A Hands-on Introduction to IBM Cloud Private

David Solomon

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IBM Cloud Technical Evangelist Team

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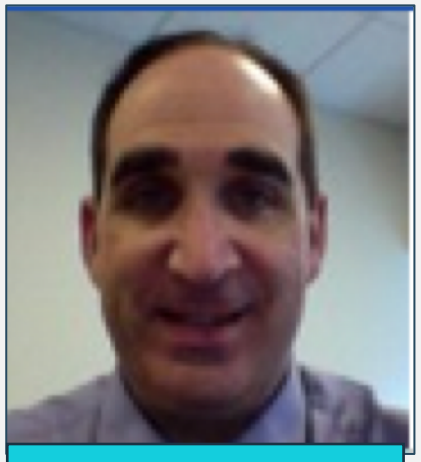
About Me



***David** Solomon*
Technical Evangelist, IBM

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Team-wolfpack

Focus / Passion

- AI, Cognitive, Emerging Technology
- Analytics
- Data (Architecture, Modeling, Integration)
- Cloud Service Architecture
- Applying the above to real-world business problems

Education & Certification

- M.S. Software Engineering
- B.S, Physics
- Data Mgmt, AI, Cloud, Docker, DevOps, …

Proud Member of the IBM WolfPack

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Since 2000, 52% of the Fortune 500 have either gone bankrupt, been acquired, or ceased to exist.

•52%

Capgemini Consulting,
"When Digital Disruption Strikes: How Can Incumbents Respond?"

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Why are we vulnerable to such seismic shifts?

Internal Threats

Siloed data and systems

Gaps in expertise and skills

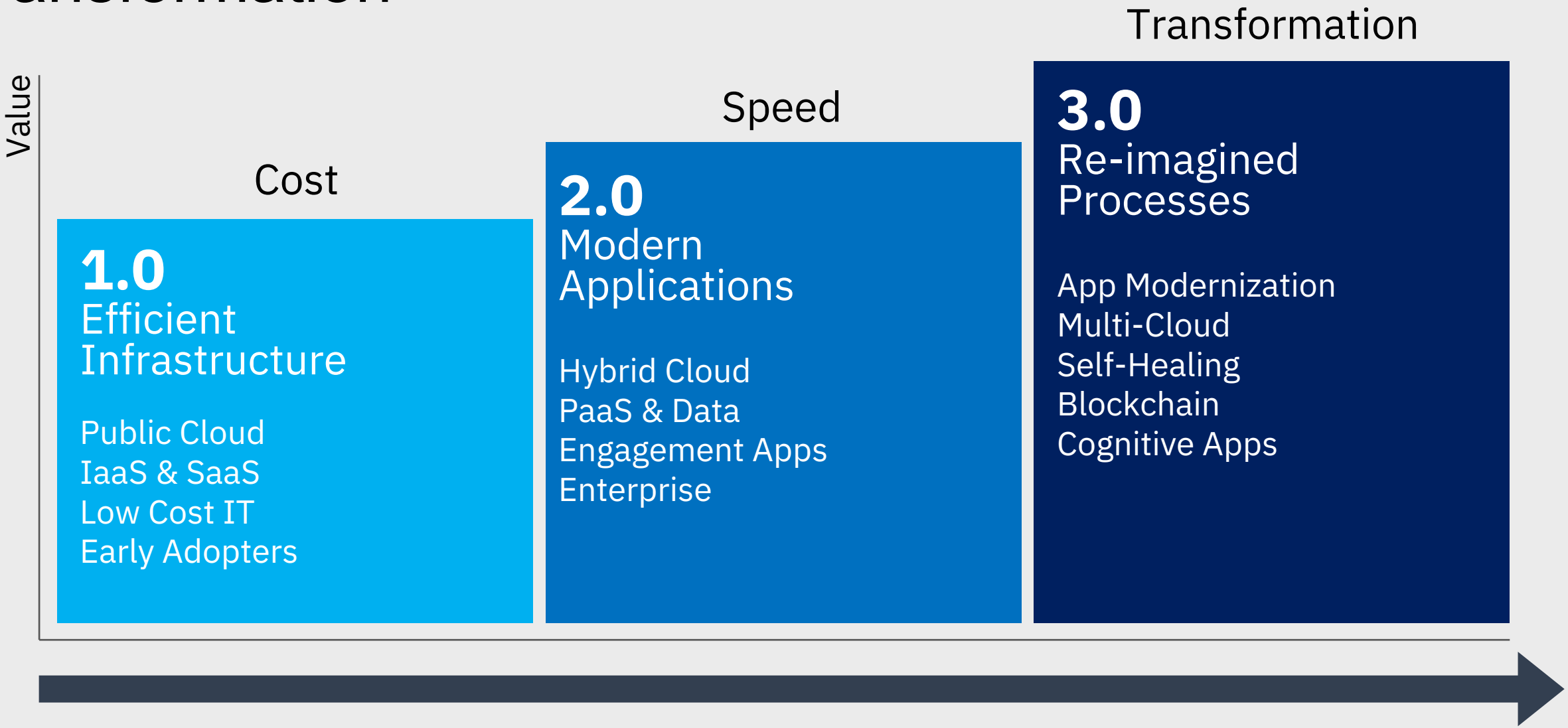
Inability to react quickly

External Threats

Born-on-digital companies that steal market share or rewrite customer expectations

New business models that reinvent our industry and change the game altogether

Cloud is the technology for transformation



Multi-cloud is the key to organizational agility

8 out of 10 committing to Multi-Cloud

71% use 3 or more clouds

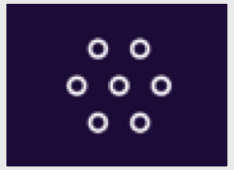
+

Getting new value from third parties

Extracting value from your entire business

IBM Cloud / © 2018 IBM Corporation

Private cloud is critical to the IBM cloud strategy



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.

