INTRODUCTION TO IBM CLOUD PRIVATE AND KUBERNETES

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SESSION ROADMAP

1

Evolution of cloud and containerized workloads (Microservices)

2

What is IBM Cloud Private?

3

Why use IBM Cloud Private on z?

4

IBP4ICP VLD Demo

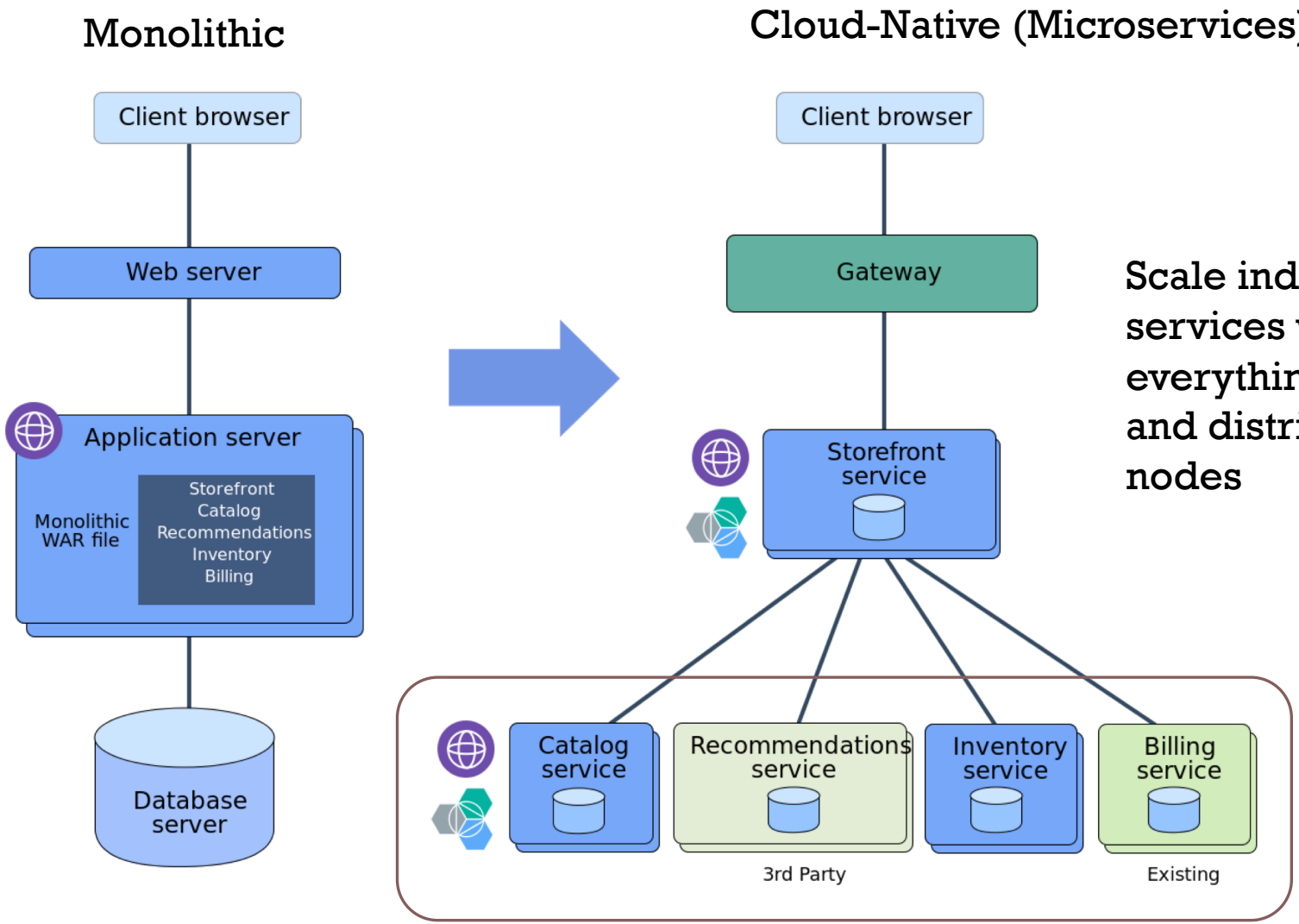
1. EVOLUTION OF CLOUD AND CONTAINERIZED WORKLOADS (MICROSERVICES)

According to NIST cloud is

https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf

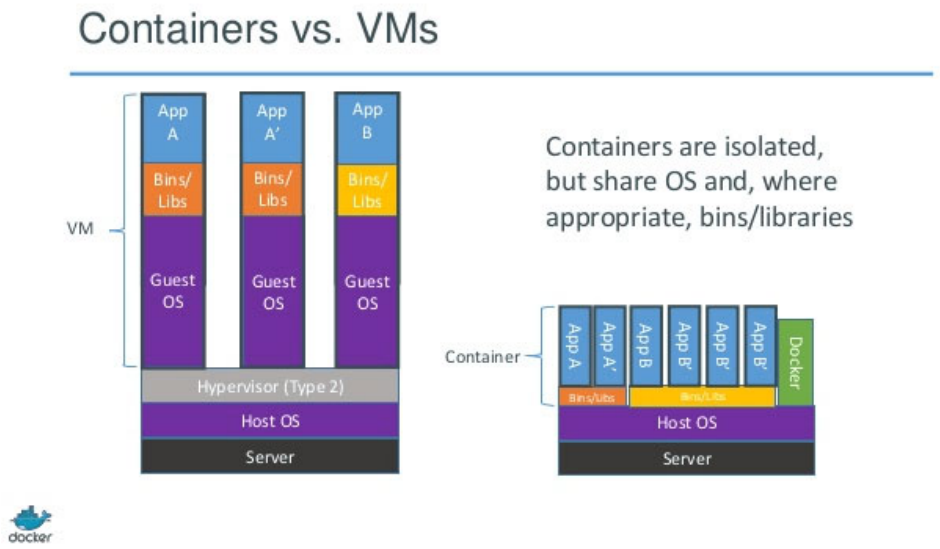
Need Apps to match scalability and speed of cloud …

Scale by increasing overall capacity (server and storage) with everything tightly coupled together



Scale individual services with everything decoupled and distributed across nodes

- **Portable**, independently packaged images for apps/services which can be used across Linux distros
- **Lightweight** Namespace Isolation and cgroup resource limits for rapid deployment
- **Storage pooling** of host os and applicable bins/libraries
- Manifest lists -> support for multiple architectures (i.e. s390x, power, x86) [up to developers to enable for a specific container]



AND CLOUD NATIVE-ARCHITECTURE (CONTAINERS)

KUBERNETES (HELMSMAN) – PUTTING THE PIECES TOGETHER

- Pod – Set of containers running in same execution environment/context (smallest unit in kubernetes) [containers in pod share some Linux namespaces (Network, IPC, and PID if enabled) but each have own cgroup]

