Kubernetes企業界的應用

葉信和 / Hsin-Ho Yeh
Software Engineer / CEO @ 信誠金融科技
hsinho.yeh@footprint-ai.com

2022/04/27

Download Slide

https://reurl.cc/6ZaEmr

About me

- 2020 - Present at 信誠金融科技
  - Shrimping: A data-sharing platform
    - https://get-shrimping.footprint-ai.com
  - Tintin: a machine learning platform for everyone
    - https://get-tintin.footprint-ai.com
- 2016 - 2020 at IglooInsure (16M+ in series A+ 2020)
  - Provide digital insurance for e-conomic world
  - Funded in KUL, Headquartered in Singapore
  - First employee/ Engineering Lead / Regional Head/ Chief Engineer
- 2013 - 2016 at Studio Engineering @ hTC
  - Principal Engineer on Cloud Infrastructure Team
- 2009 - 2012 at IIS @ Academia Sinica
  - Computer vision, pattern recognition, and data mining
- CS@CCU, CS@NCKU alumni

Agenda

- Why Kubernetes is important?
- What is containerized application?
- What is Kubernetes?
- Industrial application case study
- Q&A

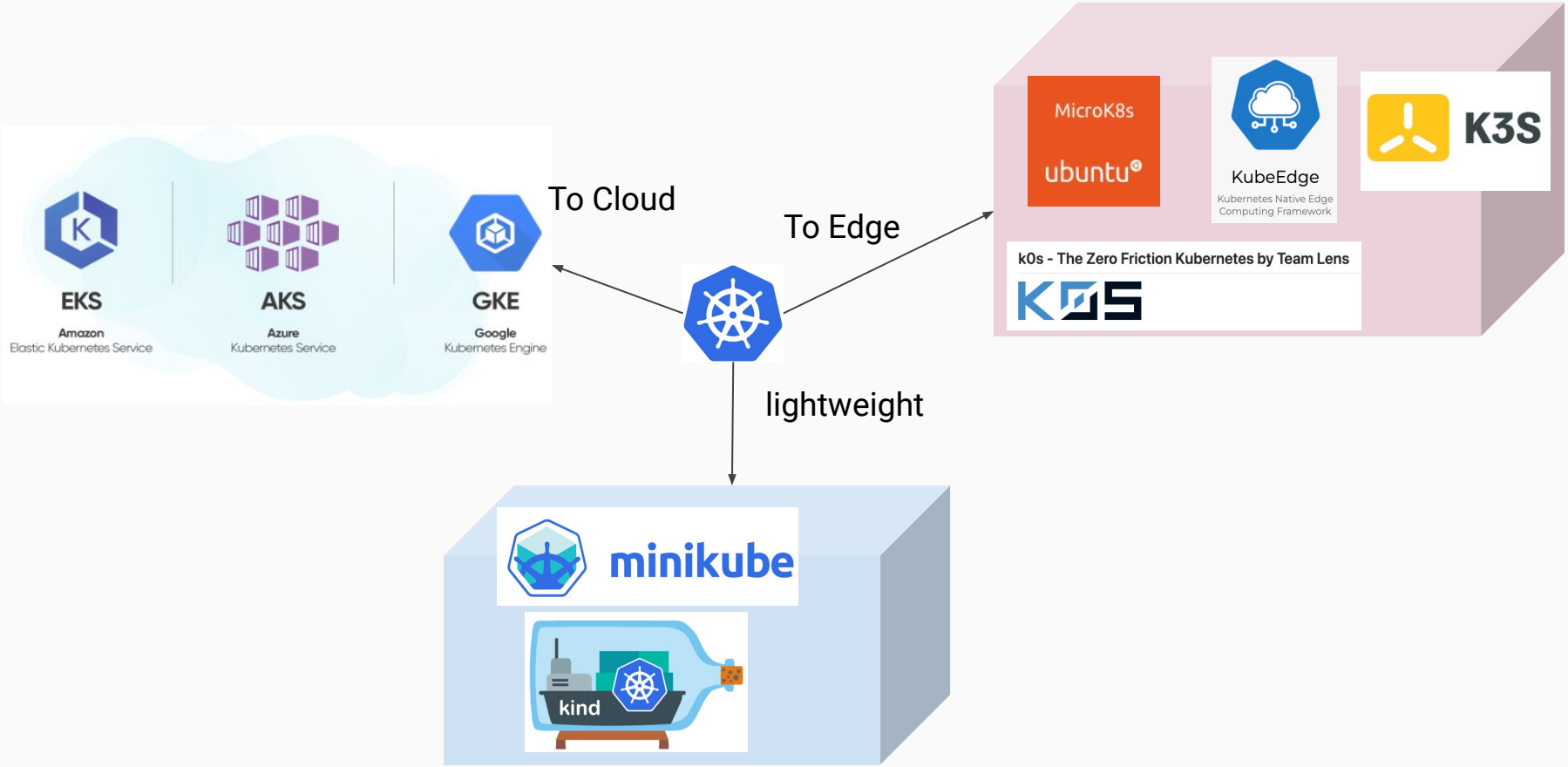
Why Kubernetes is important?