Key use cases driving private cloud adoption

1

Create new cloud-native applications

2

Modernize and optimize existing applications

3

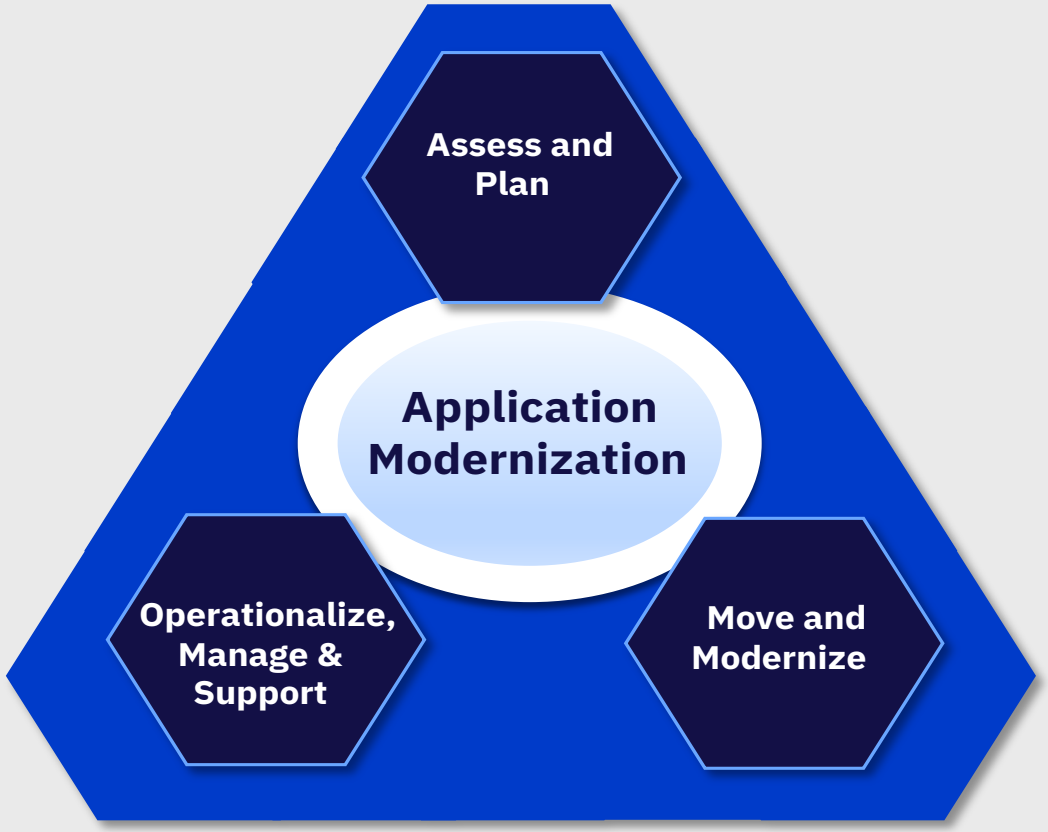
Opening up enterprise data centers to work with cloud services

Multi-cloud management and orchestration

IBM Cloud / © 2018 IBM Corporation

Organizations are focusing on modernization

- 70% of private cloud adoption is being driven by the need to modernize
- IBM delivers a framework to accelerate the app modernization journey



Assess and plan
Understand the application, components, technology stack, functional and non-functional requirements, dependencies, and processes.

Move and modernize
Containerize and move your application to the cloud; refactor monoliths with a microservices architecture.

Operationalize, manage, and support
Ready your operations teams to manage and monitor applications from a single pane of glass.

IBM Cloud / © 2018 IBM Corporation

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IBM Cloud Private brings cloud native to the enterprise:

Rapid Innovation

- Open Kubernetes-based container platform
- Cloud Foundry for app dev and deployment
- DevOps toolchain integration

Hybrid Integration

- Integration capabilities to unlock and connect
- Secure access to public cloud services (AI, Blockchain)
- Consistent experience across private/public

Investment Leverage

- Containerized versions of IBM Middleware
- Prescriptive guidance to optimize workloads
- Work with existing apps, data, skills, infrastructure

Management & Compliance

- Core operational services including logging, monitoring, security
- Flexibility to integrate with existing tools and processes

Built with open standards, preventing vendor lock-in

Executable package of software that includes everything needed to run it

Containers

Automate deployment, scaling, and management of containerized applications

Orchestration

Define, install, and upgrade Kubernetes applications

Management

Infrastructure as code to provision public cloud and on-premises environments

Provisioning

IBM Cloud / © 2018 IBM Corporation

Solution Overview

Enterprise Content Catalog

Open Source and IBM Middleware, Data, Analytics, and AI Software

Core Operational Services

Log Management, Monitoring, Metering, Security, Alerting

Kubernetes Container Orchestration Platform

kubernetes

docker

Choose your infrastructure:

Power Systems

openstack

IBM Spectrum

vmware

IBM Z

intel

Strategic Value:

Self-service catalog

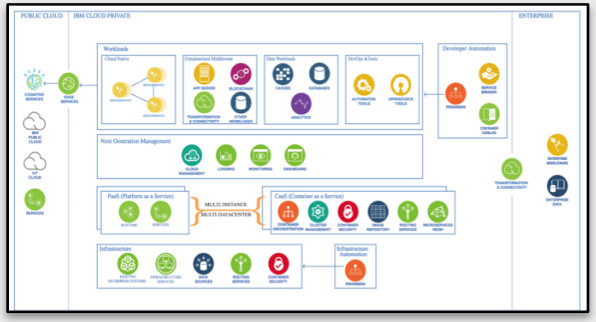
Agility, scalability, and elasticity

Self-healing

Enterprise security

No vendor lock-in

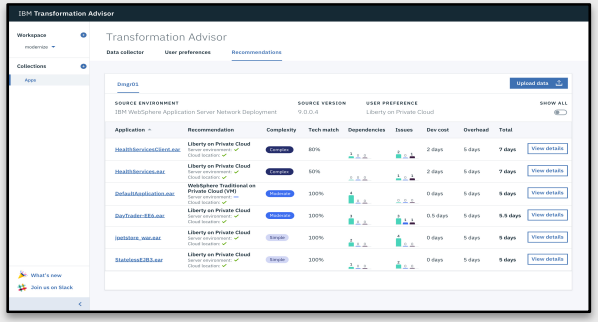
Proven Solutions to Accelerate Modernization



IBM Cloud Garage

Best Practices

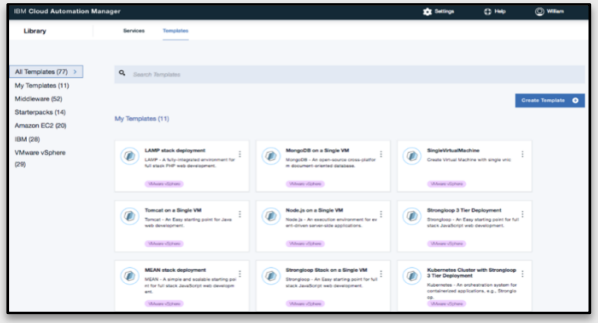
Reference Architectures



Transformation Advisor

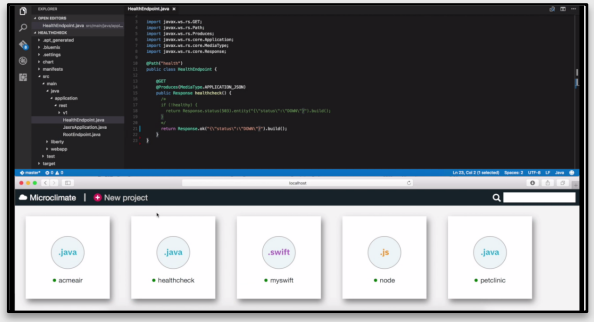
Assess and Plan

Prescriptive Guidance



Cloud Automation Manager

Multi-Cloud Provisioning and management



Microclimate

End-to-End Development Experience

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IBM Cloud Private Editions

Community

Platform
- Kubernetes (+ Helm)
- Core services
- Content catalog (Containers)

Freely Available in Docker Hub

Cloud Native

Platform
- Kubernetes (+ Helm)
- Core services
- Content catalog (Containers)

Cloud Foundry (Optional)

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

Enterprise

Platform
- Kubernetes (+Helm)
- Core services
- Content catalog (Containers)

Cloud Foundry (Optional)

IBM Enterprise Software
Cloud Native Edition, plus:
+ WAS ND
+ MQ Advanced
+ API Connect Professional

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Why Containers?

