, Red Hat, etc.)

Red Hat OpenShift (OCP) and Power

Red Hat's Enterprise Kubernetes platform

Containerize and manage existing Red Hat or open source applications via OpenShift catalog

Ideal for Red Hat stack clients and IBM Clients moving to modern, cloud native IBM middleware

Now included with all IBM Cloud Paks

Runs on Power Enterprise & Scale-out Systems

Supports baremetal, PowerVM, RH KVM (dev only)
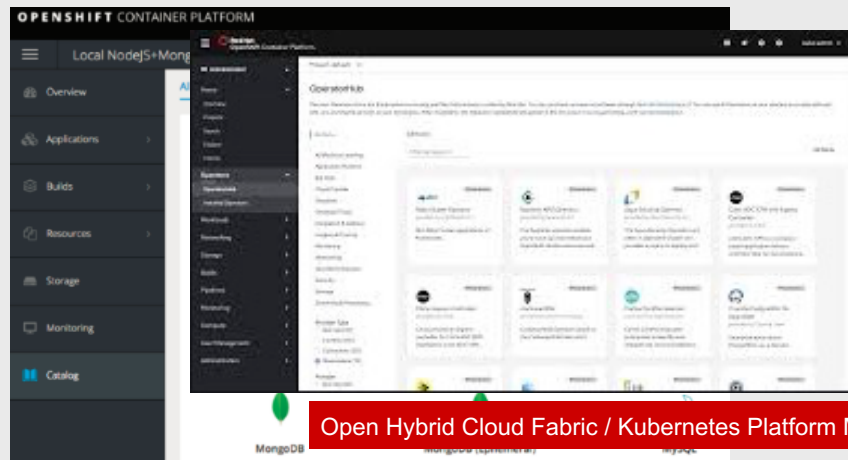
Independent Power and x86 Cluster Support

Coming soon OpenShift Container Storage

OpenShift 4.6
Try it now

POWER9

POWER Cloud Benefits

- Build, run open source cloud native apps with full control of Kubernetes on Power (bare-metal, KVM, PowerVM)

- POWER9 exploitation to modernize AIX and IBM i apps and accelerate AI/Deep Learning algorithms

Open Hybrid Cloud Fabric / Kubernetes Platform Mgmt.

Added value 1 : Performances

POWER Core performance :
- Power Systems have the most powerful cores.
- Depending on workload POWER cores can run **2 to 5 times** container than X86 cores.

Virtualization efficiency :
- OCP limitation of containers per Nodes (VMs/Lpars) brings a **huge advantage to POWER virtualization (PowerVM)**
- PowerVM is microcoded and so uses few CPU resources and is highly effective to manage VMs. It is therefore possible to have a big number of VMs without impacting much the performances.
- PowerVM is highly scalable

POWER Servers caracteristics :
- Power cores can use up to **8 threads** per core compare to **2 threads x86 hyperthreading**

- **Memory bandwidth is much higher than on x86.**
  Combining POWER memory bandwidth and core strength some workloads can be restarted within minutes instead of hours (thousands of containers)

- Power server performance is **guaranty up to 65% utilization on scale out and 80% high end** (refer IBM Systems conditions)
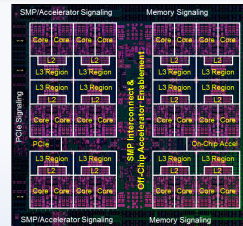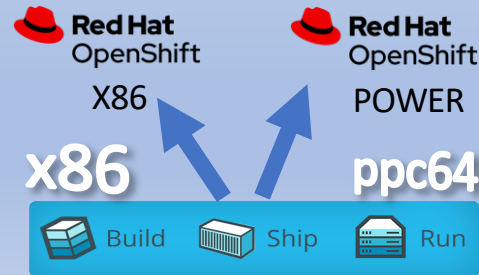
Added value 2 : Costs

TCA and TCO
- **PowerVM Virtualisation is included in the server.** It is not the case with X86 therefore the cost of the hypervisor must be included in the TCA

- **OCP cheaper on POWER than X86** if we consider the subscription price per transactions

- The comparison against X86 does not have to be done servers against servers.
  But the price of the overall solution need to be calculated and compared :
  Servers, Hypervisor, OCP subscription, Software license, floor space ….
  With this global pricing approach, POWER servers are even more competitive

OCP skills on POWER
- **OCP on Power is the same as x86.** So no need of OCP specific skills on POWER. Specialists, Architect and developers will immediately be familiar with OCP on Power.