- ReplicaSet – makes sure correct number and types of pods are available

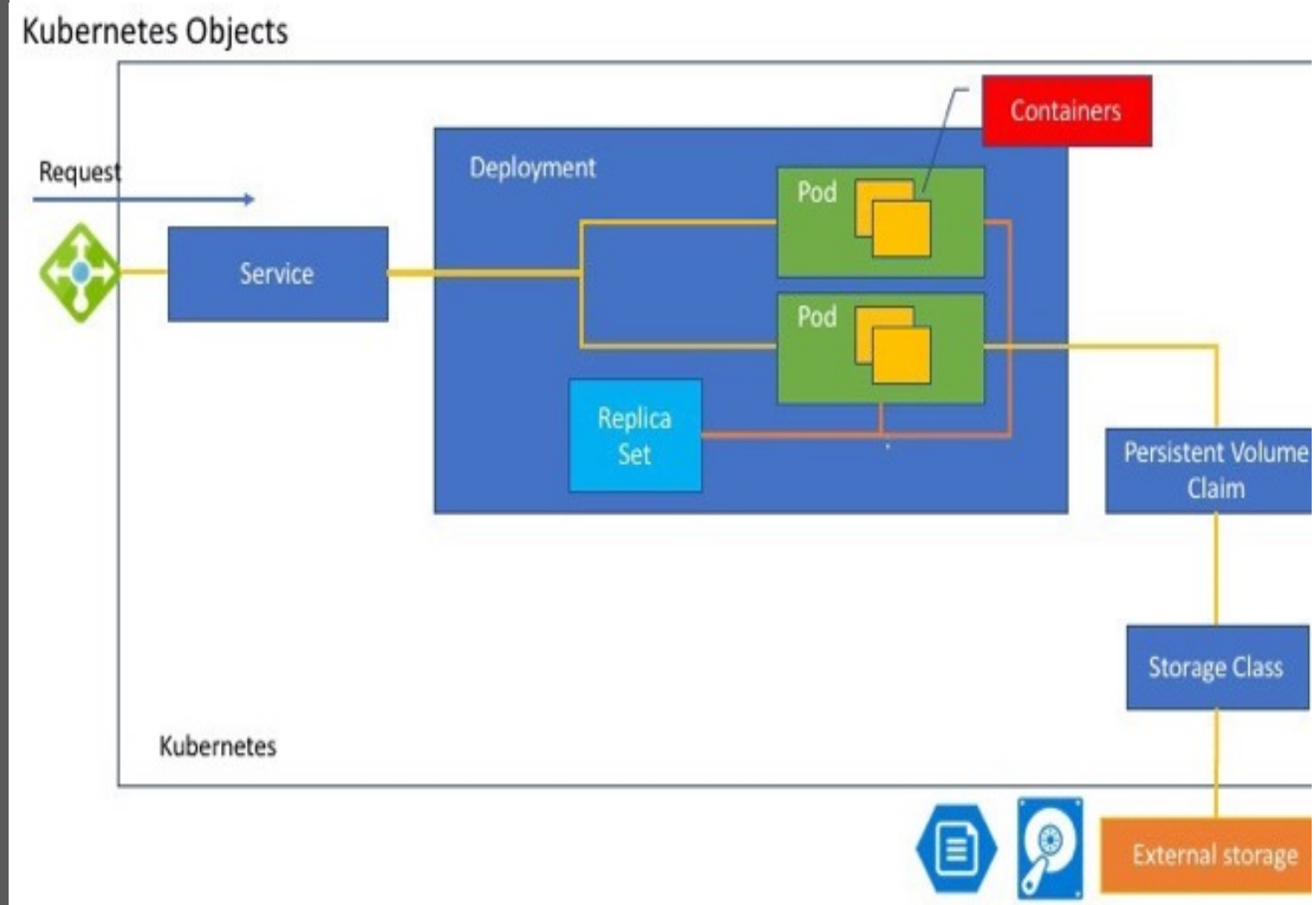
- Deployment –Manages replica sets for ease of new app version rollout.

- Service – Provides access point for pods/deployment as well as load balancing

- Persistent Volume Claim – provides storage volumes to container runtime (i.e. docker) by binding to persistent volumes

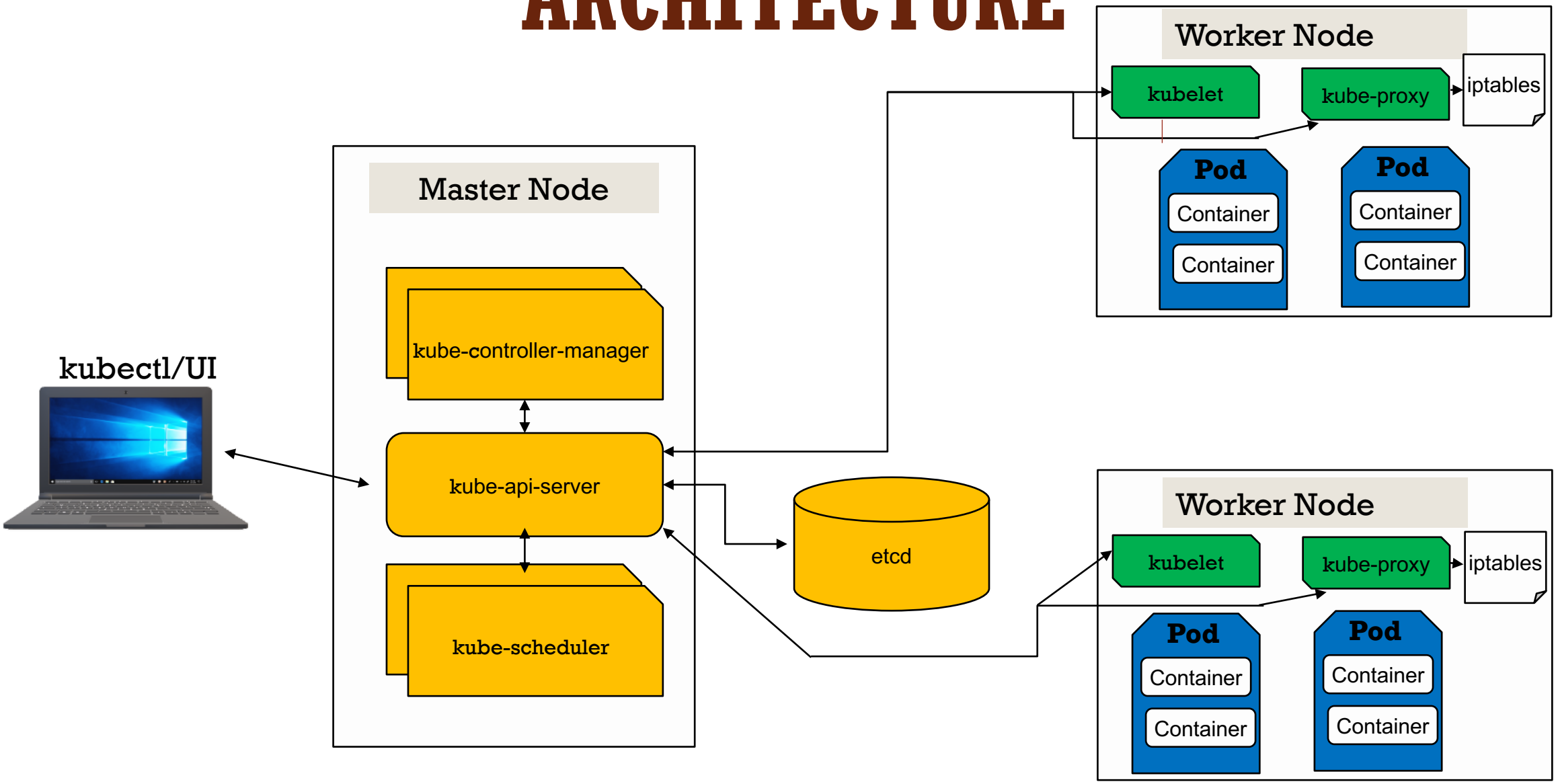
- Storage Class – groups storage so that it can be dynamically selected and provisioned

