IBM Power Systems

Container Orchestration

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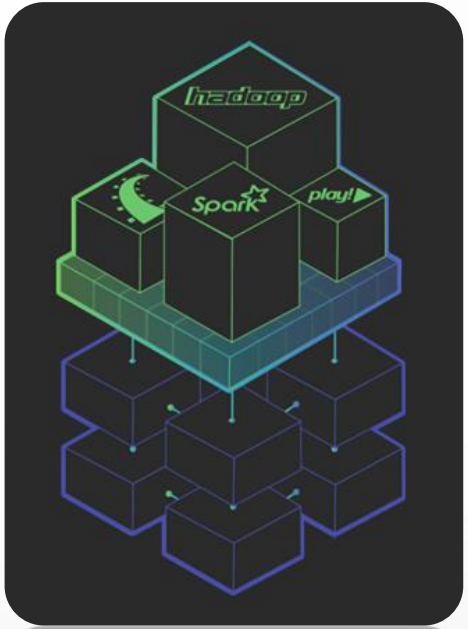
Genève – Nov 2016

Container Orchestration

- Docker Orchestration & Management tools
  - Orchestration tools extend lifecycle management capabilities to complex, multi-container workloads deployed on a cluster of machines
  - By abstracting the host infrastructure, orchestration tools allow users to treat the entire cluster as a single deployment target.

- For example:
  - Multiple hosts
  - Networking
  - Placement & Placement control
  - Affinity/anti-affinity
  - High availability
  - Scaling
  - Load balancing
  - Rolling upgrades



Container Orchestration

- Docker Swarm (Docker inc)
  - Swarm is the native clustering tool for Docker. Swarm uses the standard Docker API, meaning containers can be launched using normal Docker run commands and Swarm will take care of selecting an appropriate host to run the container on.

- Mesos (Apache)
  - Apache Mesos is an open-source cluster manager.
  - It's designed to scale to very large clusters involving hundreds or thousands of hosts. Mesos supports diverse workloads from multiple tenants; one user's Docker containers may be running next to another user's Hadoop tasks.

- Kubernetes (Google)
  - Kubernetes is an open-source system for automating deployment, scaling, and management of containerized applications.
  - Kubernetes was built by Google based on their experience running containers in production over the last decade.
- …

Open Source Options for Container Cloud Orchestration on Power

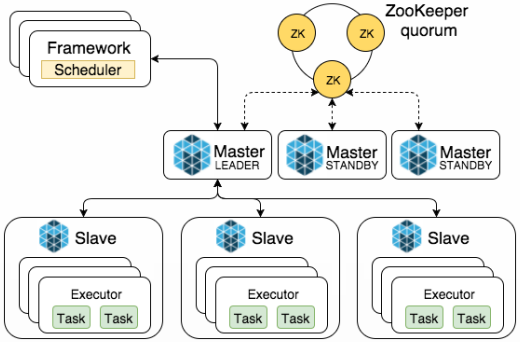
Docker Swarm/Datacenter

Docker Inc

- Docker swarm is tested and available on Power via master.dockerproject.org or Unicamp repo

Mesos

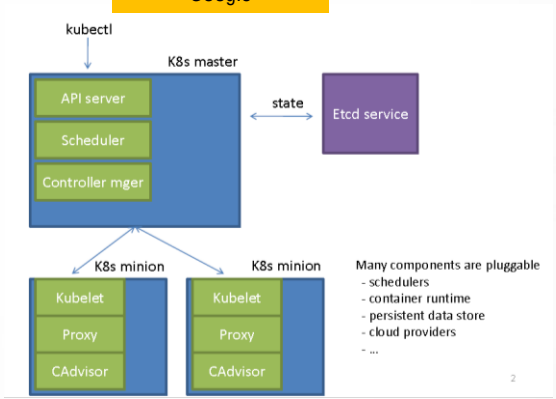
Mesosphere



- Mesos is tested and available
- http://ftp.unicamp.br/pub/ppc64el/rhel/7_1/misc_ppc64el

Kubernetes

Google

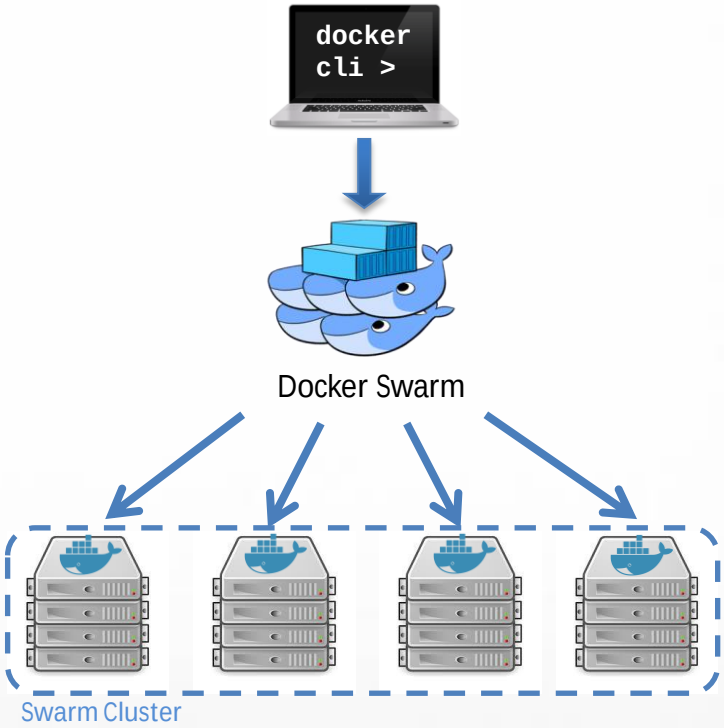


- CAdvisor and Kubernetes is tested and available
- http://ftp.unicamp.br/pub/ppc64el/rhel/7_1/misc_ppc64el/