OCP Clusters : **Containers can be easily deployed on X86 and POWER (Separate cluster)**

- **Source to image** tool can be used to modify the source once and rebuild containers binaries both for X86 and POWER

- **Container Manifest file** can be used to automatically deploy container on X86 and/or POWER depending on the business and architectural rules

- **MultiCloud manager or ArgoCD** can be used to deploy and redirect the workload either on POWER, Mainframe or X86 according to the business rules

Added value 3 : Security

Security

- OCP is the most secure container Orchestrator.
- Mainframe, POWER servers provide the best security on the market.
- No security breach have been reported for PowerVM
- OCP and POWER servers provide a far more secure platform than X86.
- On top, PowerSC brings a very effective way to manage security for Linux on Power.

## Cluster management, Governance, Visibility :

- Solutions to manage heterogeneous OCP clusters.
- Cloud Pak for Multicloud Management provides solution to manage containers and VM on premises or in the cloud composed with X86 Power and Z.

Sustainability :

- OCP on POWER is available since 2 years and benefits of a strong roadmap equal to X86

Number of containers:

- There is a huge number (several thousand) of containers images available for POWER.
- OCP catalog includes several hundreds software pre-packaged.

Cloud Paks and OpenShift on POWER Platform Availability Timeline
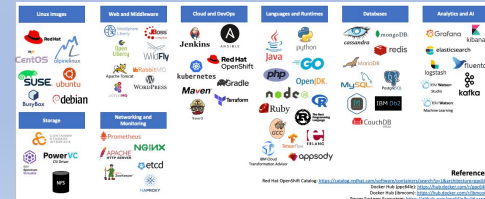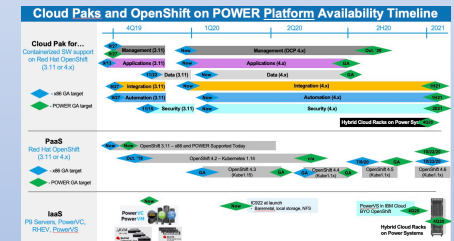
CiRES21 Live Streaming Software application runs more efficiently on Power L922

5X greater containers per core on tested Intel Xeon E7-4820 servers (Broadwell) Cloud with Kubernetes

	20x IBM Power L922 (20-core, 1TB) 50k CCTV Containers	50x Intel Cloud (40-core, 512GB) 50k CCTV Containers
Server Cost -3-year warranty	$1,390,520	$3,877,813 (3yr term Cloud – PrecisionIT TCO)
OpenShift price 3-year Subscription Premium Red Hat Support	$2,280,000	OpenShift $10,800,000
Solution Cost Server + Red Hat OpenShift	$3,670,520	$14,677,813
Solution $/container	$73.41	$293.55
OpenShift $/container	$45.60	$216
Containers/core	125	25

1. All USD list prices
2. Red Hat charges the same price for x86 and Power.
3. OpenShift Container Platform is priced by pair of cores for both x86 and Power.
4. OpenShift typically costs less on Power Systems, due to more powerful per core performance
5. PowerVM Hypvervisor enables higher container per core ratios, increasing efficiency and often reducing overall costs.
6. Red Hat charges for ALL cores on OPAL servers
7. Red Hat supports sub-capacity charging for PowerVM based servers.
8. IBM offers the choice of Red Hat L1-L3 support, or IBM L1 & L2 support, which costs a little less than L1 through L3 support from Red Hat. L3 support is always provided by Red Hat.