- Persistent Volume - Set of external storage defined to kubernetes



https://medium.com/@tsuyoshiushio/kubernetes-in-three-diagrams-6aba8432541c

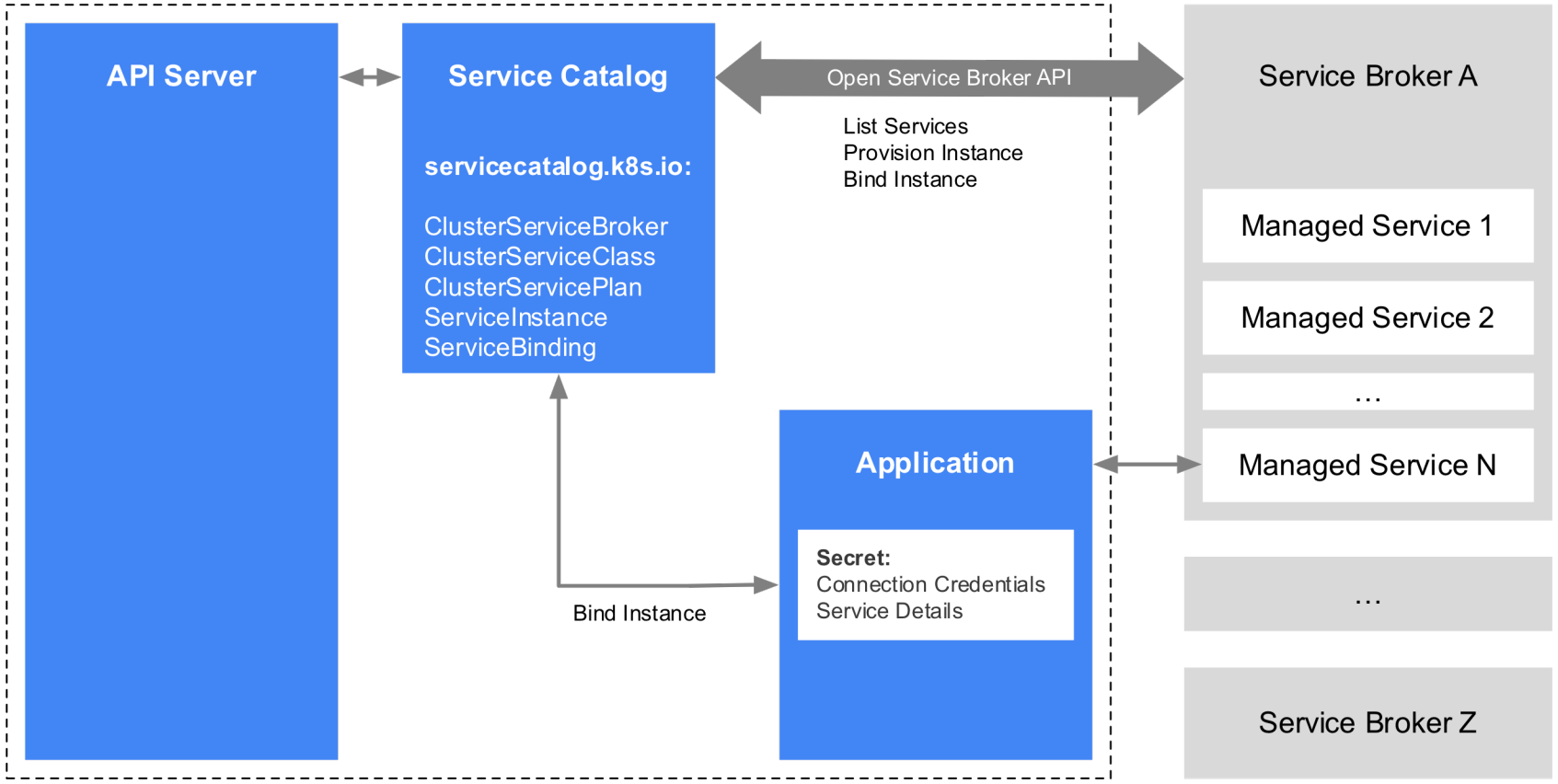
BASIC "PHYSICAL" KUBERNETES CLUSTER ARCHITECTURE



KUBERNETES NAMESPACES (NOT LINUX NAMESPACES)

- Virtual clusters all connected to the same "physical" cluster
- End user sees the cluster via current namespace (i.e. kubectl get pods will show pods in current namespace)
  - Divide cluster resources between different users
  - Resources (i.e. pods, replicasets, etc.) scoped by namespace (resource names unique within namespace)
- Initial Kubernetes Namespaces
  1. default: objects with no defined namespace
  2. kube-system: objects created by Kubernetes system (i.e. helm-api, tiller, logging, kube-dns, etc.)
  3. kube-public: originally configured as readable by all users (even unauthenticated users) to make certain resources visible cluster-wide
- Make and view namespaces
  - *kubectl create namespace hi* [makes new namespace called hi]
  - *kubectl get namespace* [returns all namespaces on the "physical" cluster]

CONNECTING EXTERNAL SERVICES TO KUBERNETES CLUSTER



https://kubernetes.io/docs/concepts/extend-kubernetes/service-catalog/

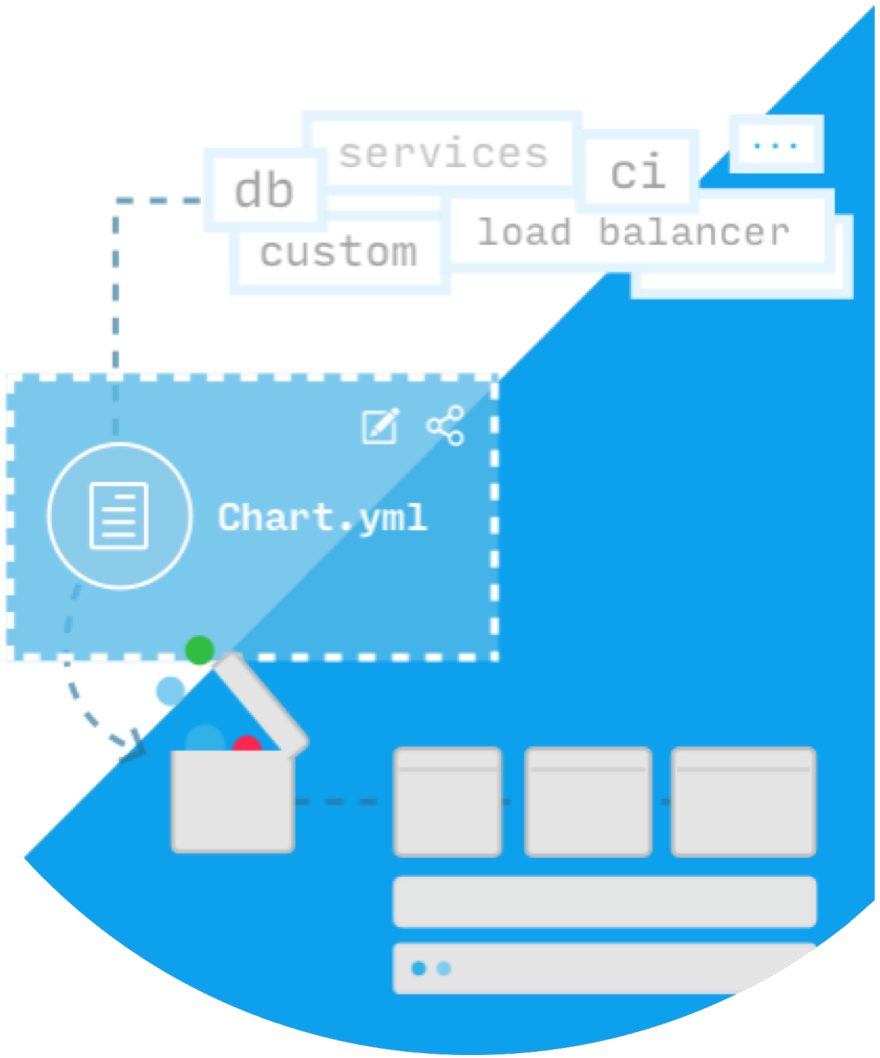
HELM : MAPPING KUBERNETES RESOURCES WITH CHARTS