History Of Kubernetes

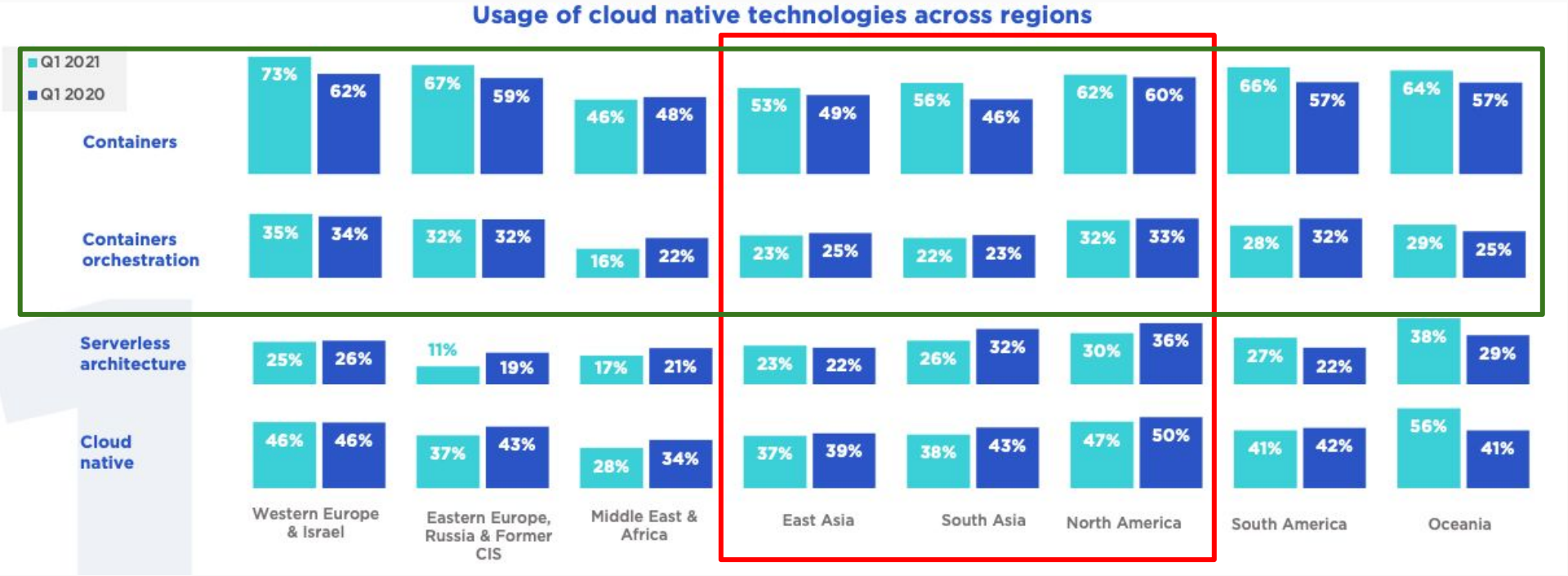
- Borg: the predecessor to Kubernetes
  - Google revealed the first time of its detail in an academic research paper, describing a “cluster manager that runs hundreds of thousands of jobs, from many thousands of different applications, across a number of clusters each with up to tens of thousands of machines.”[1]
  - A in-house cluster manager system inside Google for running every google services including Gmail, Google Maps, Google Docs…[2]
  - In a scale with ‘over 2 billion containers per week` [3]
- The very first version of Kubernetes was released in 2015
- The latest version is v1.23, released at 2022.

[1] https://research.google/pubs/pub43438/
[2] https://www.wired.com/2016/04/want-build-empire-like-googles-os/
[3] https://cloud.redhat.com/blog/building-kubernetes-bringing-google-scale-container-orchestration-to-the-enterprise

Kubernetes Distributions Evolution

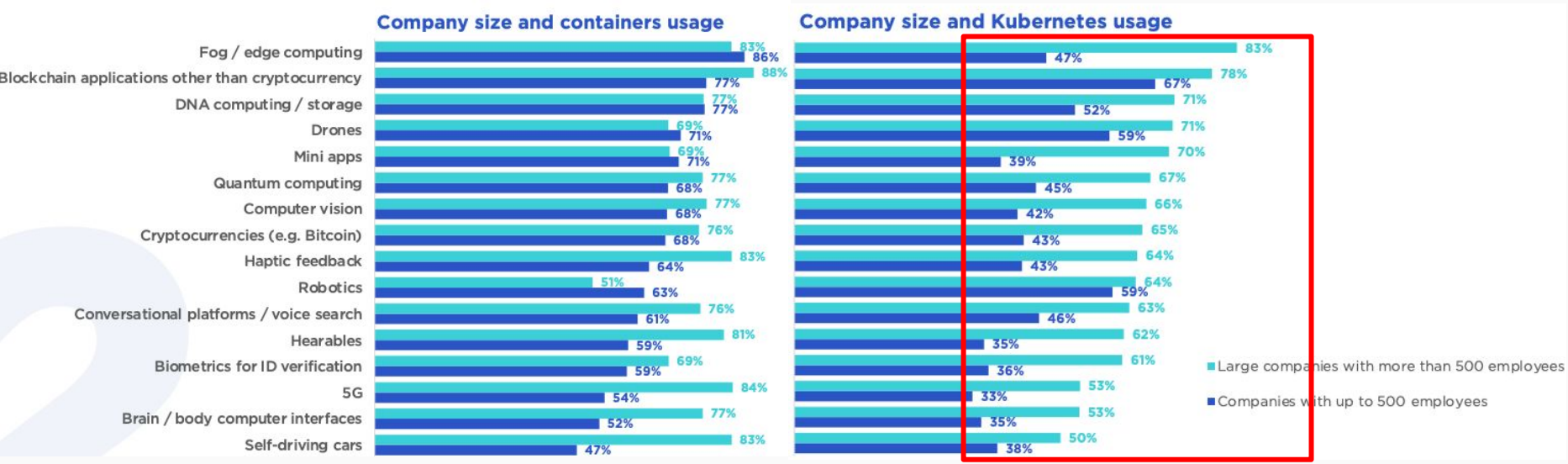


What is Kubernetes adoption rate so far?