These packages are for prototyping purposes, no official support via this site

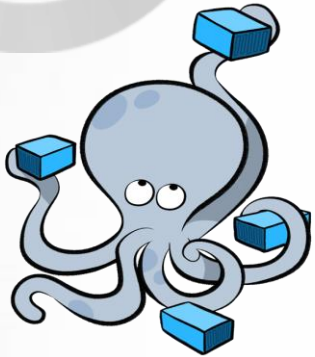
Swarm (Docker 1.12) Overview

- Integrated into Docker engine
- Manager/worker
- Auto heal, manual scale
- Service support with LB fixed IP
- Overlay networks & DNS
- Highly available manager
- Network security (TLS) with CA
- Node placement + Affinity/anti-affinity
- Deployment modeling via Compose



Docker-Compose

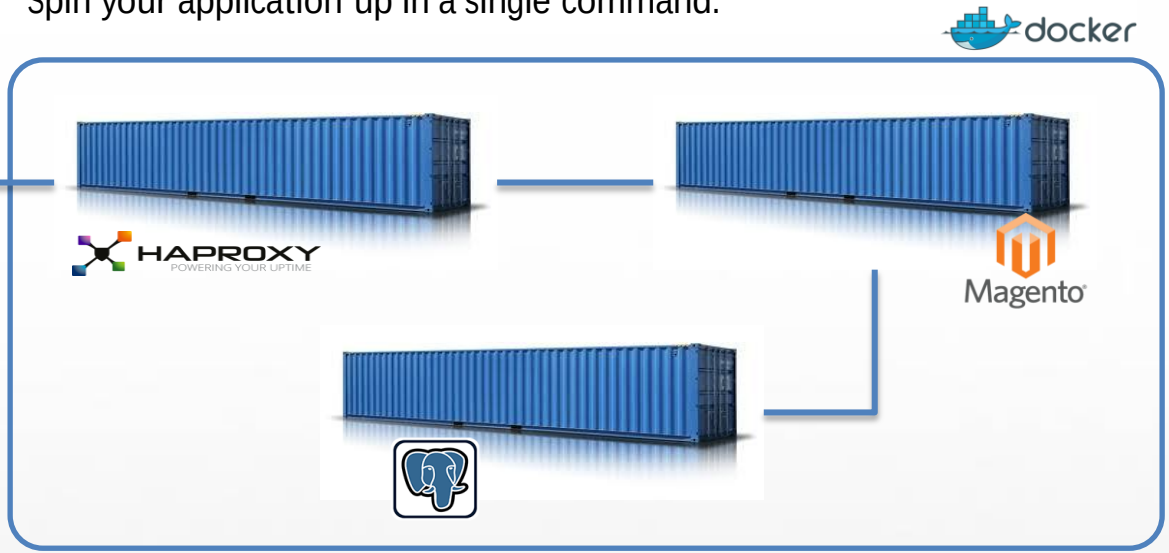
Define and run multi-container Docker applications.



External Network

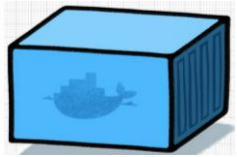
Docker Compose allows you to :

1. Define your multi-container application in a single file
2. Describe container relationship and dependencies
3. Spin your application up in a single command.

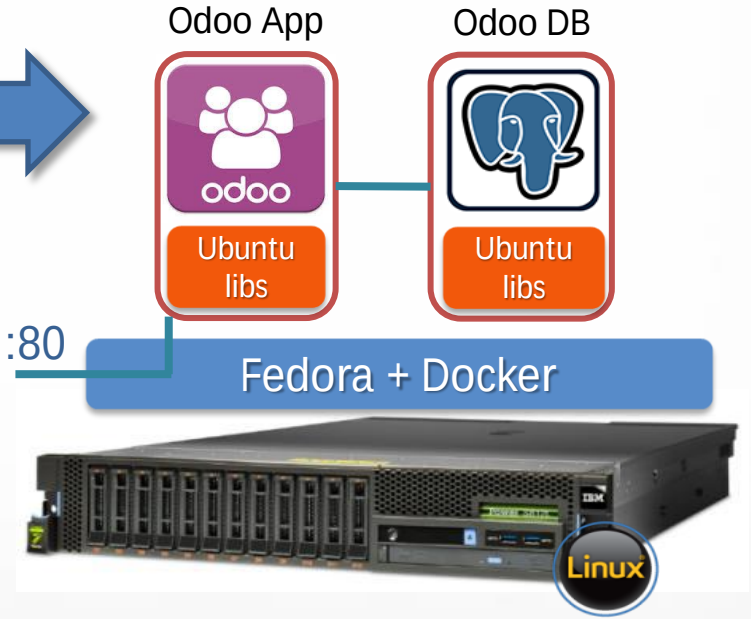


Docker Demo: Odoo Deployment

Docker hub
(public/private registry)