Charts package the different Kubernetes objects together((i.e. package manager for Kubernetes)

Complex objects -> 1 package

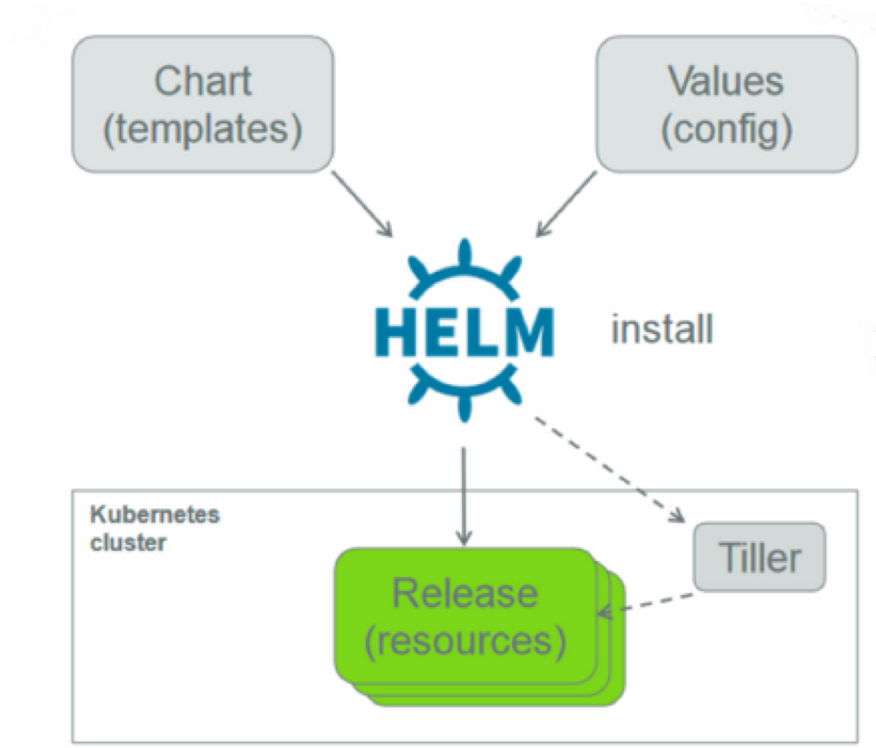
Popular applications made and deployed as charts for simple upgrades and rollbacks

Ease of sharing via online chart repositories (i.e. collections of charts)



HELM : ARCHITECTURE

- Helm - client side application for communicating with tiller
- Chart – collection of Kubernetes files
- Values – config values for helm chart deploy
- Tiller – server side of helm for deploying charts in cluster



2. WHAT IS IBM CLOUD PRIVATE?

WHERE DOES IBM CLOUD PRIVATE FIT?

8 out of 10 committing to Multi-Cloud

71% use 3 or more clouds

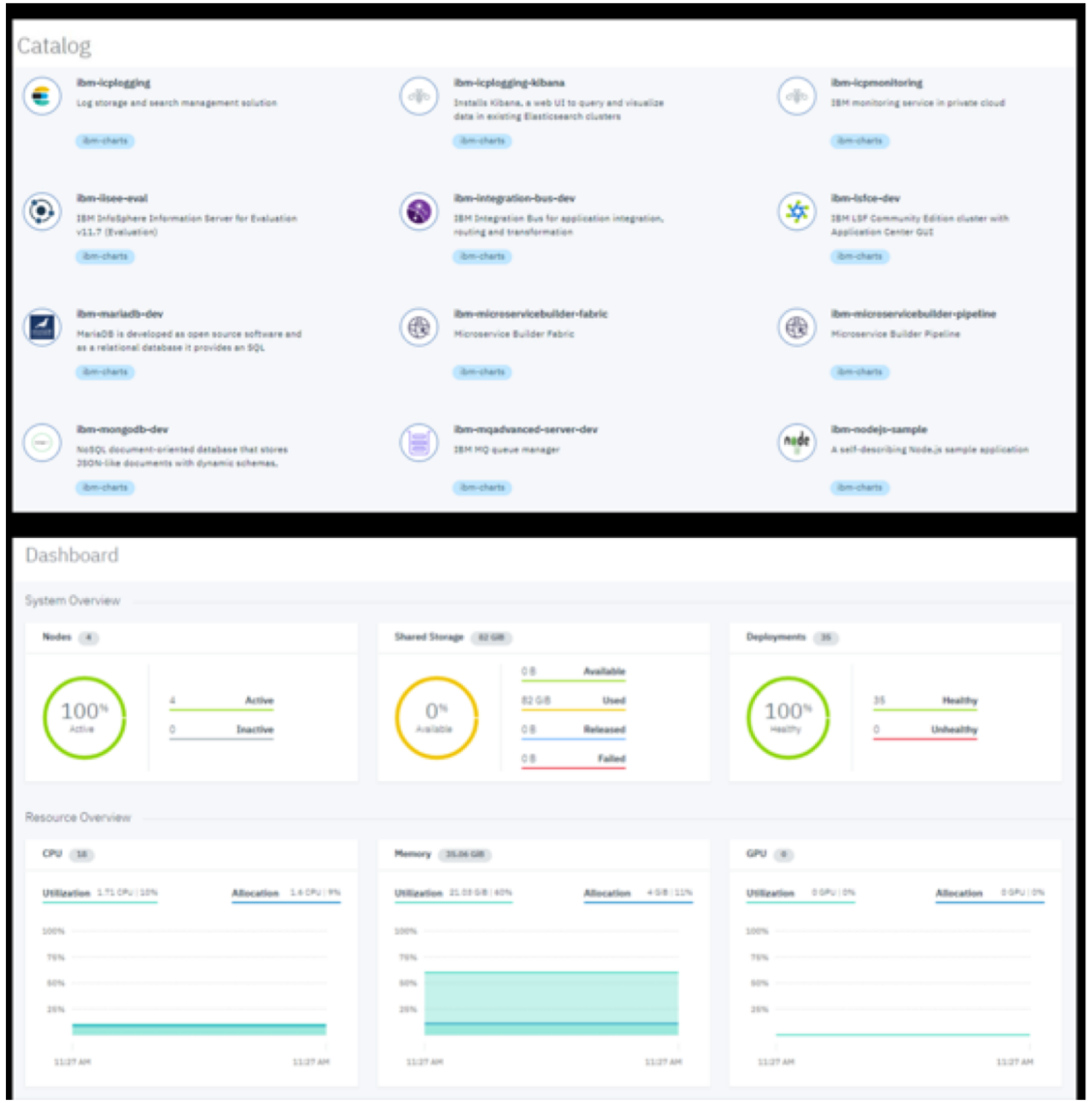
+

Getting new value from third parties

Extracting value from your entire business

IBM CLOUD PRIVATE - OVERVIEW

- Cloud deployment model for local/private workloads
- Platform to create and run cloud apps
- Built on open-source technology and Kubernetes
- Modernize deployment of existing IBM middleware and data services