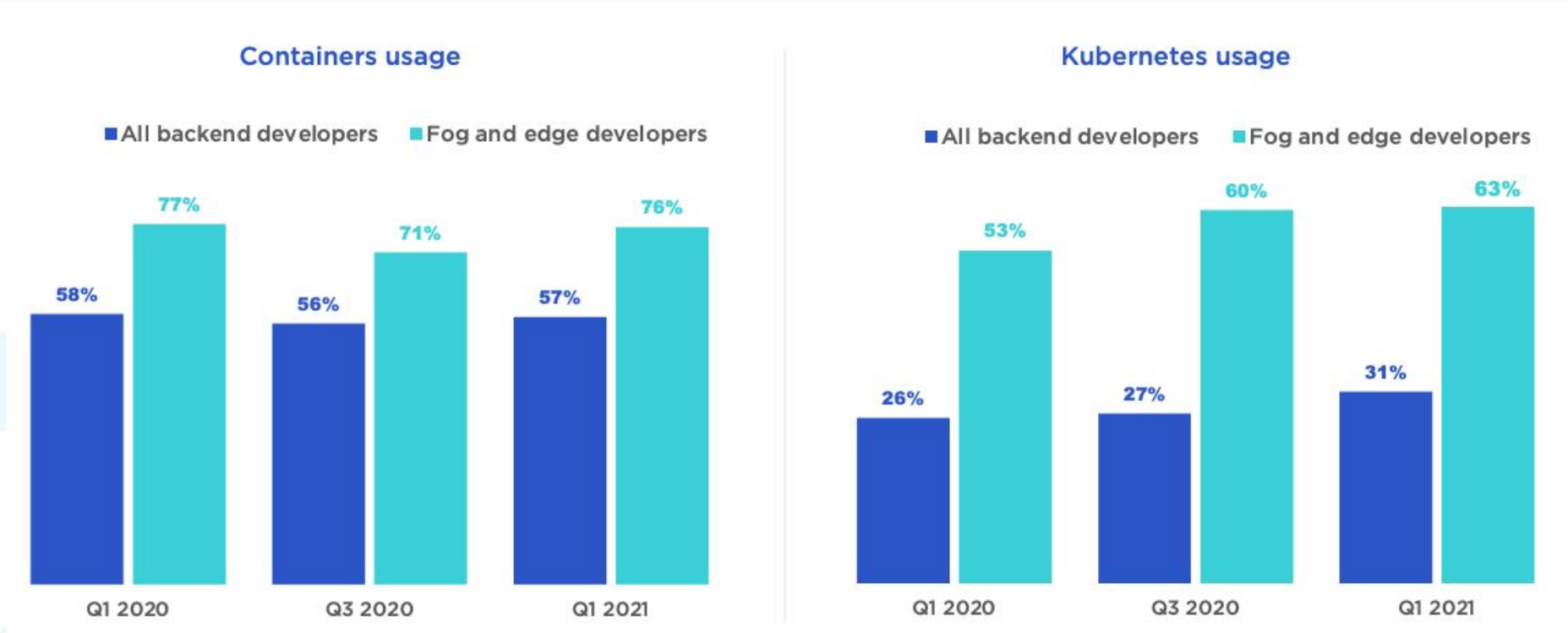
https://www.cncf.io/wp-content/uploads/2021/12/Q1-2021-State-of-Cloud-Native-development-FINAL.pdf

Container adoption rate vs Kubernetes among company size



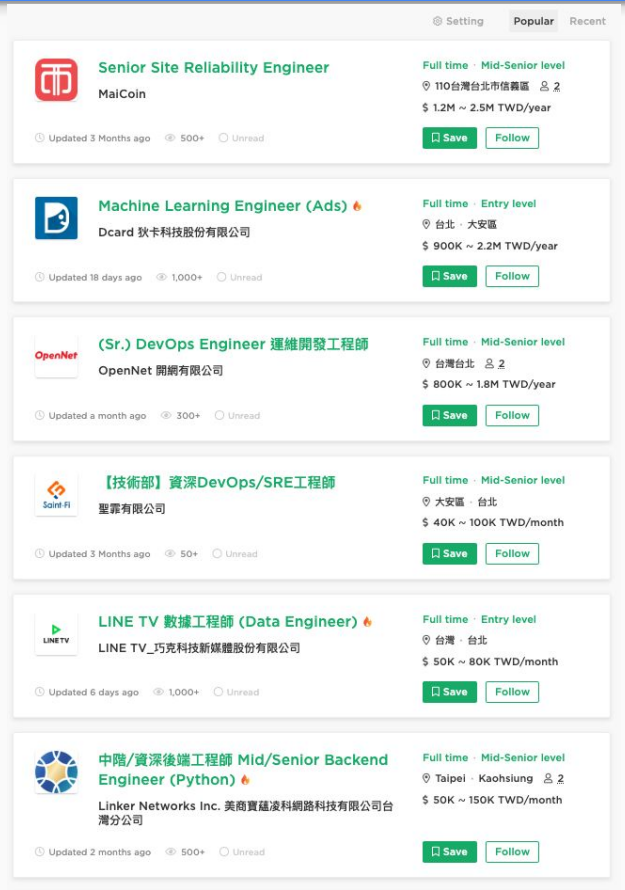
https://www.cncf.io/wp-content/uploads/2021/12/Q1-2021-State-of-Cloud-Native-development-FINAL.pdf