Deploy



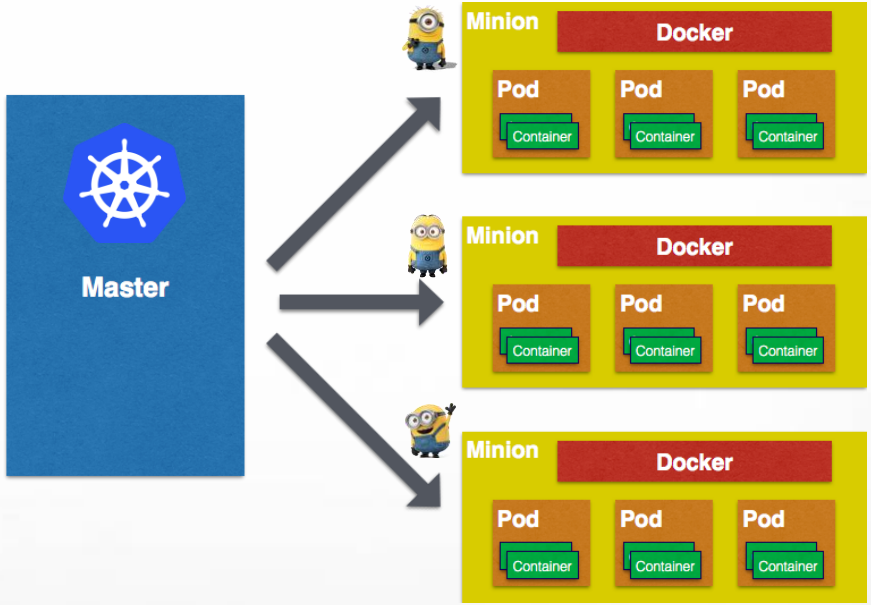

```
postgresql:
  name: odoo_db
  image: odoo_db:demo

odoo:
  name: odoo
  image: odoo:demo
  links:
   - postgresql:db
  ports:
   - "80:8069"
```

docker-compose.yml

Kubernetes Overview

kubernetes by Google

- Open sourced by Google
- Master/worker
- Pod unit of deployment/scale
- Replication Controller (autoheal/scale)
- Service support with LB external IP
- Overlay networks (IP per pod) + DNS
- No supported master HA
- Container agnostic
- Placement, affinity + anti-affinity
- YAML deployment model



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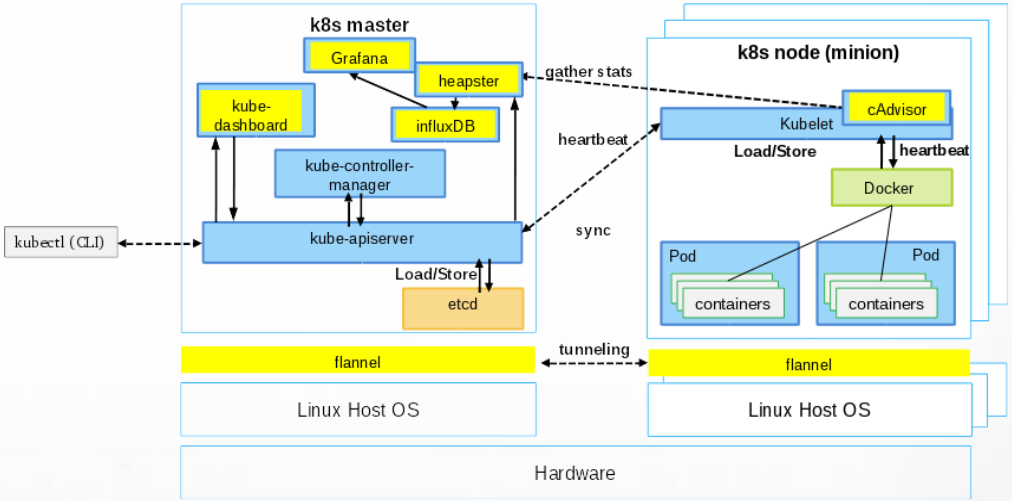


Kubernetes/Swarm Contrasts

Docker Swarm:

(+) Swarm Setup Super Simple
(+) Very Fast container listing/deployement
(+) Swarm use same docker CLI
(+) Swarm leverages **`docker-compose`**

(-) Lack of Pod in Swarm
(-) Swarm tie to Docker
(-) Swarm lack of autoscale

Kubernetes:

(+) A Container Platform
(+) Container collocation in Pod
(+) Container rolling update
(+) Could leverage Mesos