5 X
Greater containers/core

POWER9

4.7 X
Better price-performance
(OpenShift Subscription & Support)

Born in the cloud MongoDB mobile application

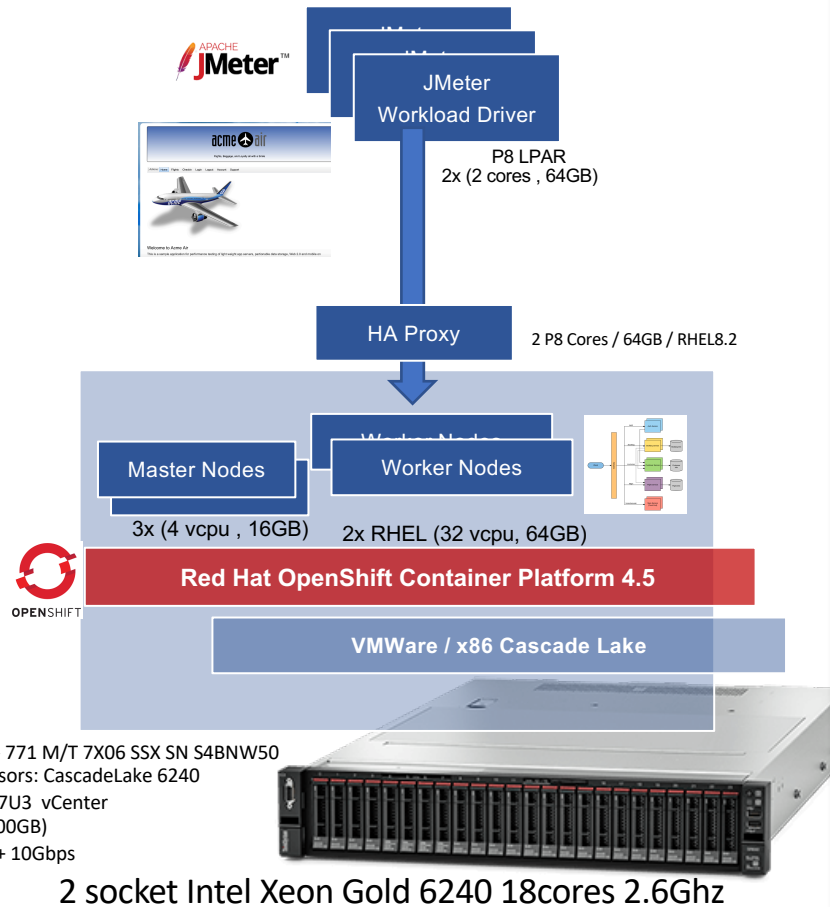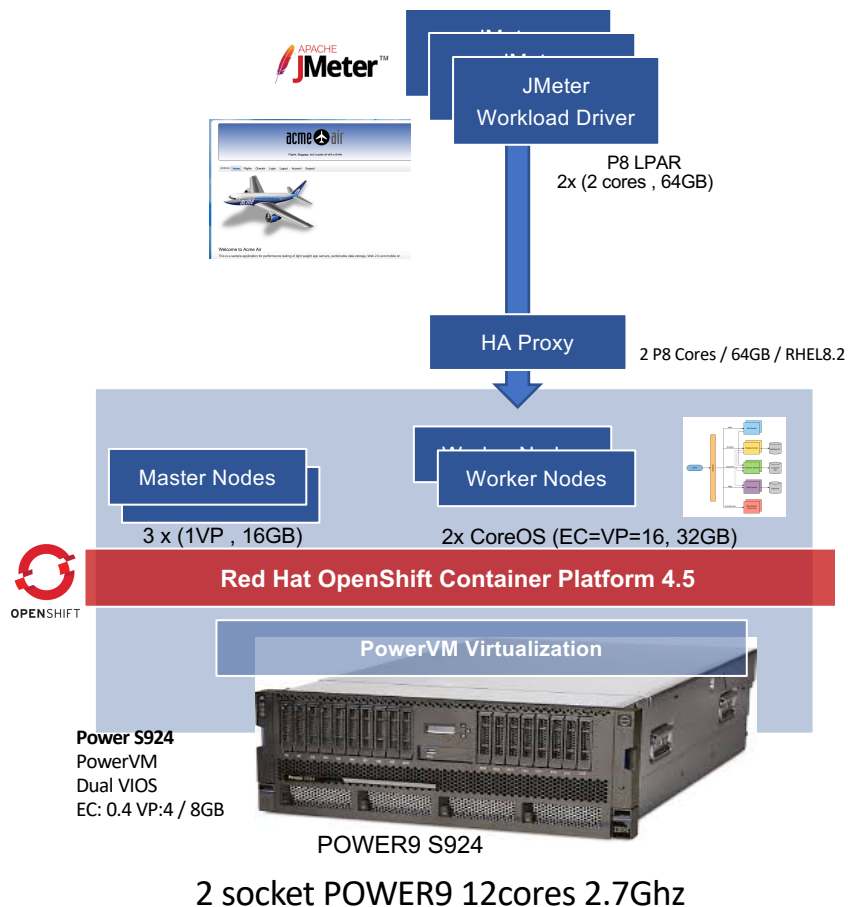|	IBM Power L922 (20-core, 256GB, 2 LPARs) 174 containers	Intel Xeon SP based 2-socket server (36-core, 256GB, 2 VMs) 98 containers
Server price [4,5,6] -3-year warranty	$28,821	$28,805
Solution Cost [7] -Server + RHEL OS / Virtualization + OCP 3 yr subscription @ $7,695 per 2 cores	*$ 115,888* ($28,821 + $10,117 + $76,950)	**$ 171,234** ($28,805 + $3,919 + $138,510)
Geospatial workload [1] Total Transactions per Second - With 2 VM's	2,542 tps	2,290 tps
$/container	$ 666	$1,747
Containers/core	8.7	2.7