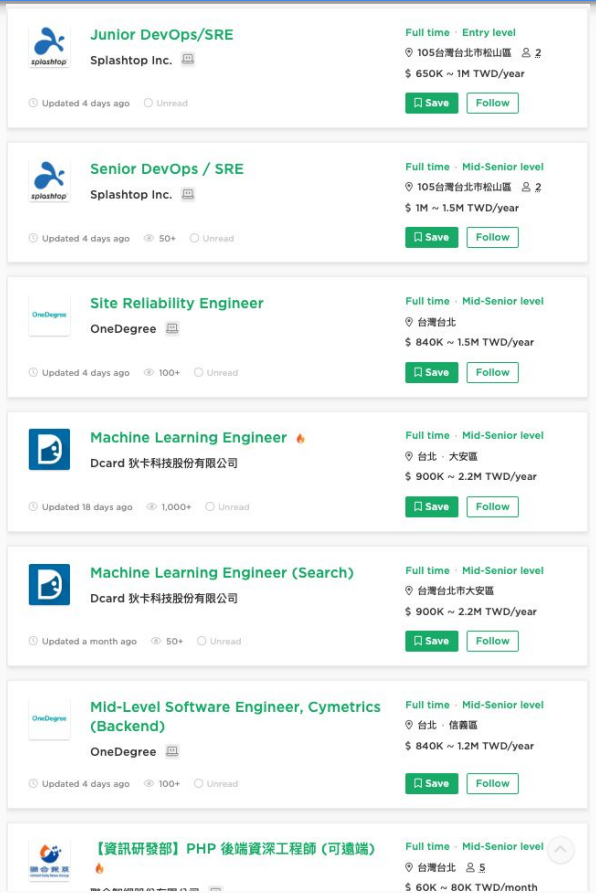
Container and Kubernetes adoption rate on edge computing



https://www.cncf.io/wp-content/uploads/2021/12/Q1-2021-State-of-Cloud-Native-development-FINAL.pdf

Relevant Jobs In Taiwan

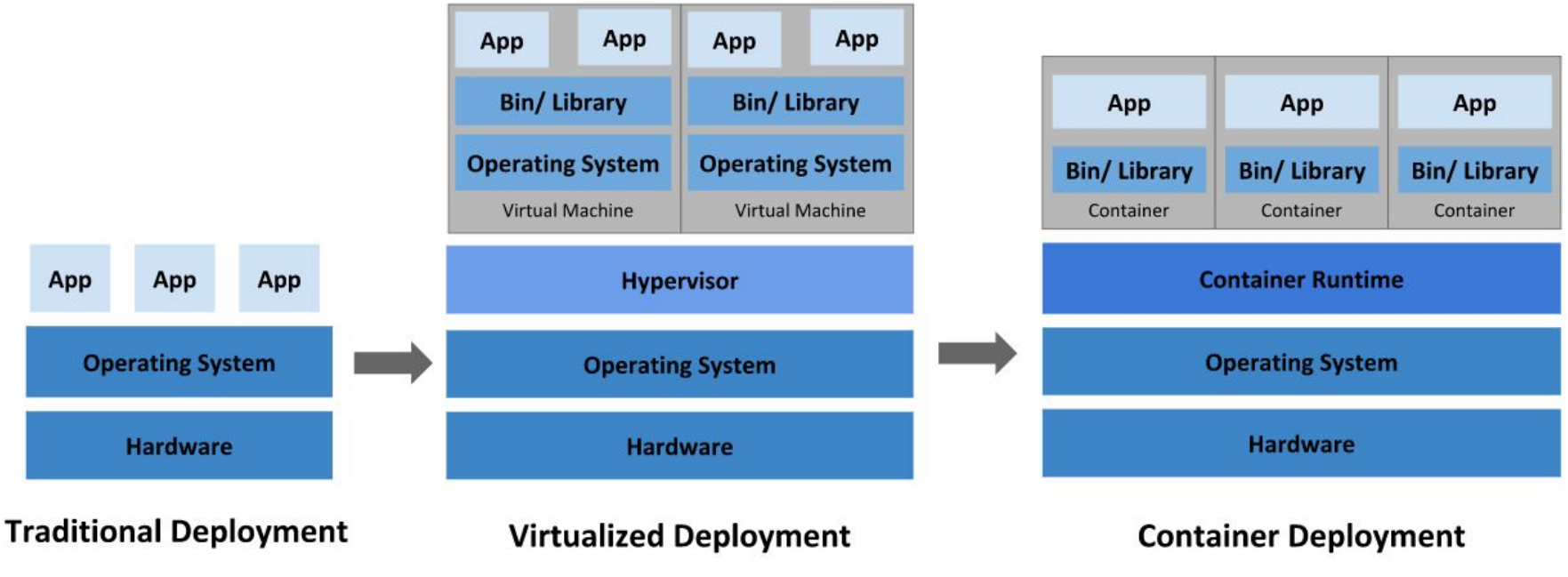




CakeResume: https://reurl.cc/j1qYnD

What is Container?