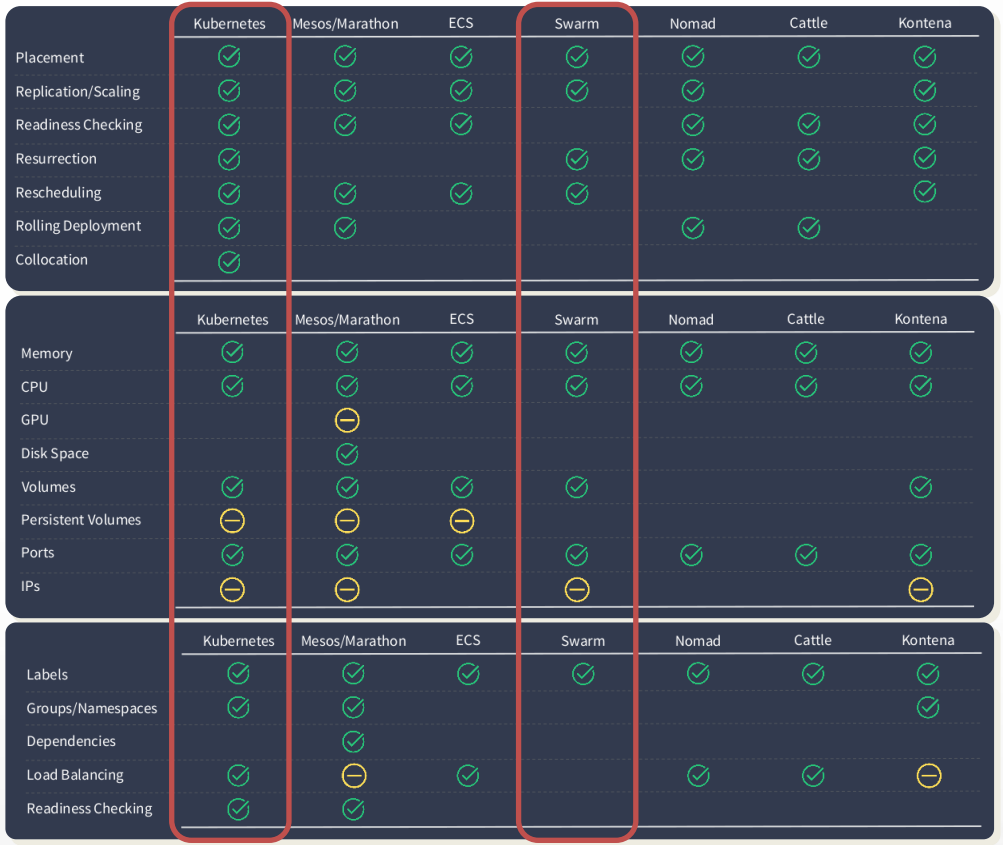
(-) Need to learn **"`Kubernetes CLI`"**
(-) Lack of HA for Kubernetes master.

ORCHESTRATION FUNCTIONAL COMPARISON (06/2016)

Workload Scheduling

Resource Management

Service Management



http://www.slideshare.net/KarlIsenberg/container-orchestration-wars?qid=04fabc4b-53c7-410b-9c7a-3937353d45ca&v=&b=&from_search=8

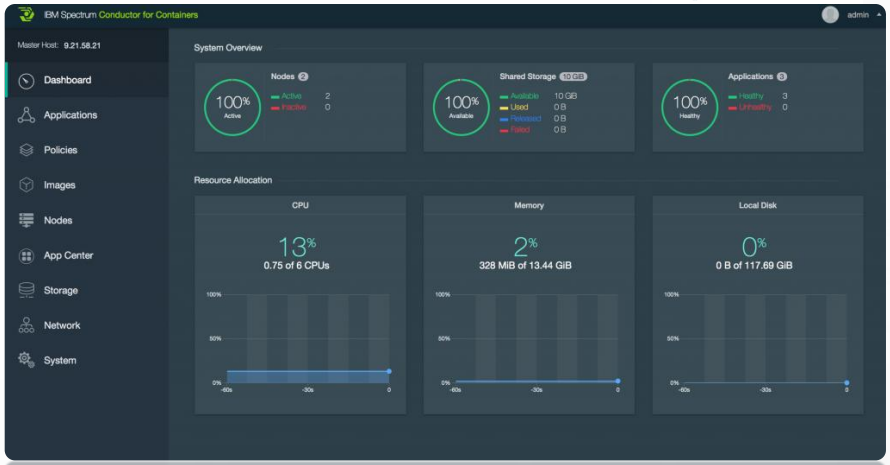
IBM Spectrum Conductor for Containers

Full Lifecycle Management for Containers

- Unified installer based on docker image (x86/ppc64le)
- Centralized GUI (Install, Manage, monitor, troubleshoot)
- Heterogeneous worker nodes (x86 / Power)
- Private Image Registry

- Enterprise Requirement
  - HA topology
  - System services live rolling upgrade and live reconfiguration
  - Heterogonous environment (Power, X86, GPU and so on)
  - Trouble-shooting, audit, alarm and event
  - Multiple site

docker kubernetes by Google MESOS



IBM Spectrum CfC Community Edition

First Version available free to use here

YouTube https://www.youtube.com/watch?v=7YMjP6EypqA

Related Services (Cloud)

- Google Container Engine (GKE)
  - Hosted Kubernetes in Google Compute Engine
  - Dynamic infrastructure
- AWS Containers
  - Docker + autoscaled infrastructure
- Azure
  - Hosted Swarm (heal,scale)
- IBM
  - Docker + autoscaled/healed infrastructure
- Many others , and…..

DEMO: “Kubernetes + Docker **in action on Power Systems”**

A company wants to deliver video content on demand to internal and external consumers.