3.2X
Greater containers/core[2]

POWER9

2.6X
Better price-performance[3]
(based on number of containers)

1. Based on IBM internal testing running MongoDB's Geospatial queries at 700 users, each running 1000 transactions using jmeter v4. Each container uses MongoDB 4.0.2 & Node.js v8.14.1 (REST APIs) with socket bound containers. Testing added containers to each server until servers reached response time limit of 99% of transactions completing in under 1 second. Results valid as of 7/16/19. Conducted under laboratory condition with speculative execution controls to mitigate user-to-kernel and user-to-user side-channel attacks on both systems. Individual result can vary based on workload size, use of storage subsystems & other conditions. Details about MongoDB workload: https://docs.mongodb.com/manual/tutorial/geospatialtutorial/
2. 3.2X greater containers/core is based on 174 containers/20 cores for Power L922 and 98 containers/36 cores for Intel Xeon. – (2,531/20)/(2,290/36) = 3.2
3. 2.6X Better price performance is based on $666/container for Power L922 and $1,762 for Intel Xeon - 1747/666 = 2.6.
4. IBM Power L922 (2x10-core/typical 2.9 GHz/256 GB memory) 2x 388 GB SSD, 2x 10 Gb two-port network, RHEL 7.6 with PowerVM (2 partitions@10-cores each),
5. Competitive stack: 2-socket Intel Xeon Skylake Gold 6150 (2x18-core/ 2.7 GHz/256 GB memory), 2 x 480 GB SSD, 3 x 10 Gb two-port network, RHEL 7.6, KVM (2 VMs@18-cores each)
6. Pricing is based on Power L922 https://www.ibm.com/lt-infrastructure/power/scale-out, and publically available x86 pricing https://ark.intel.com/content/www/us/en/ark/products/120490/intel-xeon-gold-6150-processor-24-75m-cache-2-70-ghz.html
7. Software pricing for OCP Subscription is standard version 3 year .