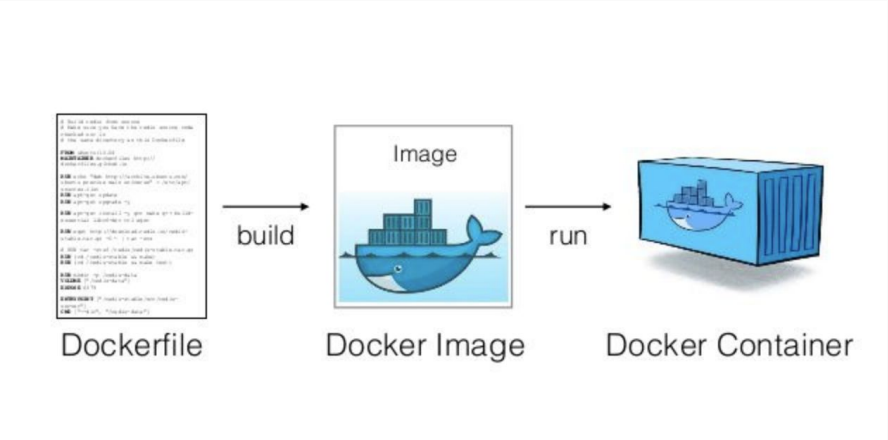
What is containerized deployment?



Ref: https://kubernetes.io/docs/concepts/overview/what-is-kubernetes/

What is Container?

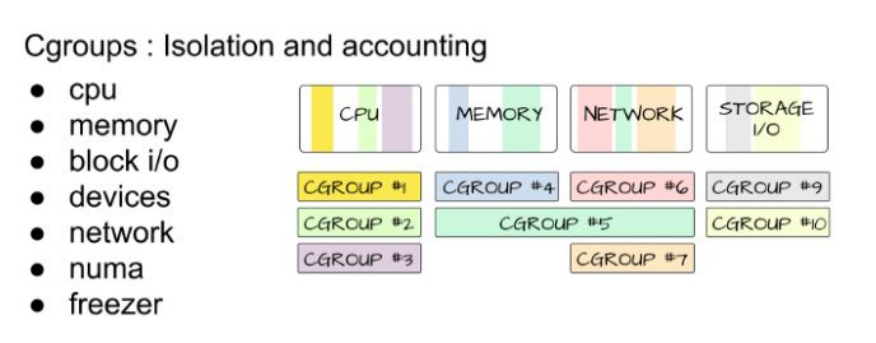
- Container
  - Container Image = Application code + dependencies
  - Runtime environment (cgroups, namespaces, env vars)
- Container Registry
  - Container repository

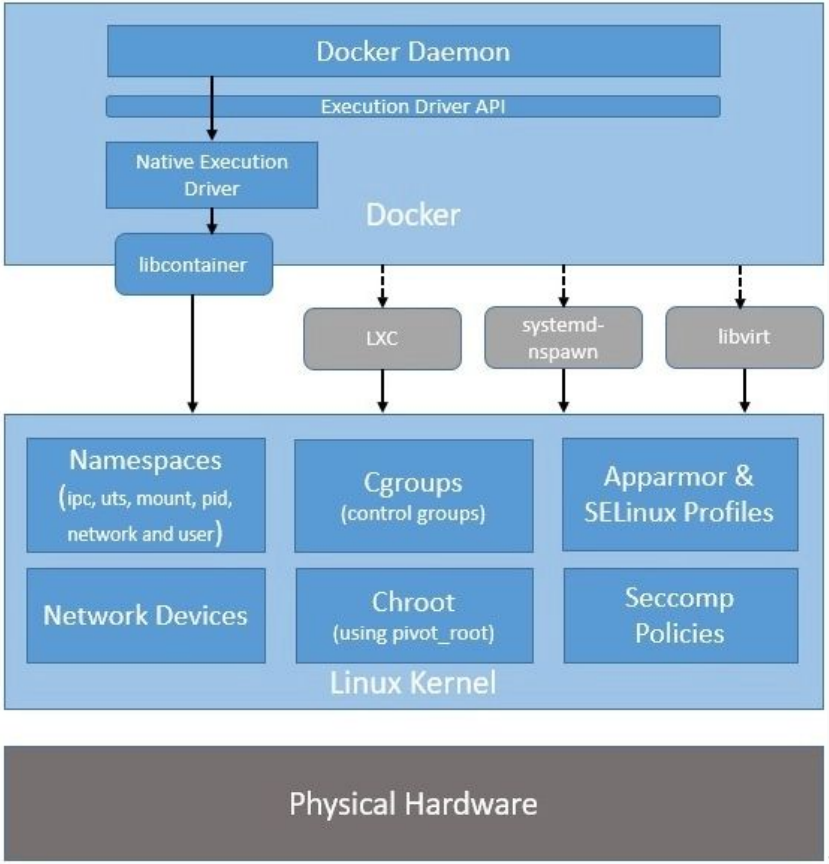


Ref: https://medium.com/platformer-blog/practical-guide-on-writing-a-dockerfile-for-your-application-89376f88b3b5

How container works?