Everyone Loves Containers

- A standard way to package an application and all its dependencies so that it can be moved between environments and run without changes
- Containers work by isolating the differences between applications inside the container so that everything outside the container can be standardized

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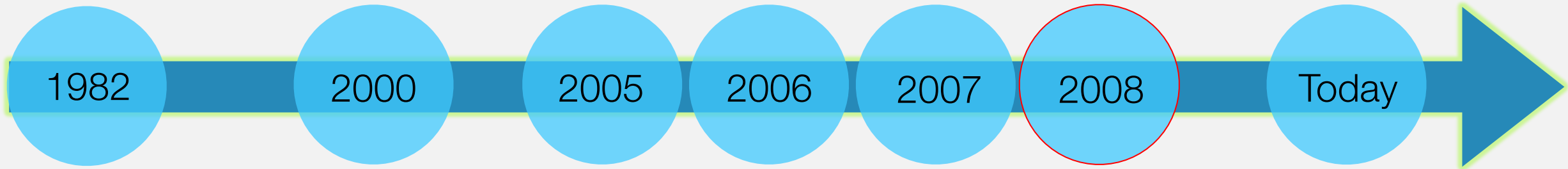
Container History Lesson



Unix/chroot
BSD

FreeBSD
jails/Solaris
zones

OpenVZ
Parallels

Cgroups/Process
Containers
IBM/Google

AIX Wpars
IBM

Linux Containers
(LXC)

docker

Rocket

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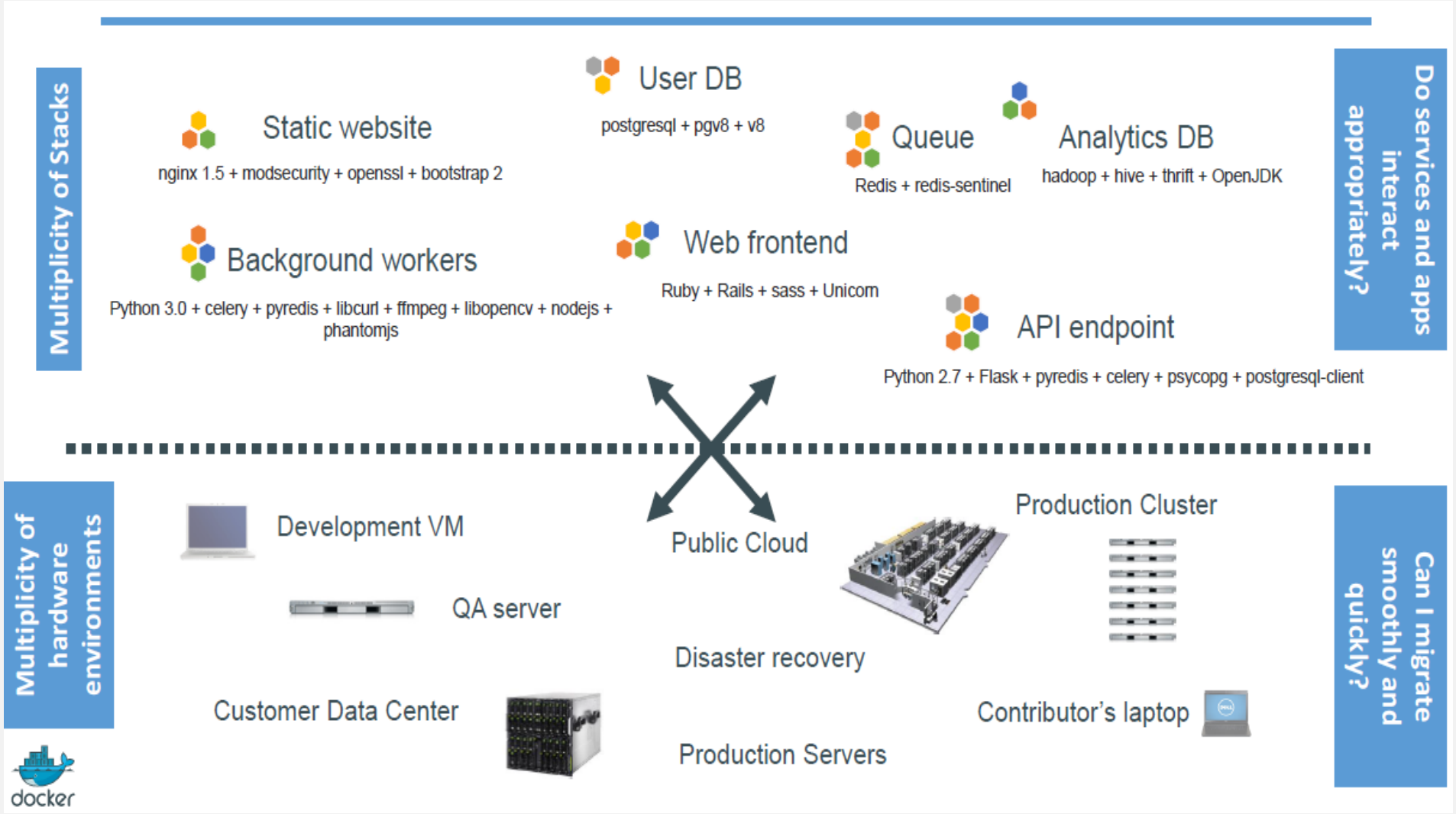
The Challenge



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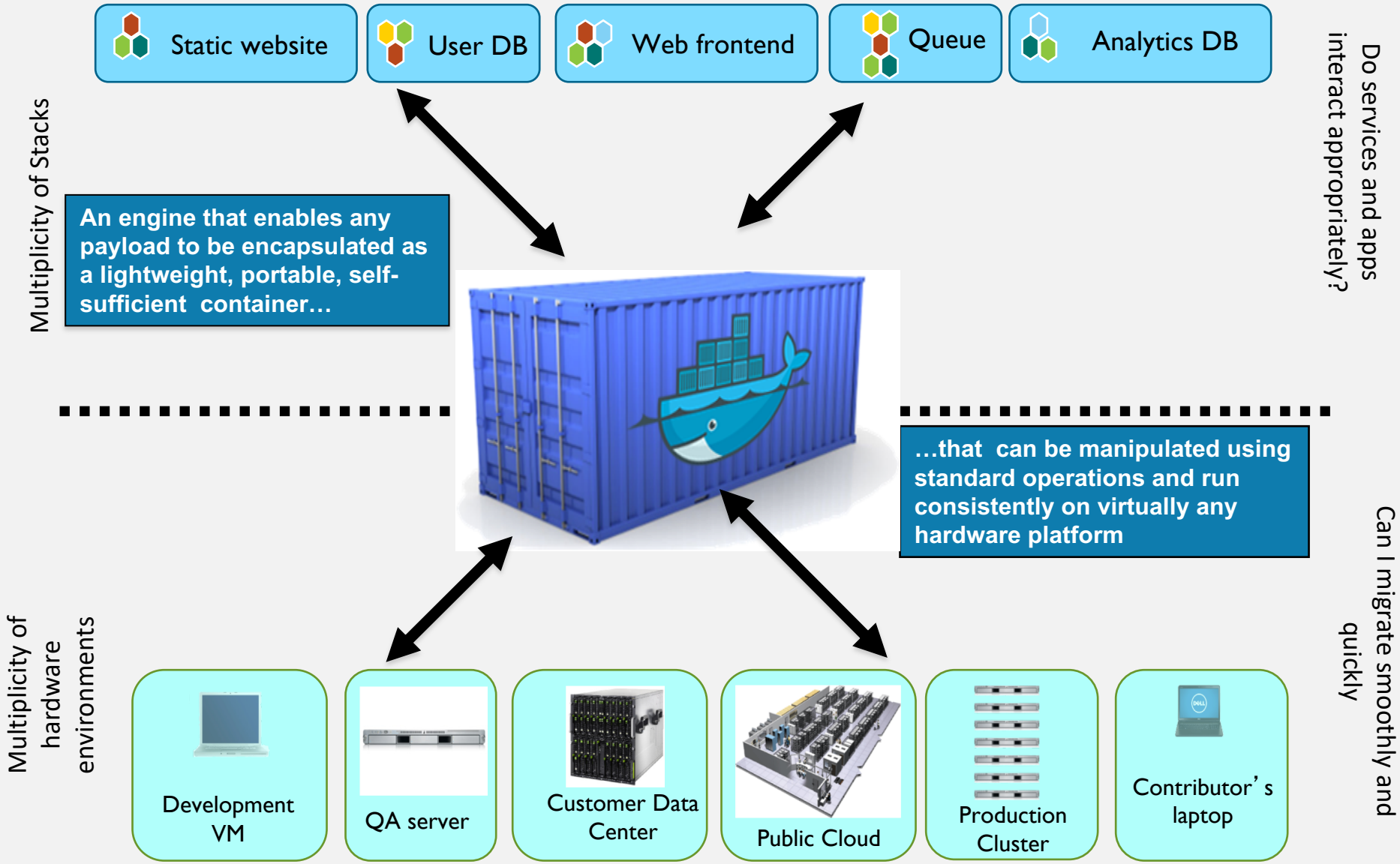
A Shipping Container for Code