Red Hat

IBM Montpellier Benchmark Infrastructure

MongoDB - JAVA

JMeter Workload Driver

P8 LPAR
2x (2 cores , 64GB)

HA Proxy

2 P8 Cores / 64GB / RHEL8.2

Master Nodes

3 x (1VP , 16GB)

Worker Nodes

2x CoreOS (EC=VP=16, 32GB)

Red Hat OpenShift Container Platform 4.5

PowerVM Virtualization

Power S924
PowerVM
Dual VIOS
EC: 0.4 VP:4 / 8GB

POWER9 S924

2 socket POWER9 12cores 2.7Ghz

JMeter Workload Driver

P8 LPAR
2x (2 cores , 64GB)

HA Proxy

2 P8 Cores / 64GB / RHEL8.2

Master Nodes

3x (4 vcpu , 16GB)

Worker Nodes

2x RHEL (32 vcpu, 64GB)

Red Hat OpenShift Container Platform 4.5

VMWare / x86 Cascade Lake

SR650
SR650- 771 M/T 7X06 SSX SN S4BNW50
Processors: CascadeLake 6240
ESXi 6.7U3 vCenter
SSD (900GB)
1Gbps+ 10Gbps

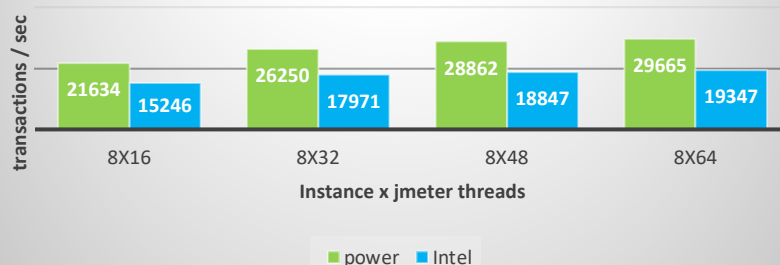## 2 socket Intel Xeon Gold 6240 18cores 2.6Ghz

IBM Montpellier benchmark Results

IBM : S924 24 core power9 / PowerVM
VS
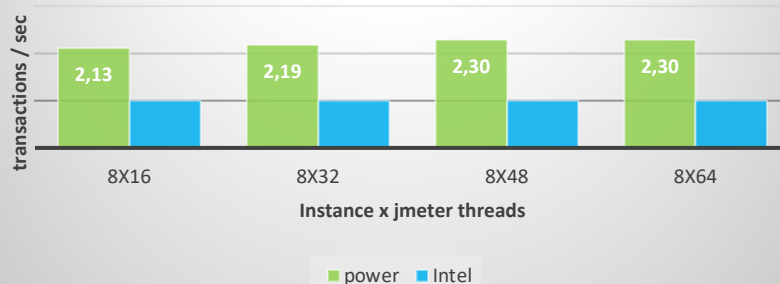**RS650 36 core Intel Xeon 6240 / VMWare ESX**

x1.5 throughput, x2.3 TPS/core, 50% less Latency

- During the performance test, both system solution were running at 100% CPU, No storage IO (non-persistent in-memory volume), same network 10Gb technology.

- PowerVM best results were achieved with Dedicated CPU for workers.

- Using PowerVM "dedicated-shared" CPU (allowing non used dedicated cpu cycle to be used by shared-pool) <u>does NOT impact</u> performance. *(Can be used to mix prod/non-prod cluster on same system.)*
- CPU virtualization (shared-pool) conducts to only **4.5%** impact on throughput (still **x2.2 better per core** than Intel VMWare solution).

Sytem performance - in TPS

transactions / sec

Instance x jmeter threads	power	Intel
8X16	21634	15246
8X32	26250	17971
8X48	28862	18847
8X64	29665	19347

■ power ■ Intel

Performance/Core Ratio vs Intel

transactions / sec

Instance x jmeter threads	power
8X16	2,13
8X32	2,19
8X48	2,30
8X64	2,30

■ power ■ Intel

Forrester Wave – Multicloud Container Development Platforms

THE FORRESTER WAVE™

Multicloud Container Development Platforms

Q3 2020

«OpenShift est la plate-forme de conteneurs multicloud la plus largement déployée et offre de puissantes expériences de développement et d'opérations unifiées sur de nombreuses plates-formes publiques et sur site»

Prochain Webinar sur le sujet par FW - 11 Novembre :
https://red.ht/2TAG2Ov

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IBM

Thank You