- Namespace for isolation
- Cgroups for resource limiting





Ref: https://www.baeldung.com/linux/docker-containers-evolution
https://medium.com/@BeNitinAgarwal/understanding-the-docker-internals-7ccb052ce9fe

What is Dockerfile?

- A dockerfile contains instructions needed to build a given image

```
FROM ubuntu:18.04

RUN apt-get update && apt-get install -y build-essential

COPY . /app

RUN make /app

CMD python /app/app.py
```

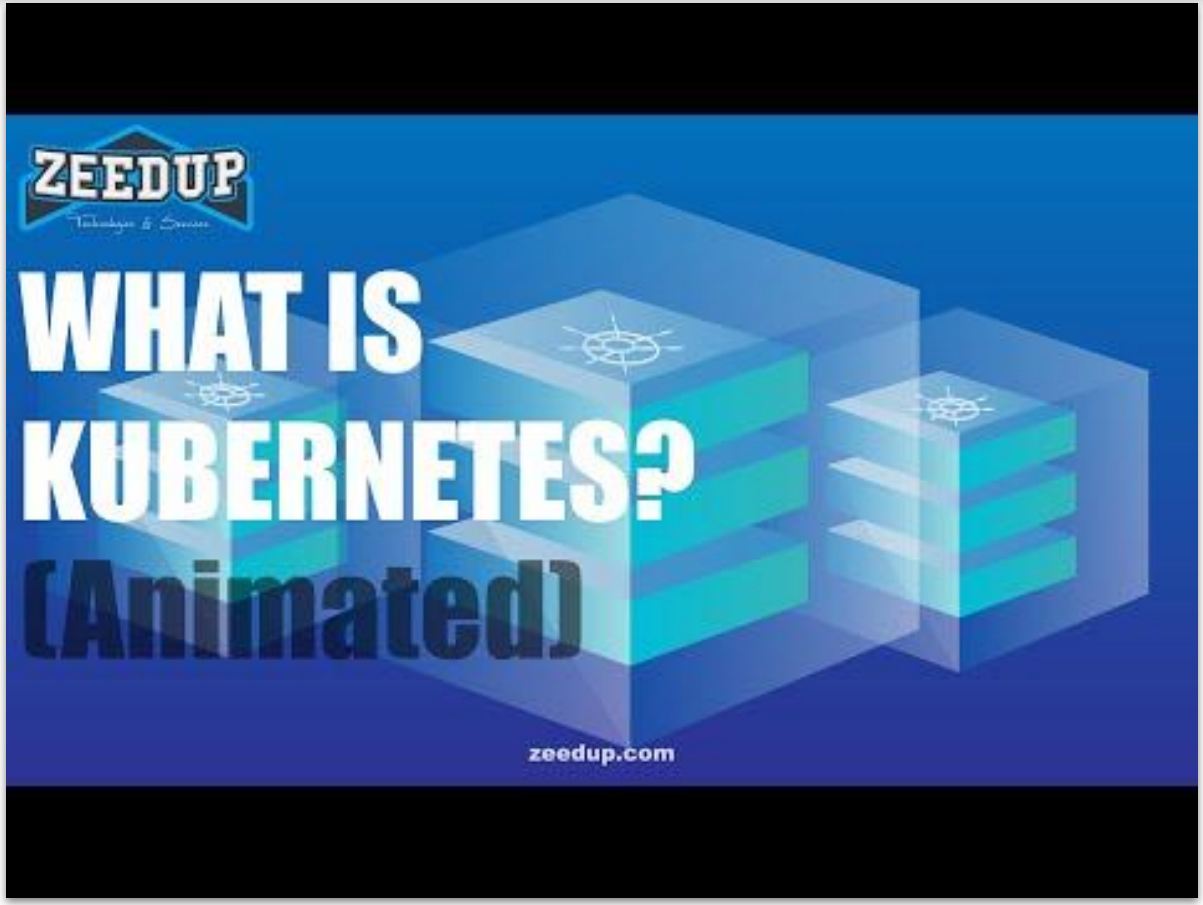
How to build a Docker Image

```
FROM php:7.0-apache

COPY index.php /var/www/html/index.php

EXPOSE 80
```