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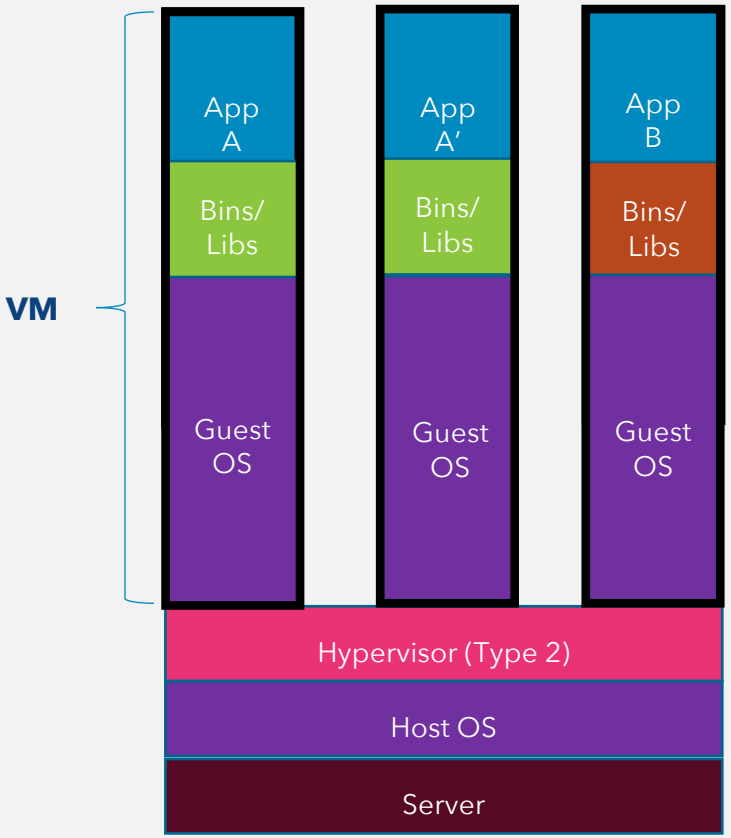
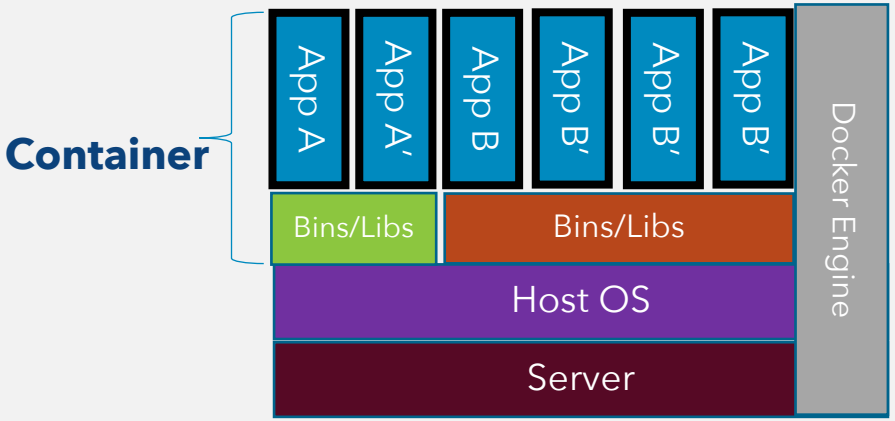
VM's vs. Containers



Containers are isolated, but share OS and, where appropriate, bins/libraries

…faster, less overhead



Simple Fact:

A container is ***just a process / service*** running on the host machine and ***managed by the Docker Engine***

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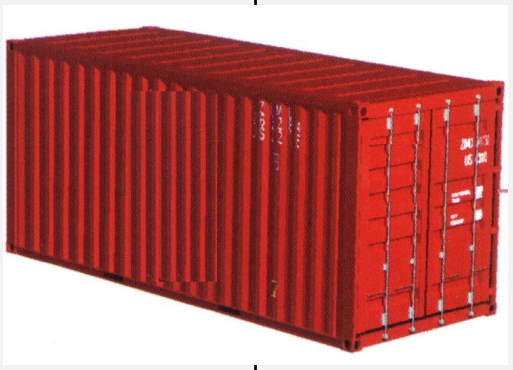
Dev vs. Ops

Dev	Ops



- Code
- Libraries
- Configuration
- Server runtime
- OS

- Logging
- Remote access
- Network configuration
- Monitoring

Separation of concerns

A container separates and bridges the Dev and Ops in DevOps

- Dev focuses on the application environment
- Ops focuses on the deployment environment

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Container Advantages

- Containers are portable
- Containers are easy to manage
- Containers provide “just enough” isolation
- Containers use hardware more efficiently
- Containers are immutable

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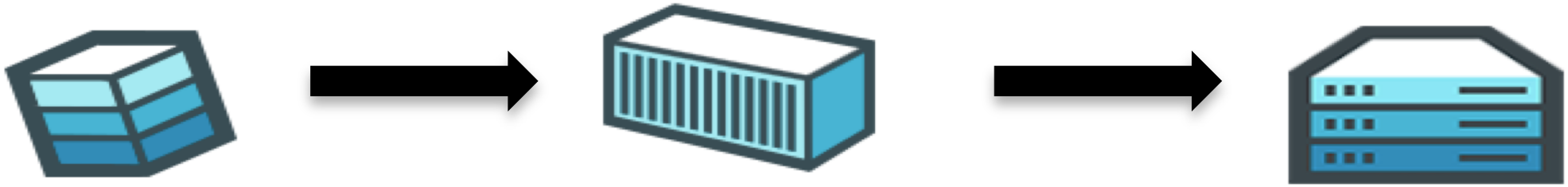
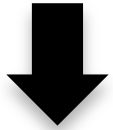
Docker Containers