3 Use Cases related to a Video On Demand application to demonstrate Docker on Power

- #1 Generate video content : Ephemeral microservice
- #2 Distribute video content : Microservice Autoscaling
- #3 Application live rolling update

What is demonstrated

Docker

Docker orchestration

Docker & microservices

Docker on system-hybrid infrastructure

Power Systems

x86

Hybrid Cloud

Docker & Hybrid Cloud

Hybrid Cloud

SOFTLAYER an IBM Company

Docker & IBM Cloud software

docker

openstack

urban{code}

An IBM company

Hybrid Cloud with multiple CSP

SOFTLAYER an IBM Company

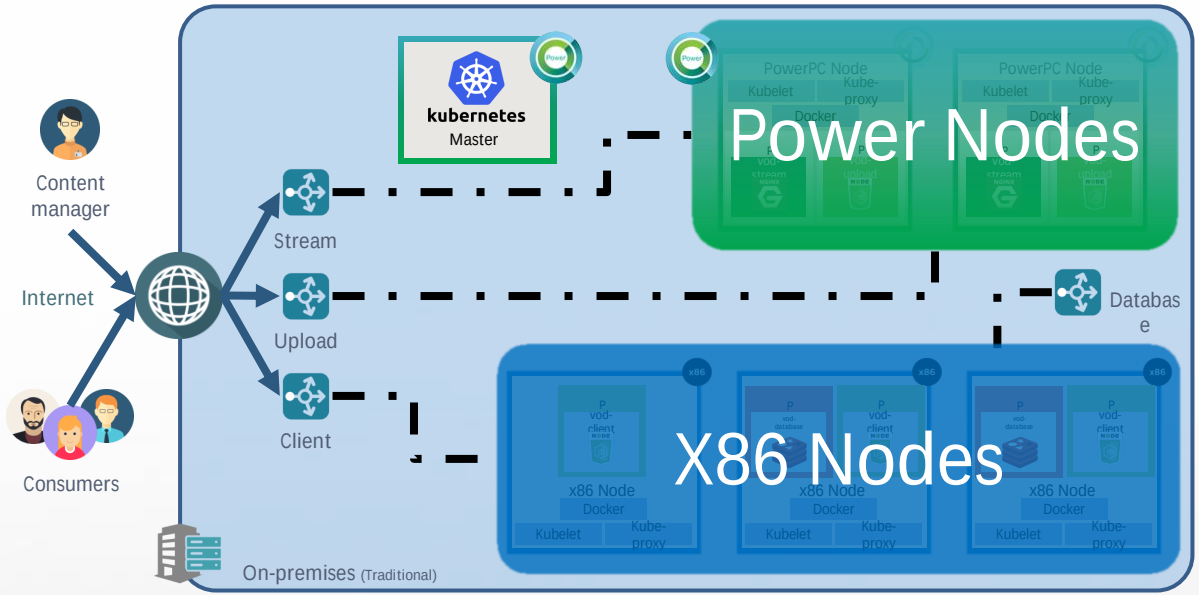
amazon web services

Microsoft Azure

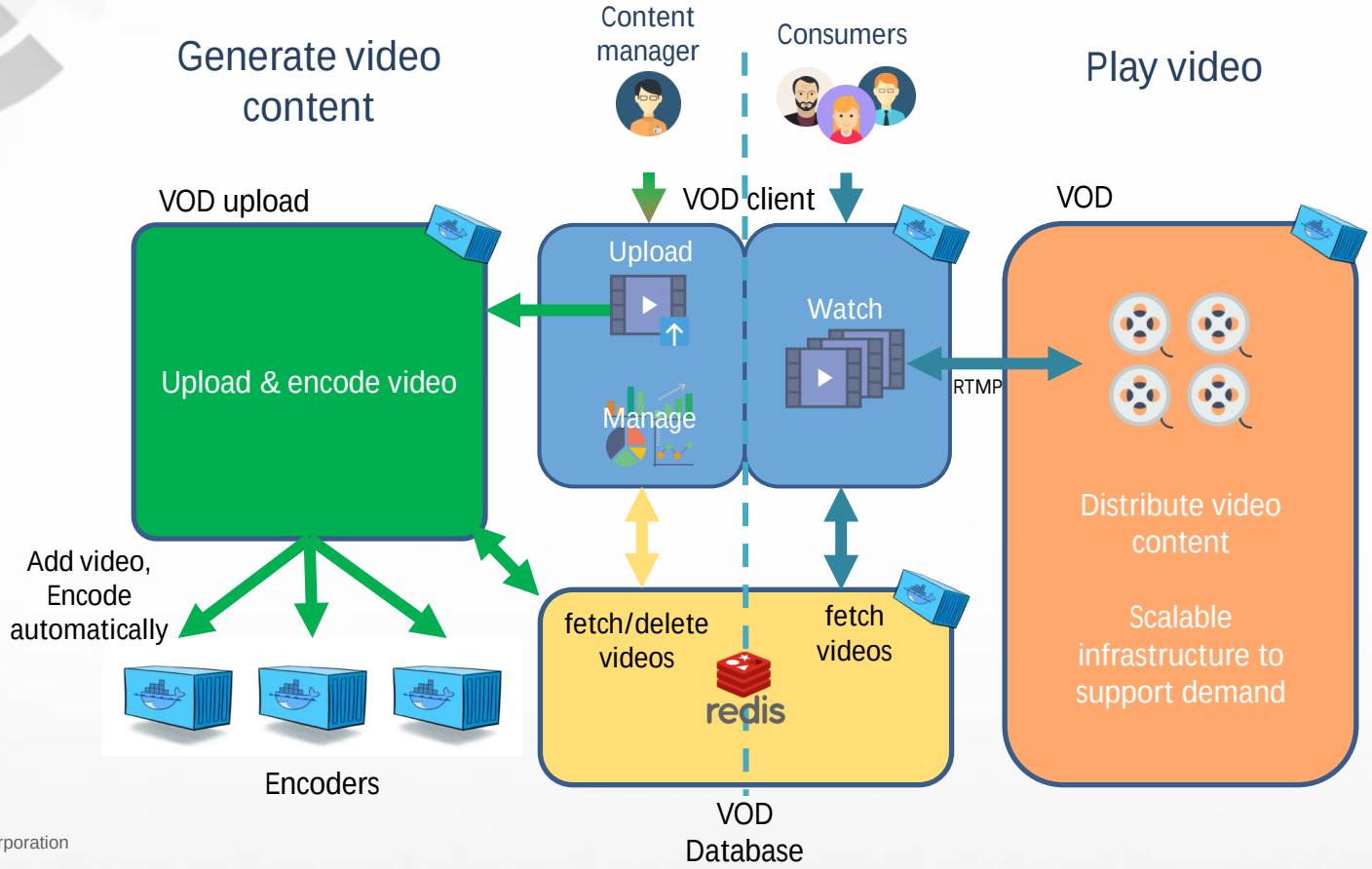
Under study…

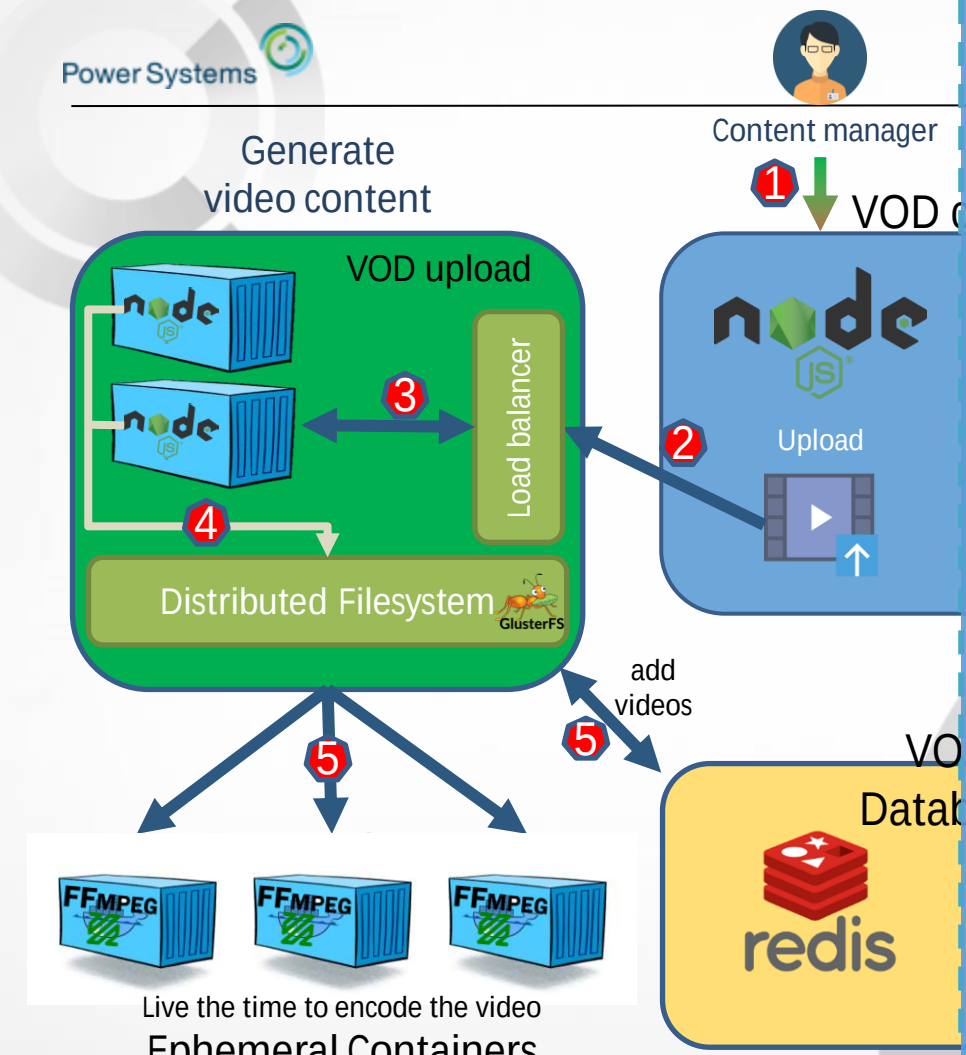
Architecture Overview

- 3 Power Linux VM running Ubuntu 16.04 (KVM / Power 8)
- 3 Intel Linux VM running Ubuntu 14.04 (VMware ESX 5.x / x86)



Architecture overview





Use case #1
Upload a video

1 - Load home page
2 – Redirect to upload microservice
3 – Choose a container to handle upload
4 – Save file on the filesystem
5 – Simultaneously encode the video in a ephemeral container and add the video to the database