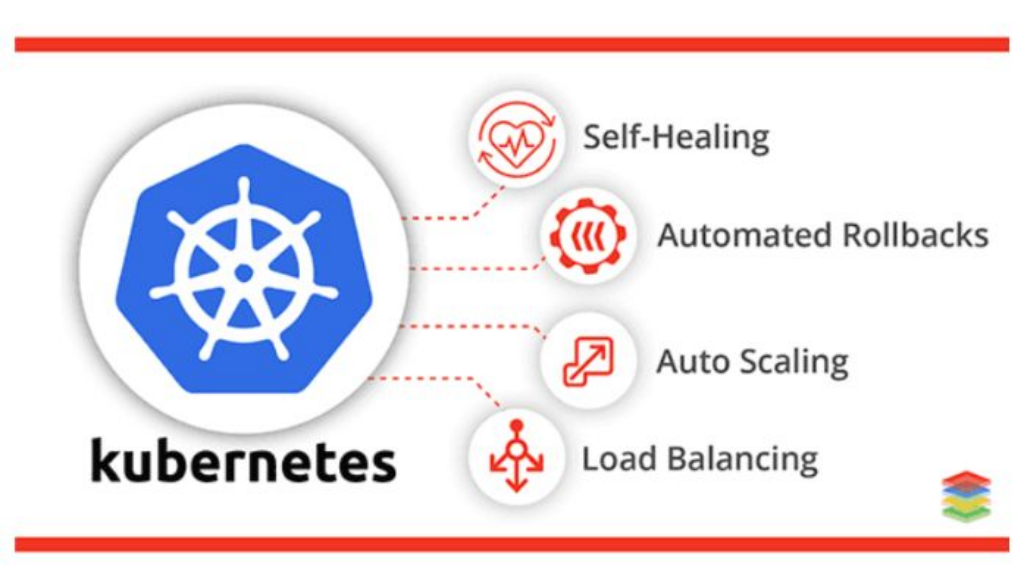
```
docker build -t footprintai/k8sworkshop:php-demo -f Dockerfile .

 => [internal] load metadata for docker.io/library/php:7.0-apache                4.6s
...
 => [2/2] COPY index.php /var/www/html/index.php
0.8s
 => exporting to image
0.2s
 => => exporting layers
0.1s
 => => writing image
sha256:e74d16d21b10069d0beba2cc6daf7cc011723d7e51523c3830e50b1bc5338e88      0.0s
 => => naming to docker.io/footprintai/k8sworkshop:php-demo                  0.0s
```

What is Kubernetes?

Kubernetes 3D Introduction animation for beginners



Kubernetes Feature Highlighted



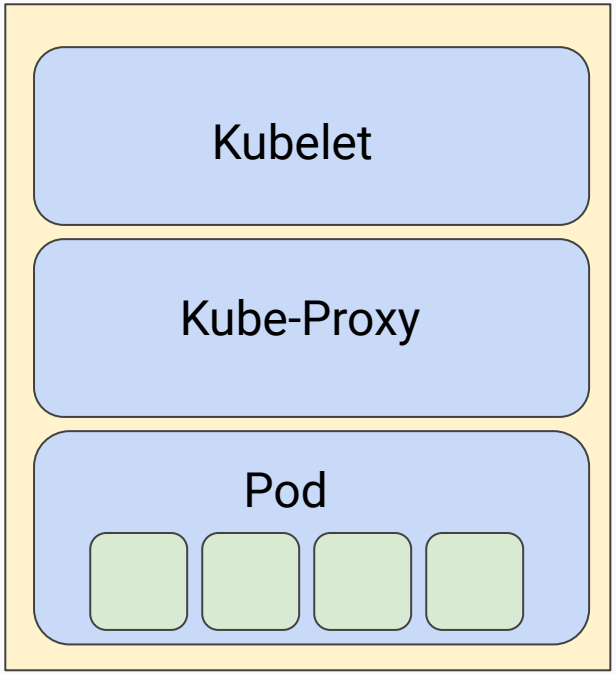
Ref: https://medium.com/swlh/kubernetes-the-evolution-of-a-technology-revolution-805302172ea6

What is Kubernetes?

- High level concepts
  - **Node** are machine that run containerized applications.
  - **Pod** are unit for application workload.
  - **Scheduler** schedules pods to run on nodes.
  - **Deployment/Replica Set** ensures that a specified number of pod replicas are running at any one time.
  - **Service** is an abstract way to expose an application running on a set of Pods as a network service.

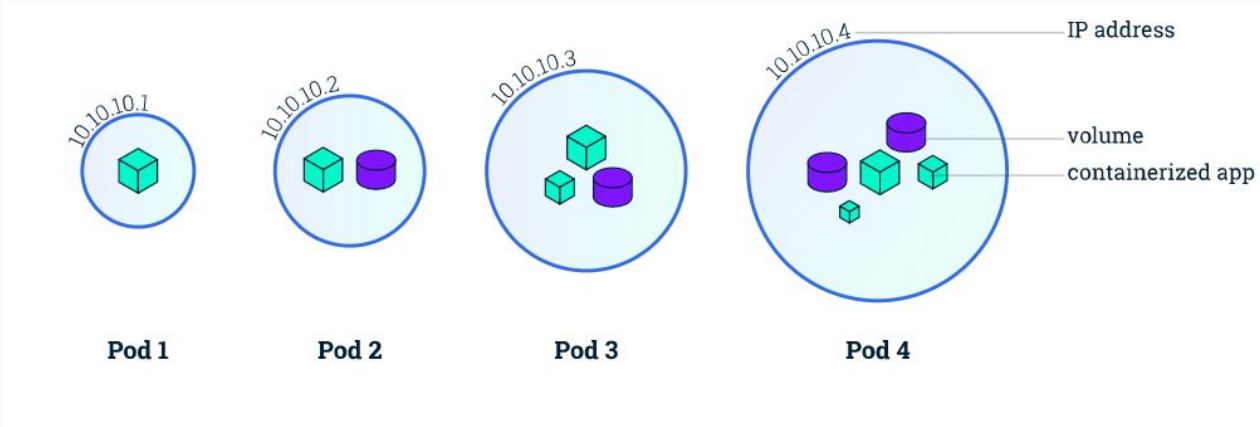
What is a Node?