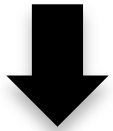
Docker Mission

Docker is an **open platform** for building distributed applications for **developers** and **system administrators**





Any App



Anywhere

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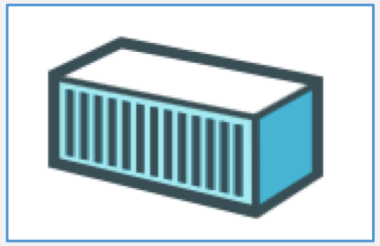
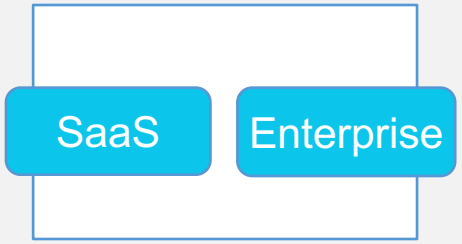
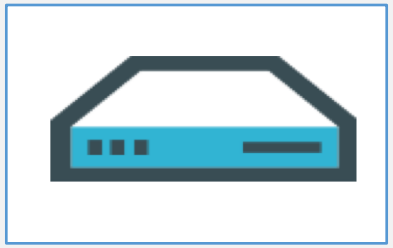
Docker Components







Image

- A read-only snapshot of a container stored in Docker Hub to be used as a template for building containers

Container

- The standard unit in which the application service resides or transported

Docker Hub/Registry

- Available in SaaS or Enterprise to deploy anywhere you choose
- Stores, distributes, and shares container images

Docker Engine

- A program that creates, ships, and runs application containers
- Runs on any physical and virtual machine or server locally, in private or public cloud
- Client communicates with Engine to execute commands

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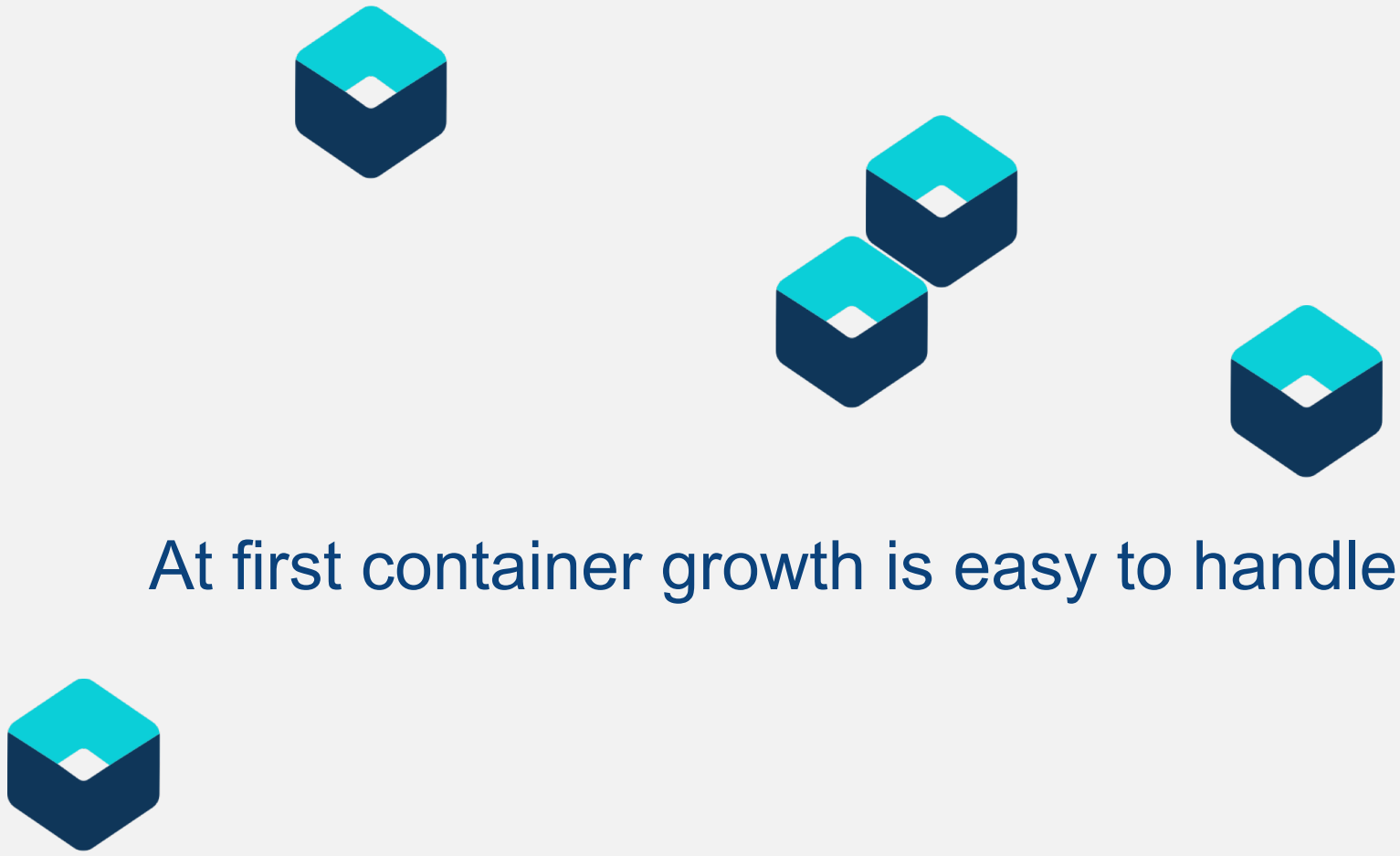
Containers



At first container growth is easy to handle….