High-Level Architecture & Kubernetes Features

Current High-Level Architecture

Underlying Stack

Application & Developer Services
- IBM Middleware, Open Source, 3rd Party

Management Layer
- UI / Dashboard (for Managing Apps)

Container Platform
- Kubernetes

Container Engine
- Docker (CE-version supported)

Operating System
- Ubuntu, Red Hat Enterprise Linux (RHEL), SUSE

Local Virtual & Physical Infrastructure
- Bare Metal, zVM, KVM

Features

Horizontal Scaling

Intelligent Scheduling

Service Discovery & Load Balancing

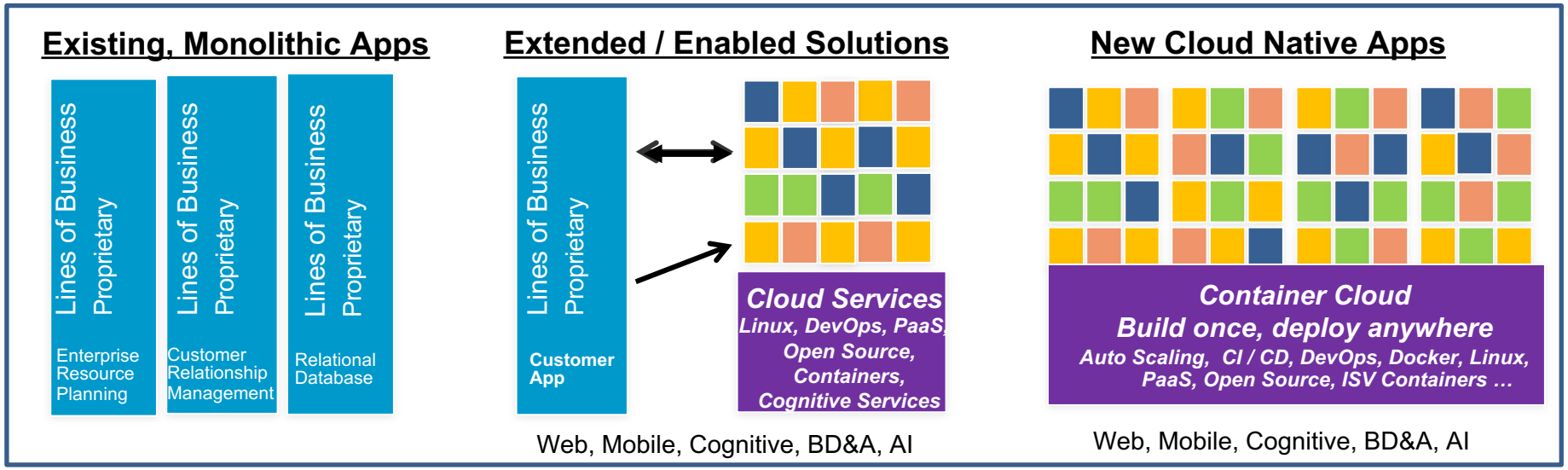
Self-Healing

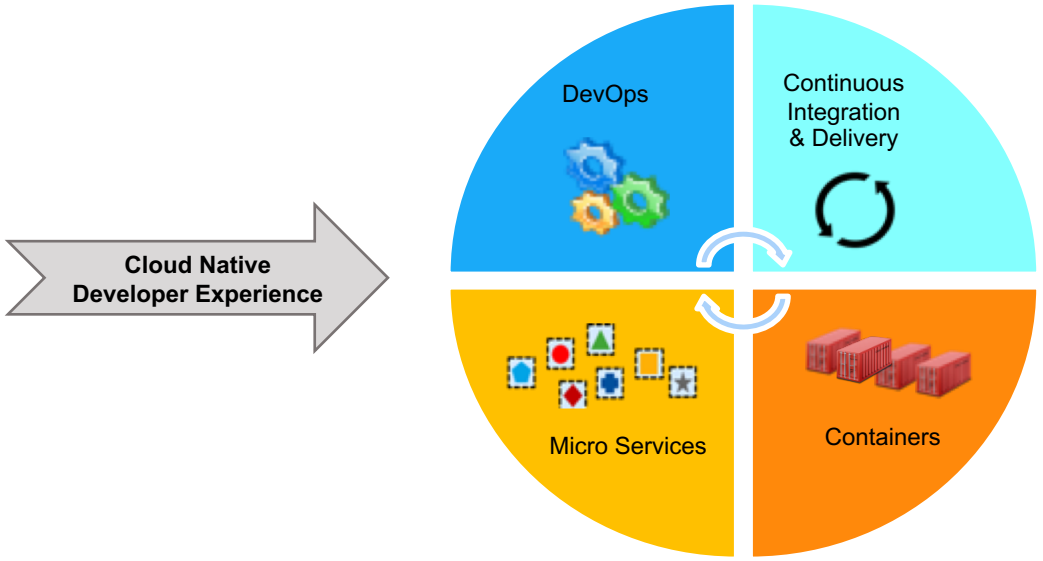
Automated Rollouts & Rollbacks

Secret & Configuration Management

Kubernetes is an open source Orchestration Tool that allows automation of key container as scaling, upgrades etc.

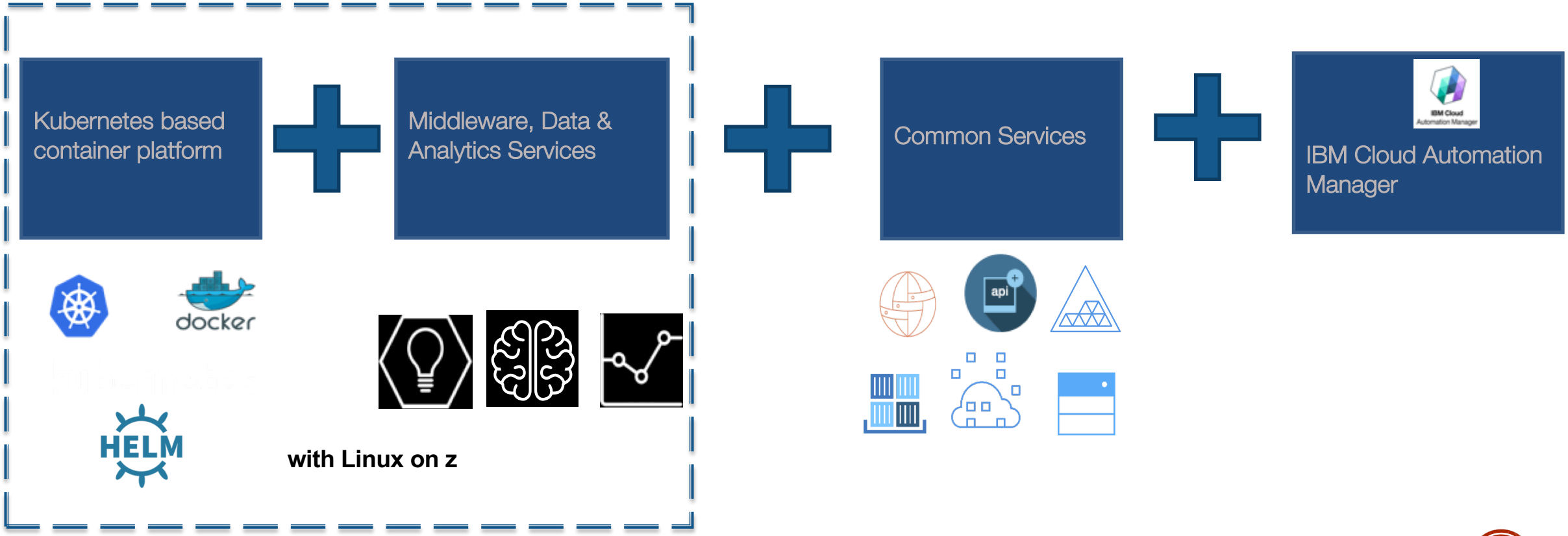
WHAT DOES IBM CLOUD PRIVATE PROVIDE?