Ephemeral workload

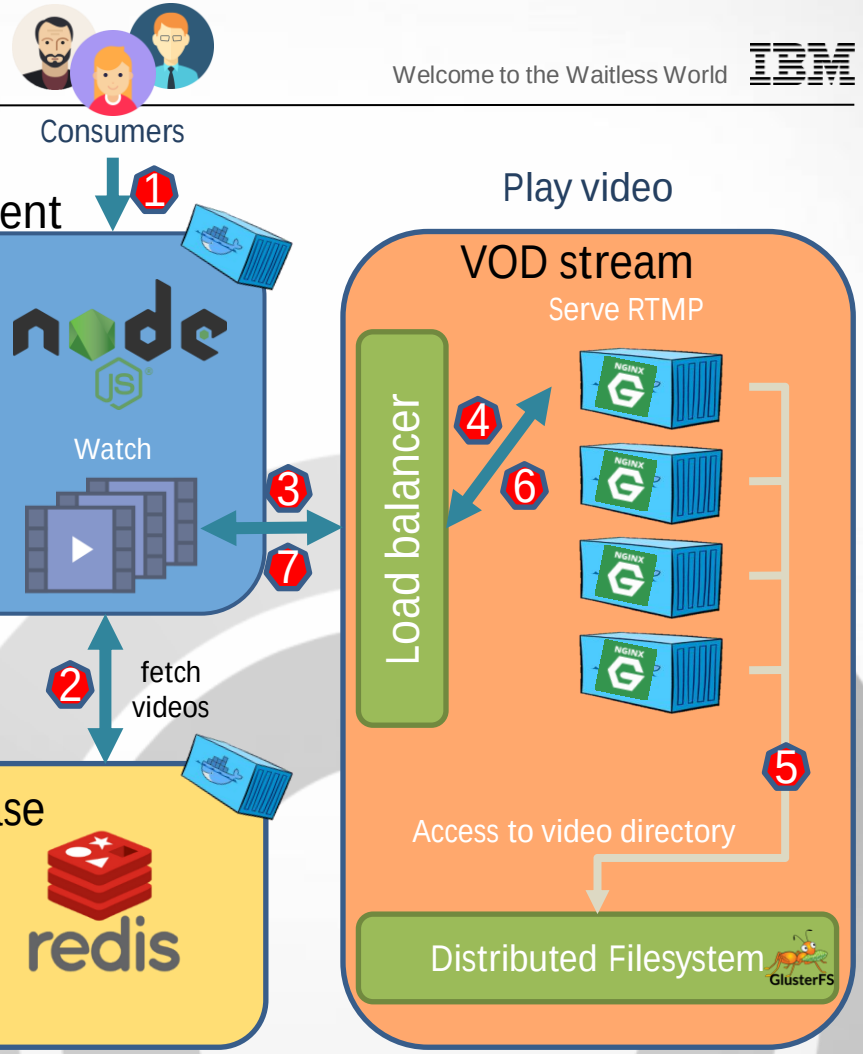
Microservices

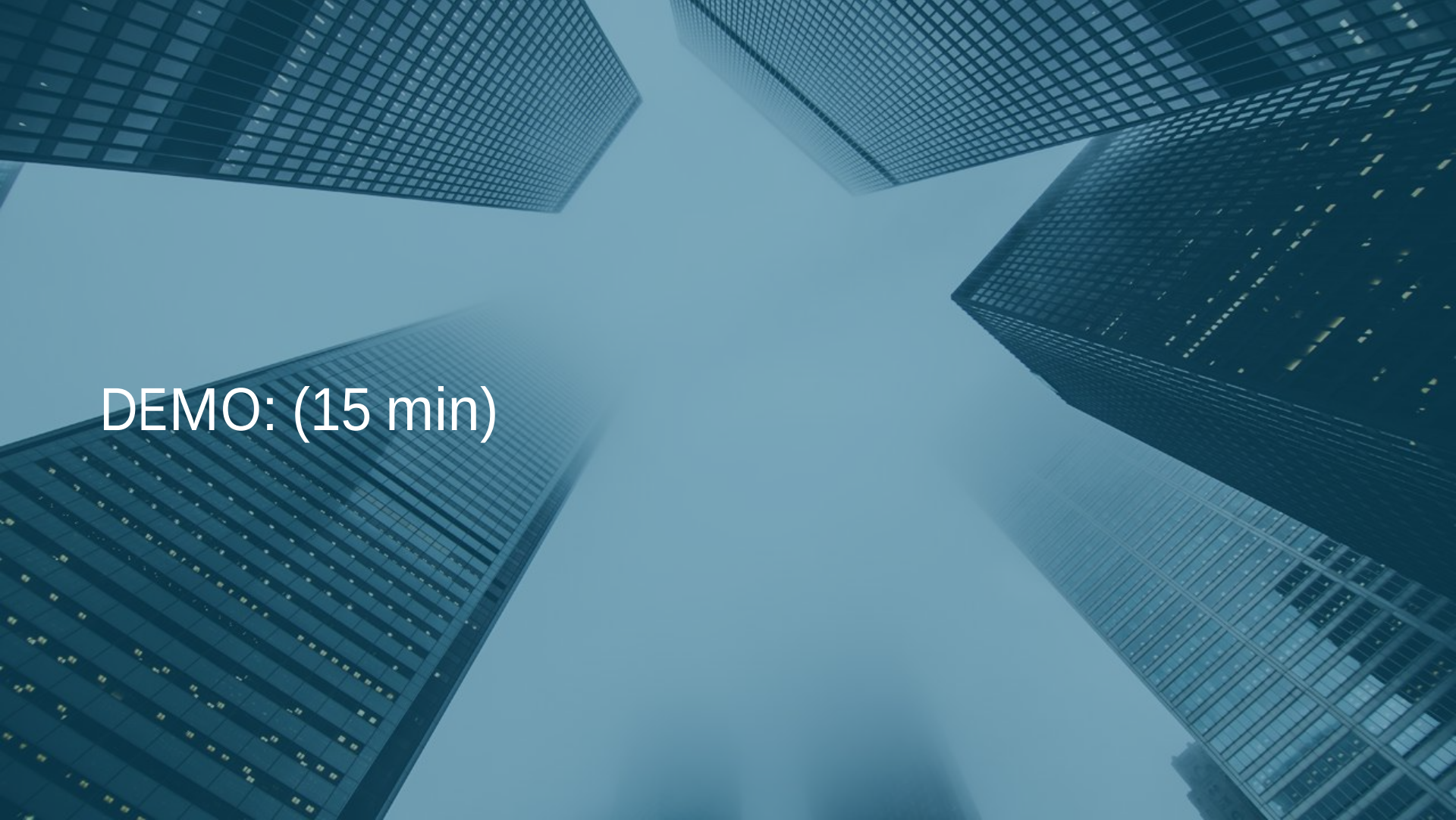
Use case #2
Play a video

1 - Load home page
2 - Fetch the videos and display to the user
3 - Redirect to player. The player request for a video