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Containers

But soon it is overwhelming… chaos reigns

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Orchestration

More to Containers than just Docker

Serverless

APACHE OpenWhisk™

PaaS

CLOUD FOUNDRY

Container Orchestration

Apache MESOS™

kubernetes

Swarm/
Swarm Mode

Container Engine

OPEN CONTAINER INITIATIVE

rkt

docker

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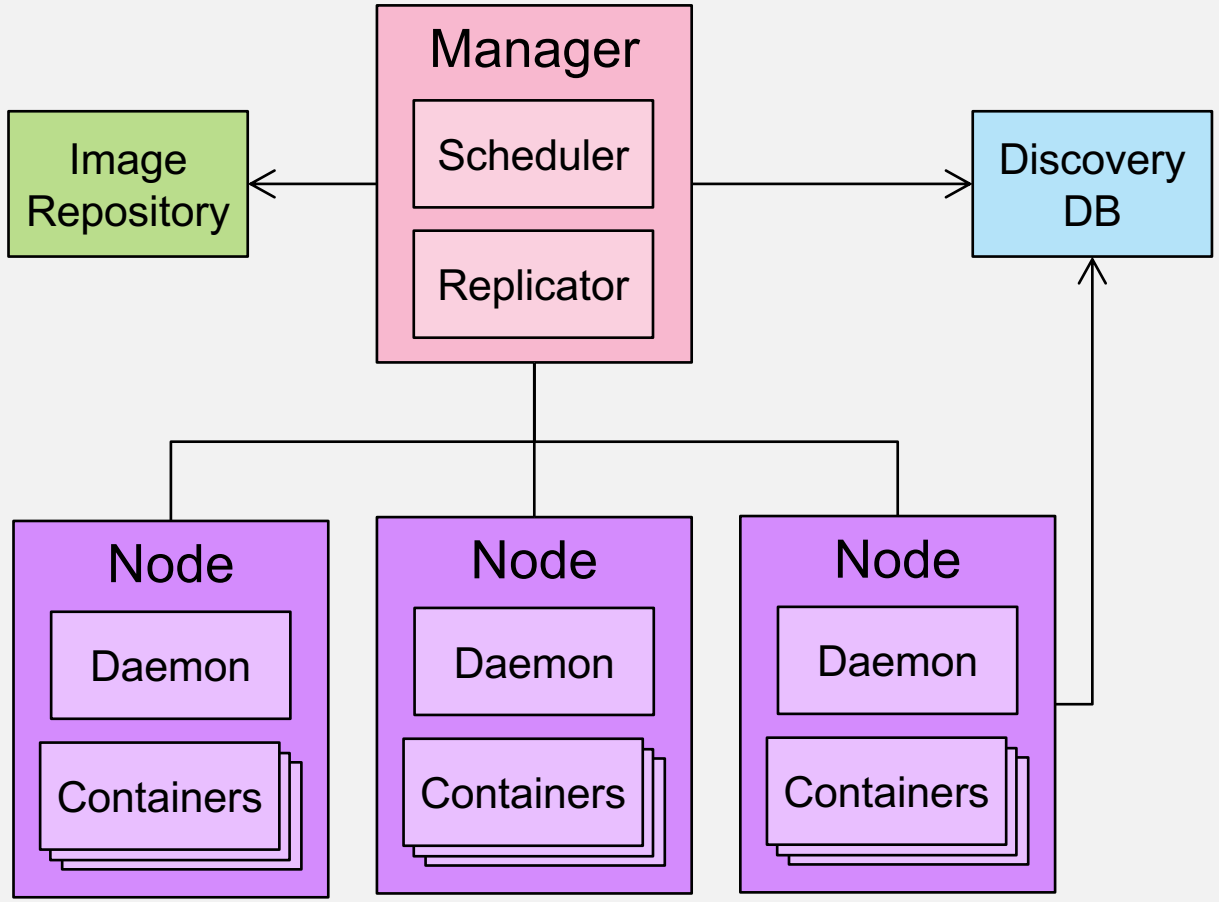
What is Container Orchestration?

- Container orchestration
  - Cluster management
  - Scheduling
  - Service discovery
  - Replication
  - Health management

Container Orchestrator



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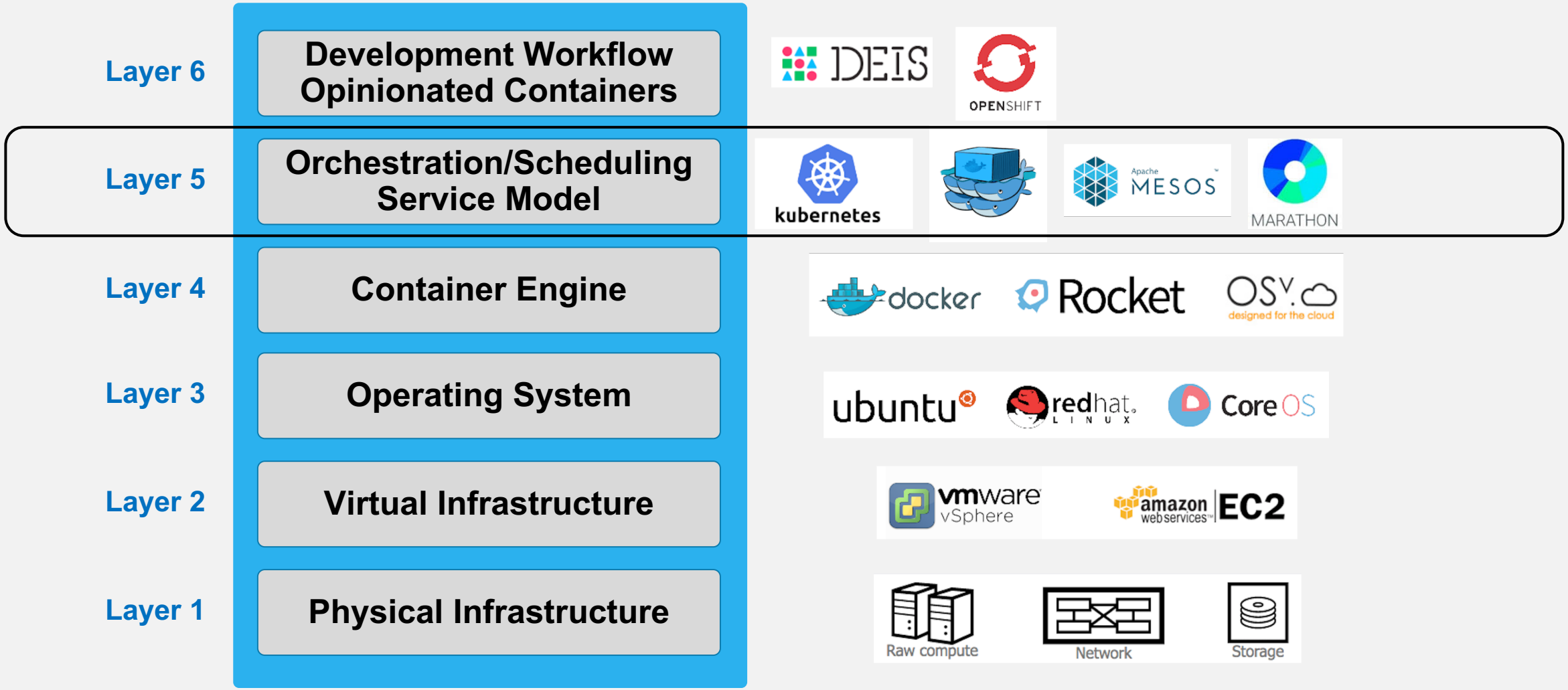
Container Ecosystem Layers



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Kubernetes

What is Kubernetes?

- Container orchestrator
- Manage applications, not machines
- Designed for extensibility
- Open source project managed by the Linux Foundation

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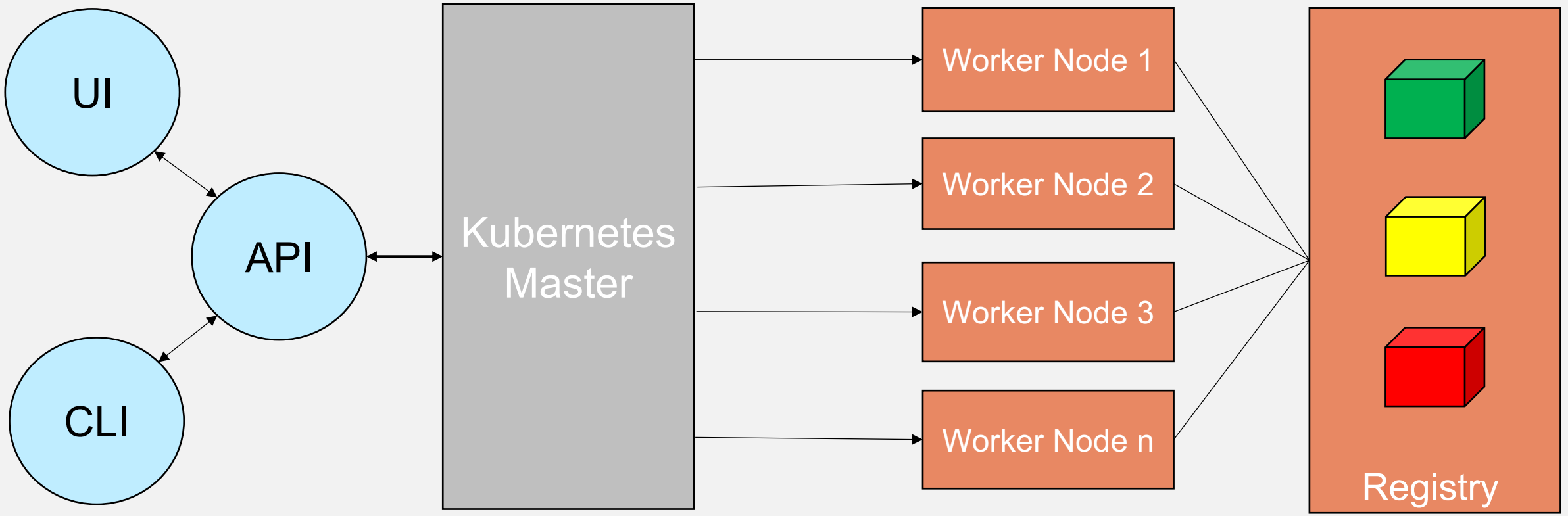
Kubernetes Architecture