WHAT DOES IBM CLOUD PRIVATE PROVIDE WITH LINUXONE / LINUX ON Z ?

- Kubernetes based CaaS model Docker CE and Kubernetes
- Includes Service Catalog with a library of IBM MW and Open Source services (Db2, WAS, DSX, Node, etc.)
- Can be managed from Intel or Power or Z
- Create a Build, Test, Development & Production Environment for z



Core Operational Services

To simplify Operations Management, Security, DevOps, and hybrid integration

Graphical User Interface
Editor / Git

Chef Configuration Manager

Automation for provisioning middleware and application configuration

IBM Microsoft ORACLE

- Compliance Automation
- Supermarket Recipes
- Middleware Configuration
- Middleware
- OS Configuration

Terraform Provisioning Platform

Infrastructure as Code for provisioning on public and on-premise cloud

- OS
- Virtualization
- Compute
- Storage
- Networking

CAM {REST} API

Service Composer and Orchestration Engine

Service Integrations — Service Composer

Flow Engine

Template Management

Template API

Terraform | Helm

Instance Management

Workload

Service

IaaS Management

IBM Cloud Microsoft amazon webservices openstack vmware

https://medium.com/ibm-cloud/ibm-cloud-automation-manager-a-primer-460d912246d2

IBM Cloud Private Available Versions / packages

Community

Use Case

Start easily - create cloud-native applications in a non-production environment

Platform
- Kubernetes
- Core services (Security, logging, monitoring, etc)
- Catalog of containerized content

Freely available in Docker Store

Note: The Community Edition is limited to 1 Master Node, and is for non-production use.

Cloud Native

Use Case

Confidently develop & deploy microservices built on 12-factor application principles

Platform
- Kubernetes
- Core services (Security, logging, monitoring, etc.)
- Catalog of containerized content

Cloud Foundry on Intel (Optional add-on)

IBM Enterprise Software
- Microclimate
- WebSphere Liberty
- IBM SDK for node.js
- Cloud Automation Manager

Enterprise

Use Case

Modernize existing applications
Open & Connect enterprise data centers to work with cloud services

Platform
- Kubernetes
- Core services (Security, logging, monitoring, etc.)
- Catalog of containerized content

Cloud Foundry on Intel (Optional add-on)

IBM Enterprise Software
- *Cloud Native*

\+ WAS ND
\+ MQ Advanced
\+ API Connect Professional

3. WHY USE IBM CLOUD PRIVATE ON Z?

MODERNIZING LINUX ON THE PLATFORM

- *Participating in the Open World*
- *Participating in open source communities to upstream platform support*
- *Enable a rich set of modern dev languages & run times*
- *Enable new open source databases*
- Modernize applications with speed, agility & security
- *Leveraging Containers & Microservices for Cloud Native App Dev*
- *Having a DevOps Environment that looks and feels like x86*
- Be an ultra secure & performant cloud-native platform for modern developers
- *Adding KVM & DPM to lower z skills barrier*
- *Enabling "born on the cloud" Ubuntu distro*
- *New relationships with ISVs for critical apps on the platform*

A RICH OPEN ECOSYSTEM OFFERING GREATER FLEXIBILITY & CHOICE

Distributions	Virtualization	Languages	Runtimes	Management	Database	Analytics
ubuntu Supported by Canonical	KVM	python	nodeJS	CHEF	MariaDB	Spark
SUSE	VM	Ruby	RAILS	puppet labs	PostgreSQL	elasticsearch
redhat	LPAR	php R	Zend framework (PHP)	ANSIBLE	mongoDB	
Community Versions	DPM	ERLANG	OpenJDK	juju	cassandra	Apache Solr
debian openSUSE	Docker)	Scala	LLVM	openstack	IBM Cloudant	
fedora CentOS	LXD (Ubuntu)	Clojure JS OCaml Java Swift	Apache Tomcat	kubernetes vmware vRealize urban{code}	redis MySQL ORACLE Diamond Partner DB2	BLU Acceleration

Canonical unveils 6th LTS release of Ubuntu with 16.04

For the latest view of packages, see URL

THE LINUX FOUNDATION

OPEN MAINFRAME PROJECT

Why include Z as part of your private cloud strategy…

- Provides Scale, High Availability, Reliability, Unmatched Security with Hyper Protect Containers, Integration to z/OS services…all this with no special Z skills required

Consumable Security: With Secure Service Container technology

Price/Performance: IBM Cloud Private licenses priced at par with x86 cores, an IFL offer higher virtualization capacity - can run more workloads depending on how much you want to virtualize

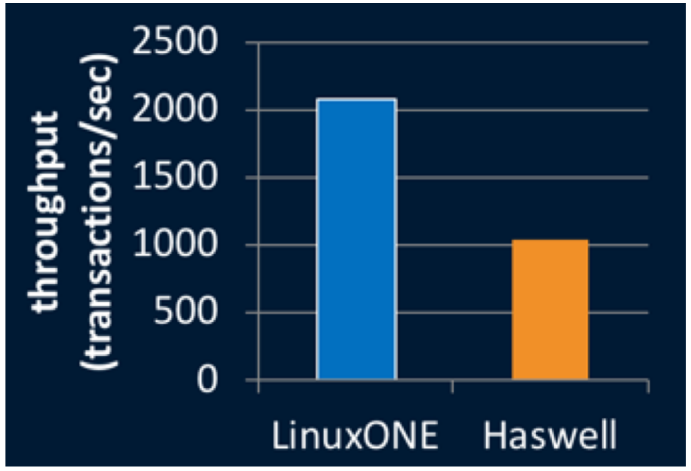
Diagonal Scale : Scale both vertically and horizontally. Example, a single node MongoDB scaling to 17TB while still maintaining <5ms latency and 2x throughput and 99.999% uptime