4 - Choose a container
5 - Get video on the file system
6-7 Player consumes RTMP flux

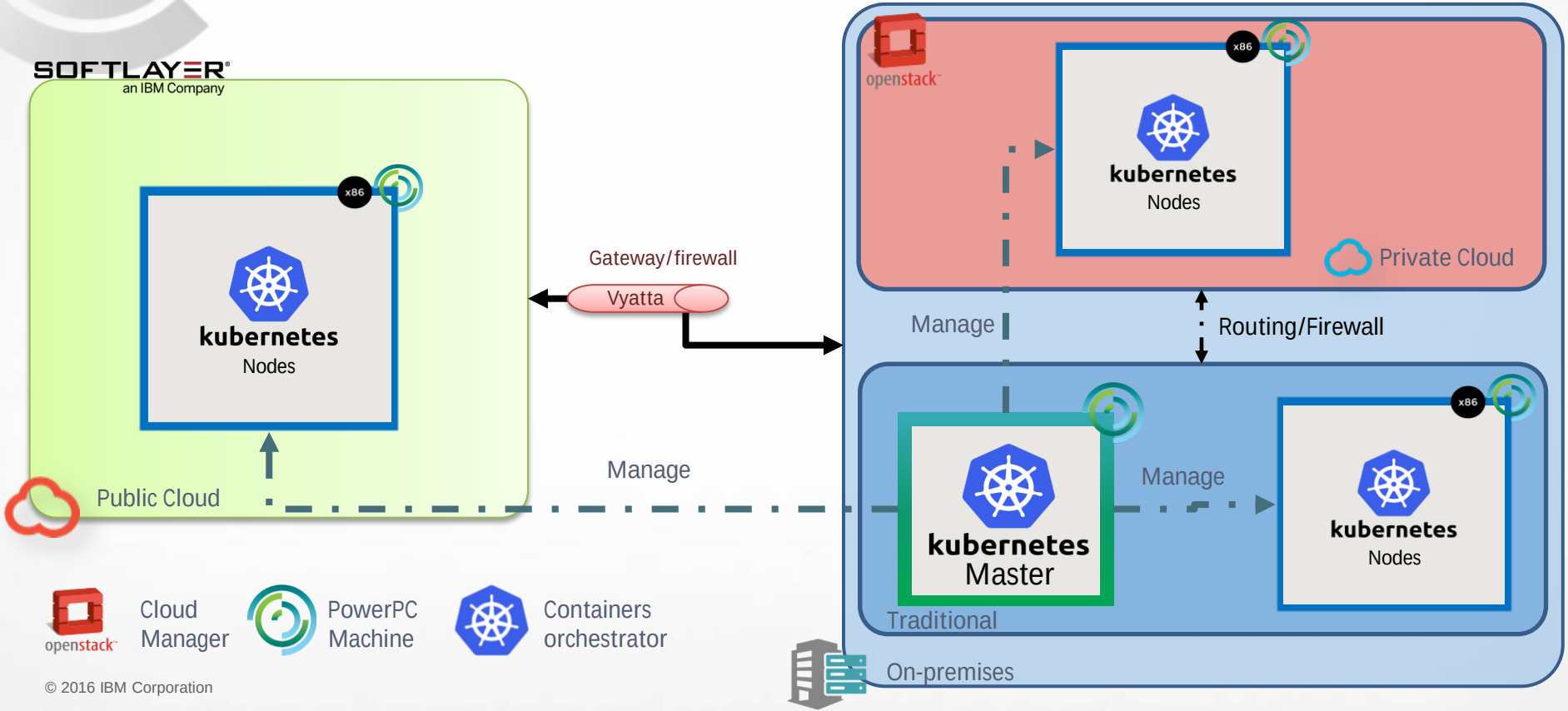
Auto-Scaling

Microservices




DEMO: (15 min)

Hybrid Cloud Infrastructure Overview



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