- Etcd
- API Server
- Controller Manager Server
- Scheduler

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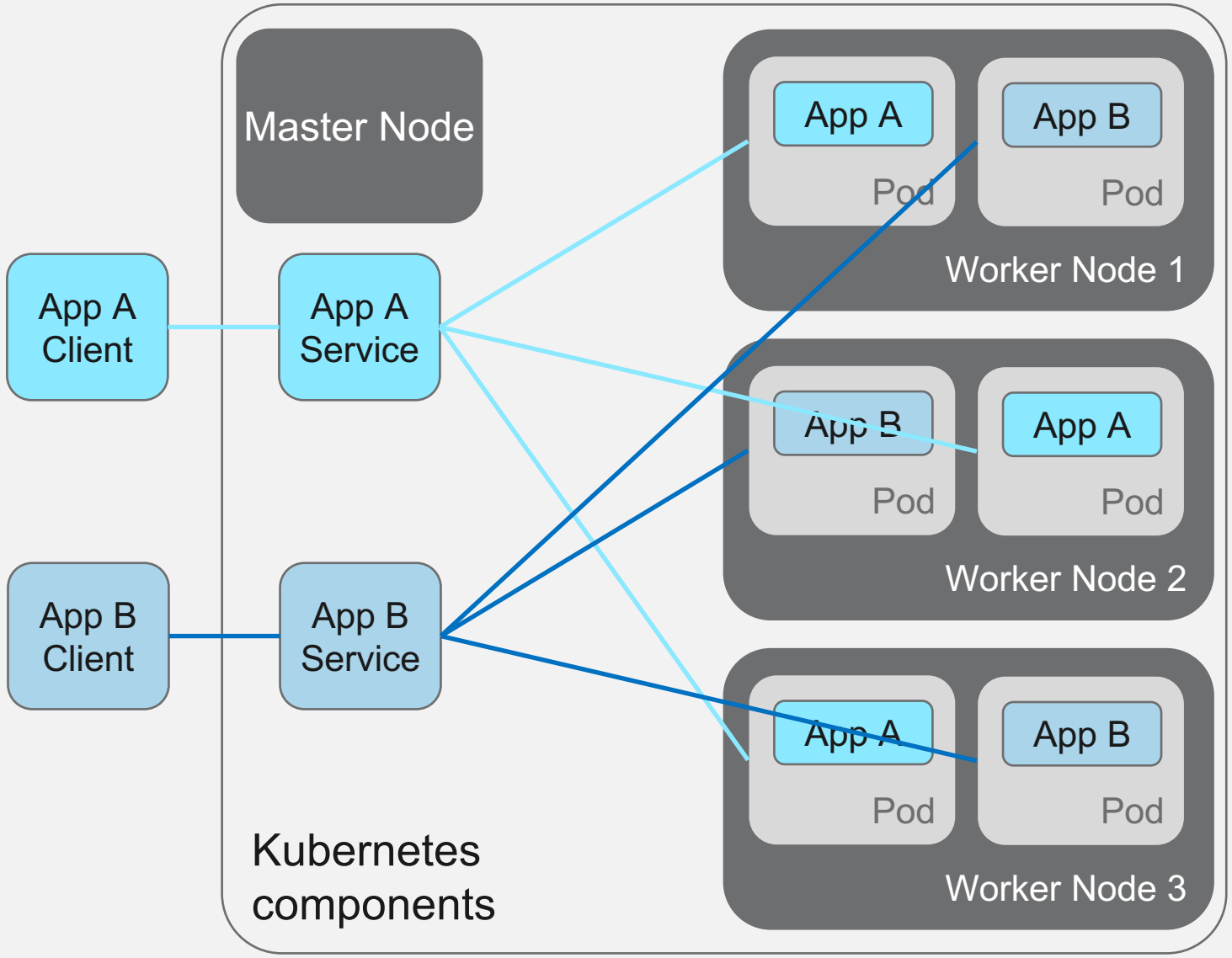
Kubernetes Architecture: Workloads

- Container
  - Packaging of an app
- Pod
  - Unit of deployment
- Service
  - Fixed endpoint for 1+ pods



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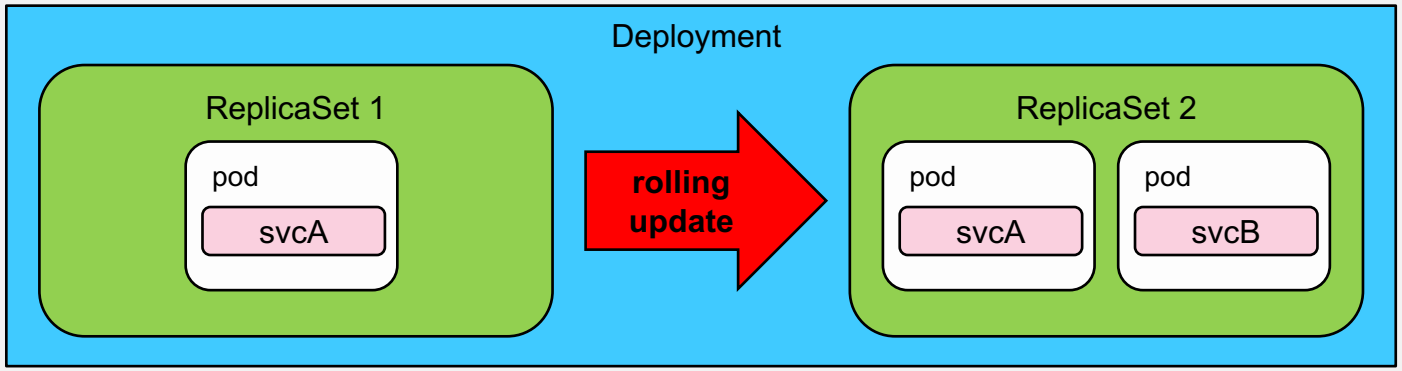
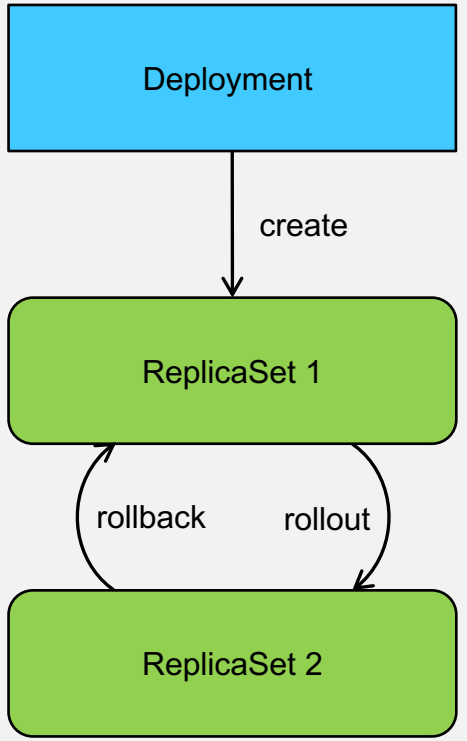
Kubernetes Terminology: Deployment