Extreme Virtualization and Scale

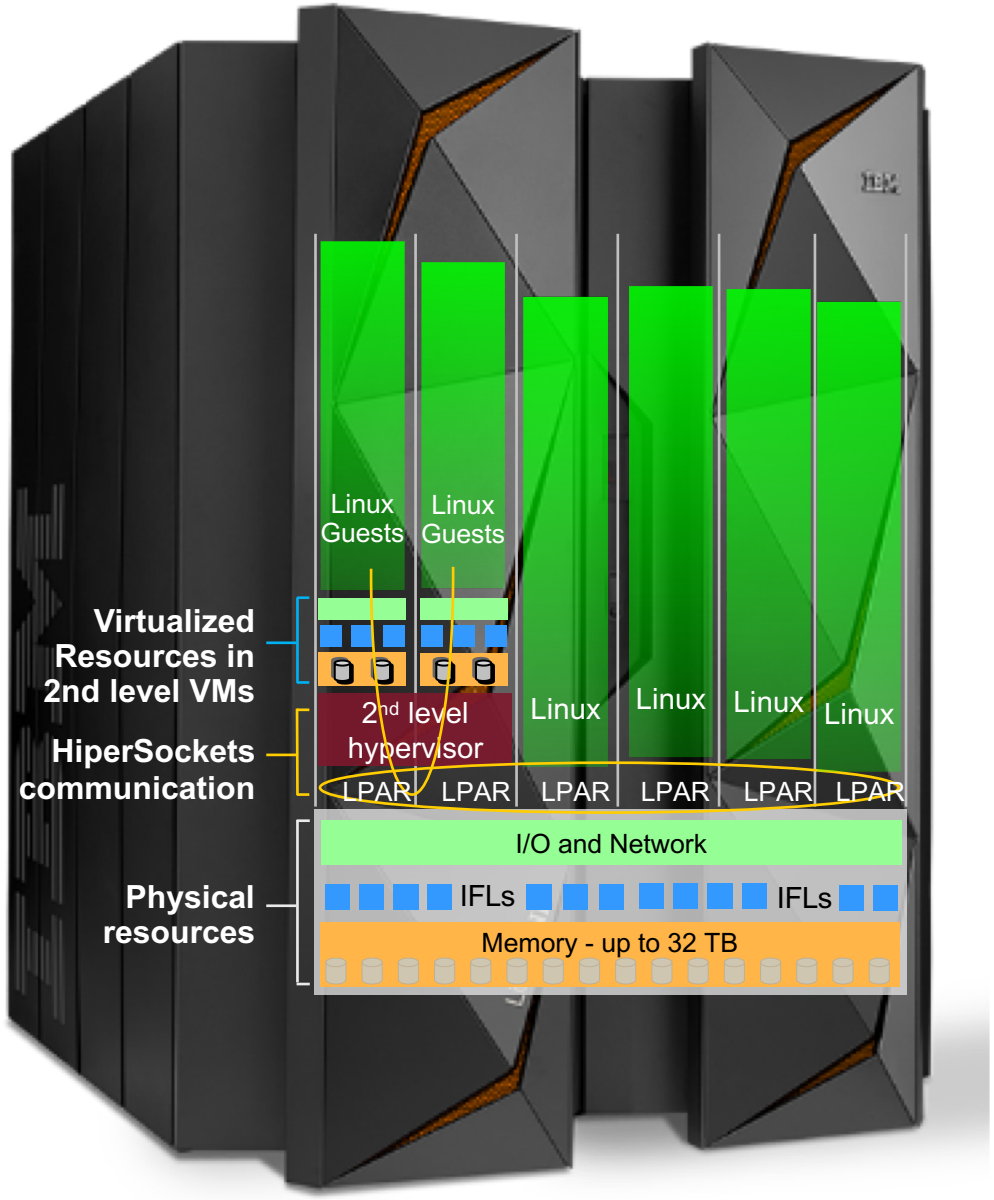
1k Linux guests/hypervisor
85 EAL5+ zVM/KVM per box
+2 million containers
Massive dedicated I/O
640 co-processors

Performance at Scale

Runs 4K active Docker containers on avg 2.0x better than comparable Haswell-based system!
Host over 13K Docker containers with mixed (heavy & light) workload



LINUX ON IBM LINUXONE™ EMPEROR II BASICS



Nested virtualization	Hardware optimized for two hypervisor levels
Extreme utilization	Through balanced system design
HiperSockets™	Efficient and secure internal network for all workload communication
Virtualization Management	z/VM + IBM Wave and/or KVM with standard manageability interfaces - efficiency at scale with easy administration, provisioning and automation
Linux VMs	Up to thousands Linux VMs running standard Linux distributions
Protected Key encryption	Fast in-system encryption without exposing private keys to the Operating Systems

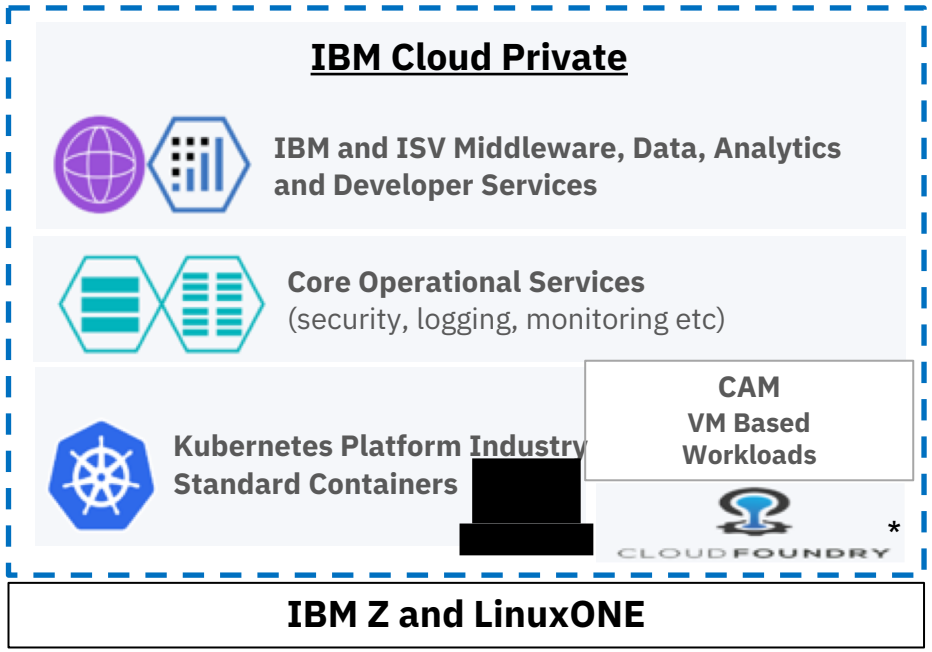
redhat. SUSE ubuntu

debian openSUSE fedora

WHY IBM CLOUD PRIVATE ON Z

Benefits on Z

- **Modernization and Digital Transformation Speed**.
- **Highest levels of Security**
- **Only private cloud offering that can support IBM Z**

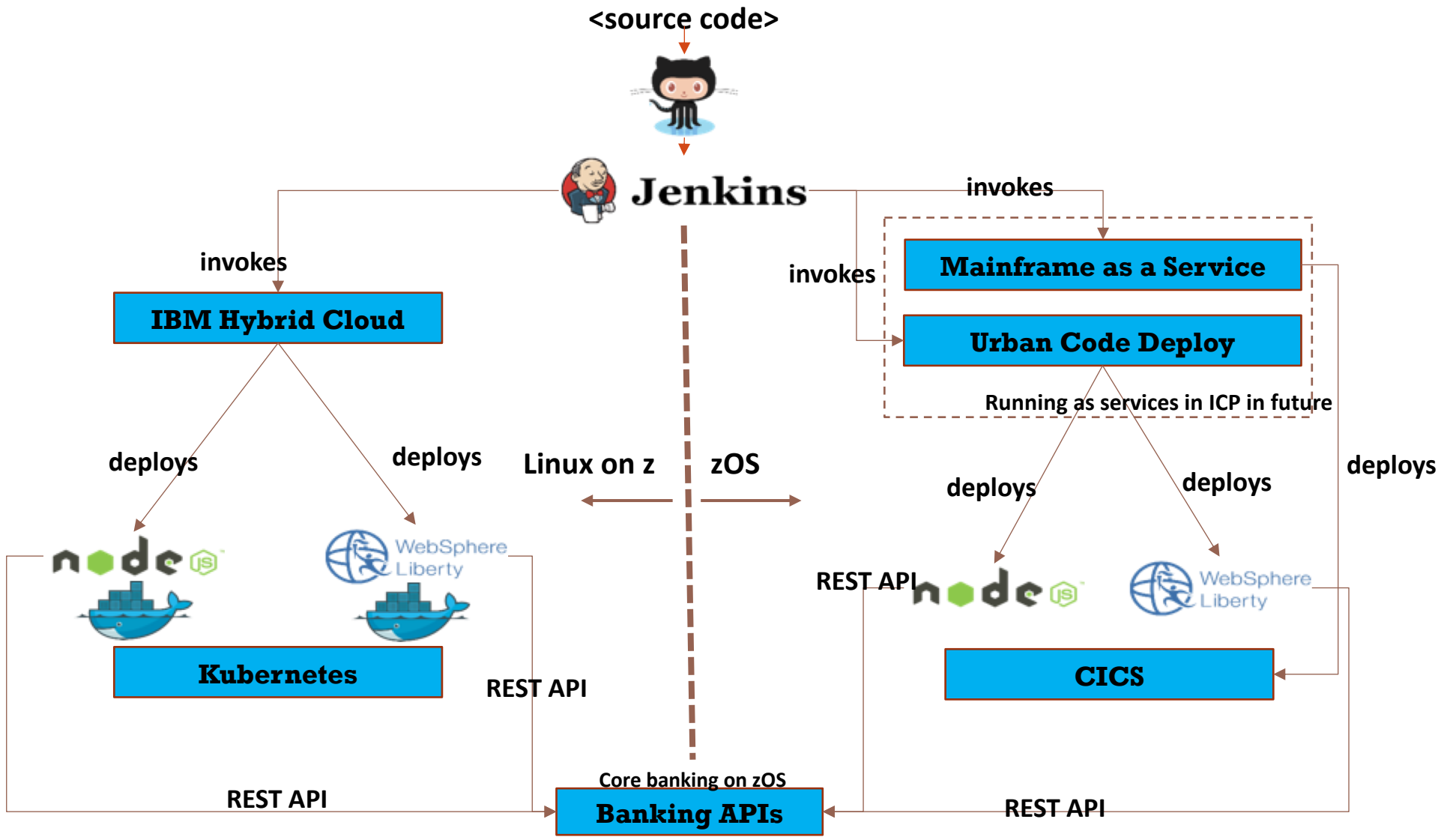


Adoption Patterns

- **Application Modernization** with IBM Middleware and Container content.
- **Digital Transformation** with z/OS
- **Cloud Native Services** with Hyper Protect Containers and Runtimes

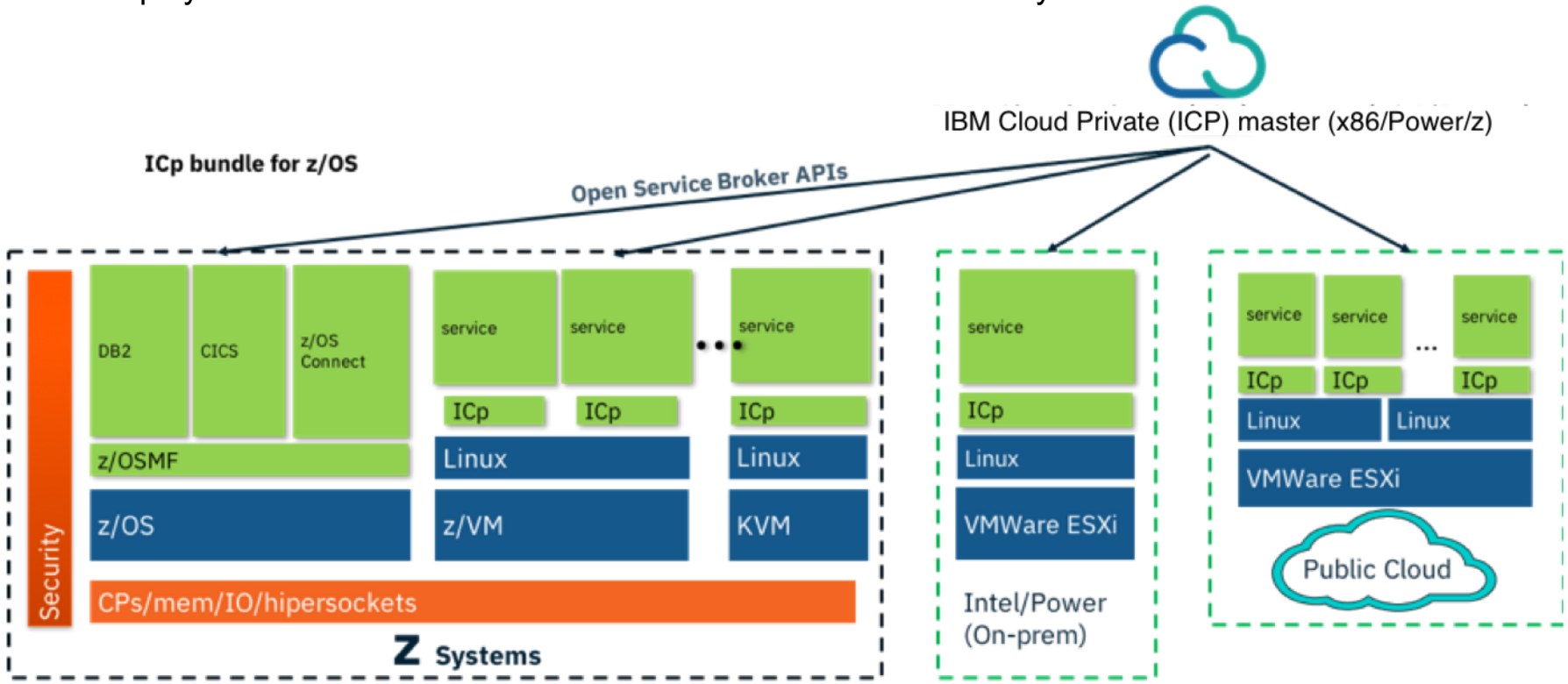
Enterprise grade. **Open** by design. **Secured** by IBM Z

Continuous Deployment/Integration with Jenkins



Future: IBM Z as a differentiating asset in ICP from services that span z/OS, Linux, and public cloud

- Cloud consumption for z/OS (DBz-aaS, WASz-aaS, MQ-aaS, CICS-aaS etc)
- DevOps, microservices and application life-cycle management for zOS
- Cloud automation to help overcome skill gaps
- Open service broker APIs connect external managed services to applications in the Kubernetes cluster
- IBM Multi-Cloud Manager v3.1 enables management of clusters in different environments (i.e. ICP, public clouds, etc.) from IBM Cloud Private => deploy charts from ICP across connected clusters and collectively monitor all connected clusters



4. IBP4ICP VLD DEMO

DEMONSTRATION VEHICLE LIFECYCLE DEMO MEETS IBP4ICP

TRY IT YOURSELF!

- IBM Cloud Private Community Edition: free distribution for testing out/familiarizing yourself with ICP [meant for dev only not production]
- 1 master node (x86, power, or z [linux on z/LinuxONE]) + worker nodes (x86, power, z [linux on z/LinuxONE])

1. Configure cluster: https://www.ibm.com/support/knowledgecenter/en/SSBS6K_3.1.2/installing/prep_cluster.html
2. Then install IBM Cloud Private Community Edition:

    a. Instructions for Manage from x to x, z, power
    https://www.ibm.com/support/knowledgecenter/en/SSBS6K_3.1.2/installing/install_containers.html

    b. Instructions for Manage from z
    https://www.ibm.com/support/knowledgecenter/SSBS6K_3.1.2/installing/install_s390x.html#install

THAT'S ALL FOLKS … QUESTIONS?