- Deployment
  - A set of pods to be deployed together, such as an application
- ReplicaSet
  - Ensures that a specified number of pod replicas are running at any given time





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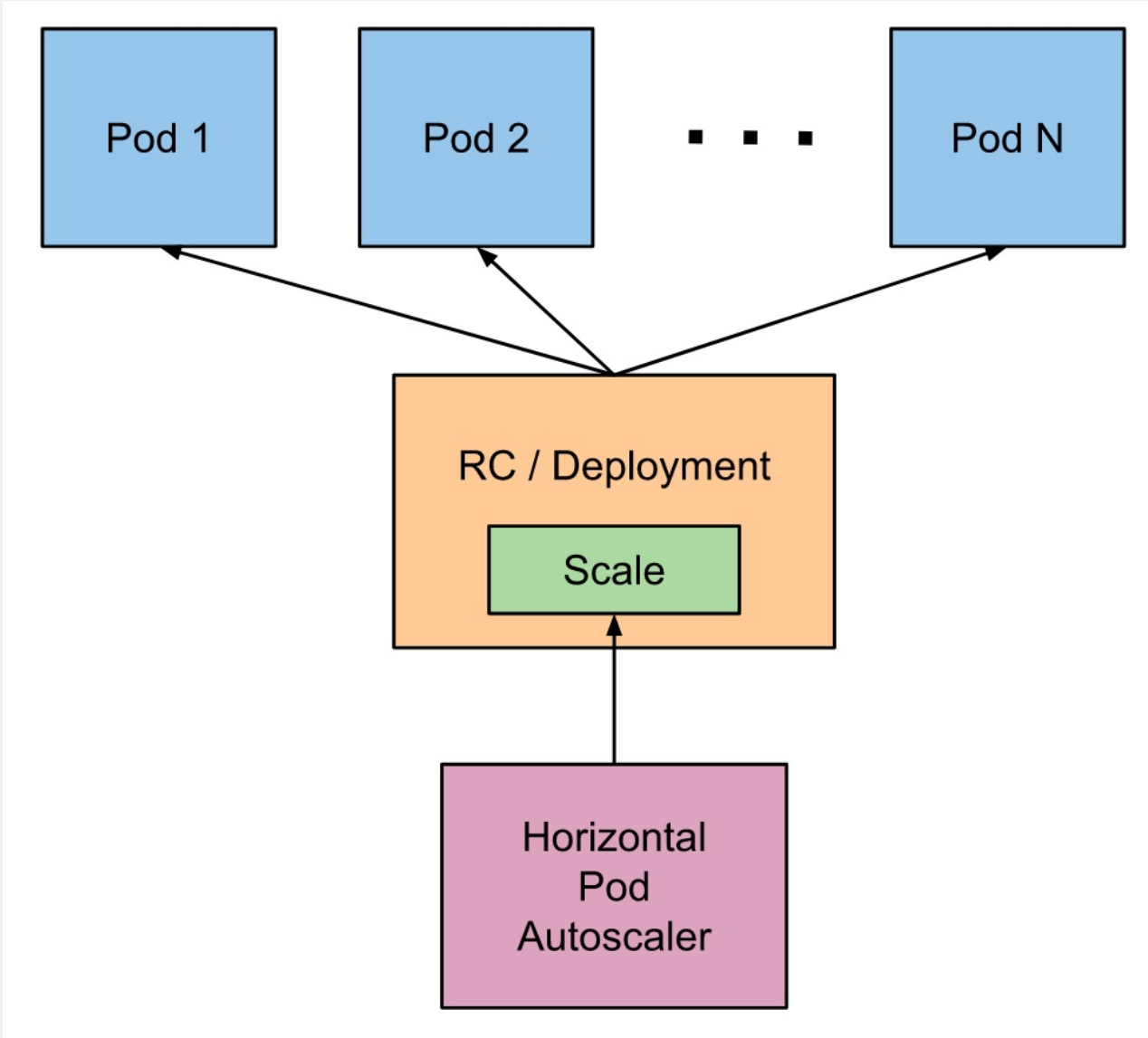
Kubernetes Terminology: Autoscaling

- Horizontal Pod Autoscaling (HPA)

```
$ kubectl autoscale deployment
<deployment-name> --cpu-percent=50
  --min=1 --max=10 deployment
"<hpa-name>" autoscaled
```



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Common Kubernetes Commands

- Get the state of your cluster
  ```
  $ kubectl cluster-info
  ```
- Get all the nodes of your cluster
  ```
  $ kubectl get nodes -o wide
  ```
- Get info about the pods of your cluster
  ```
  $ kubectl get pods -o wide
  ```
- Get info about the replication controllers of your cluster
  ```
  $ kubectl get rc -o wide
  ```
- Get info about the services of your cluster
  ```
  $ kubectl get services
  ```
- Get full config info about a Service
  ```
  $ kubectl get service
  NAME_OF_SERVICE -o json
  ```
- Get the IP of a Pod
  ```
  $ kubectl get pod NAME_OF_POD -
  template={{.status.podIP}}
  ```
- Delete a Pod
  ```
  $ kubectl delete pod NAME
  ```
- Delete a Service
  ```
  $ kubectl delete service
  NAME_OF_SERVICE
  ```

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Helm & Helm Chart

- Helm
  - Package manager for Kubernetes
  - Used to manage Kubernetes applications
- Helm Chart
  - Used to define, install, and upgrade complex Kubernetes applications
  - Easy to create, version, share and publish
  - Expressed in “Yet Another Markup Language” (YAML) files

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Kubernetes in the IBM Cloud

TWO PRIMARY OPTIONS

IBM Cloud (Public)

- IBM Kubernetes Container Service available as a fully managed service, as well as private Docker registry
- Pods and Containers can leverage other IBM Cloud services, such as Watson AI, the Watson Data Platform, and many others
- Pods and Containers can access your services either on-prem or from other cloud providers through secure means
- Full DevOps services available to help manage application development

IBM Cloud Private

- An operational Kubernetes-focused development and production version of IBM Cloud for deployment in your on-prem or cloud environment
- Enterprise-quality management, scalability, security, and resiliency features to support your Kubernetes Cluster deployment
- Built-in access to enterprise services such as analytics, middleware, data storage, and data science
- Access and integrate to your other on-prem and/or cloud services

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Survey

http://ibm.biz/survey_atl_icp

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