- Container runtime
  - Docker / CRI-o
- Kubelet
  - Primary node agent running on each node
  - It register the node with api server and manage pods according to PodSpec.
- Kube-Proxy
  - Network proxy runs on each node. This reflects services as defined in the Kubernetes API on each node and can do simple TCP, UDP, and SCTP stream forwarding or round robin forwarding across a set of backends.



What is a Pod?

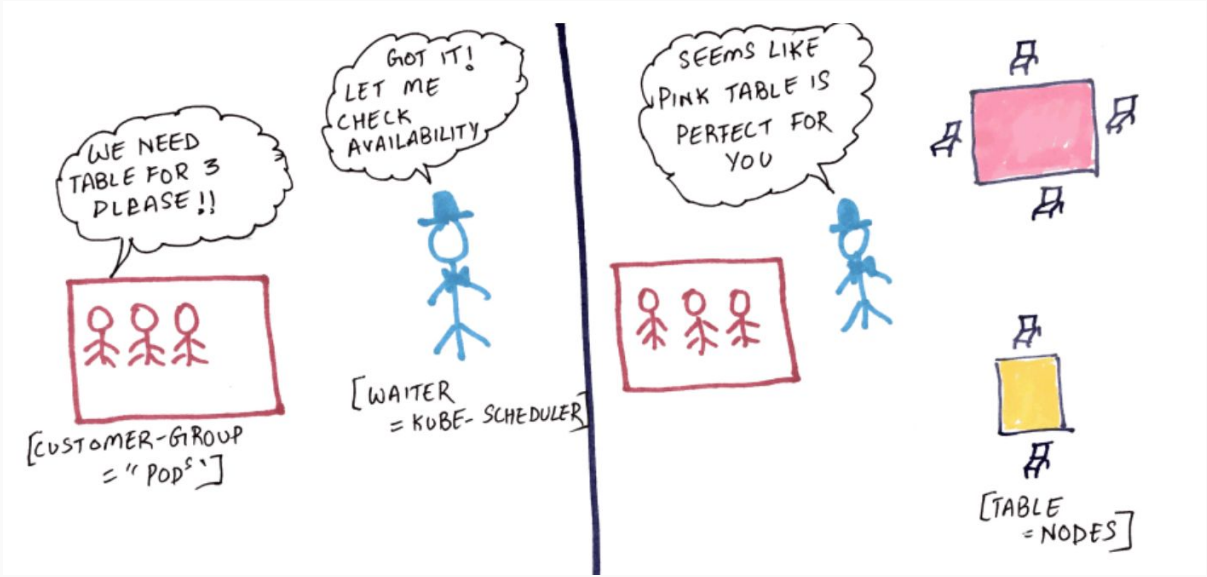
- A pod represents a logical application, it could contains a or multiple containers.
- A pod has unique IP address, persistent storage volume, and a configuration on how container should run
- Containers inside the same pod shares namespaces.
  - Containers inside the same pod ca locate each other and communicate via localhost



Ref: https://kubernetes.io/docs/tutorials/kubernetes-basics/explore/explore-intro/

What is a Scheduler?

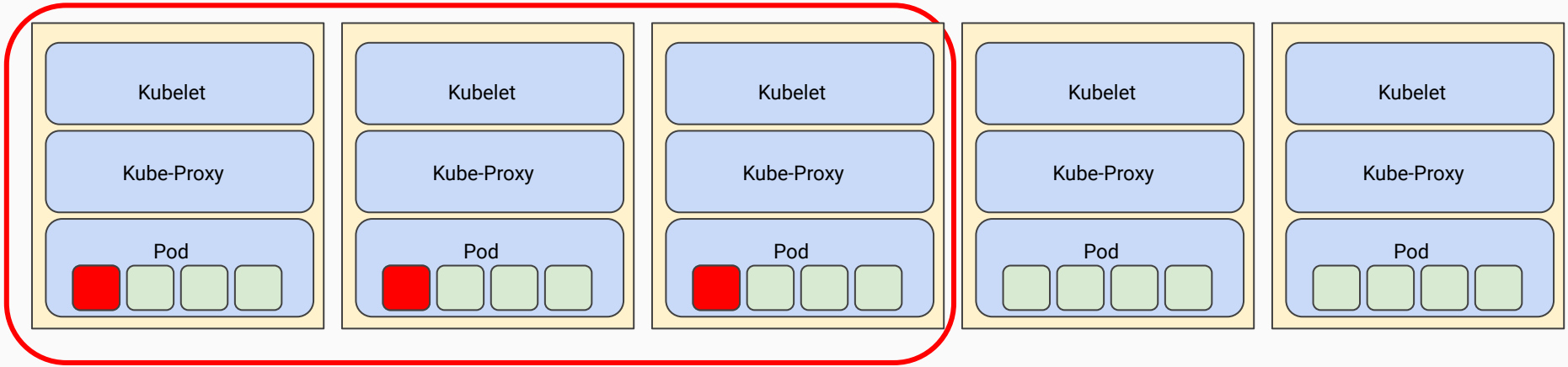
- The scheduler determines (filtering & scoring) which Nodes are valid placements for each Pod in the scheduling queue according to constraints and available resources.



Ref: https://dev.to/ranand12/kubernetes-scheduler-visually-explained-in-plain-english-with-a-story-1g4c

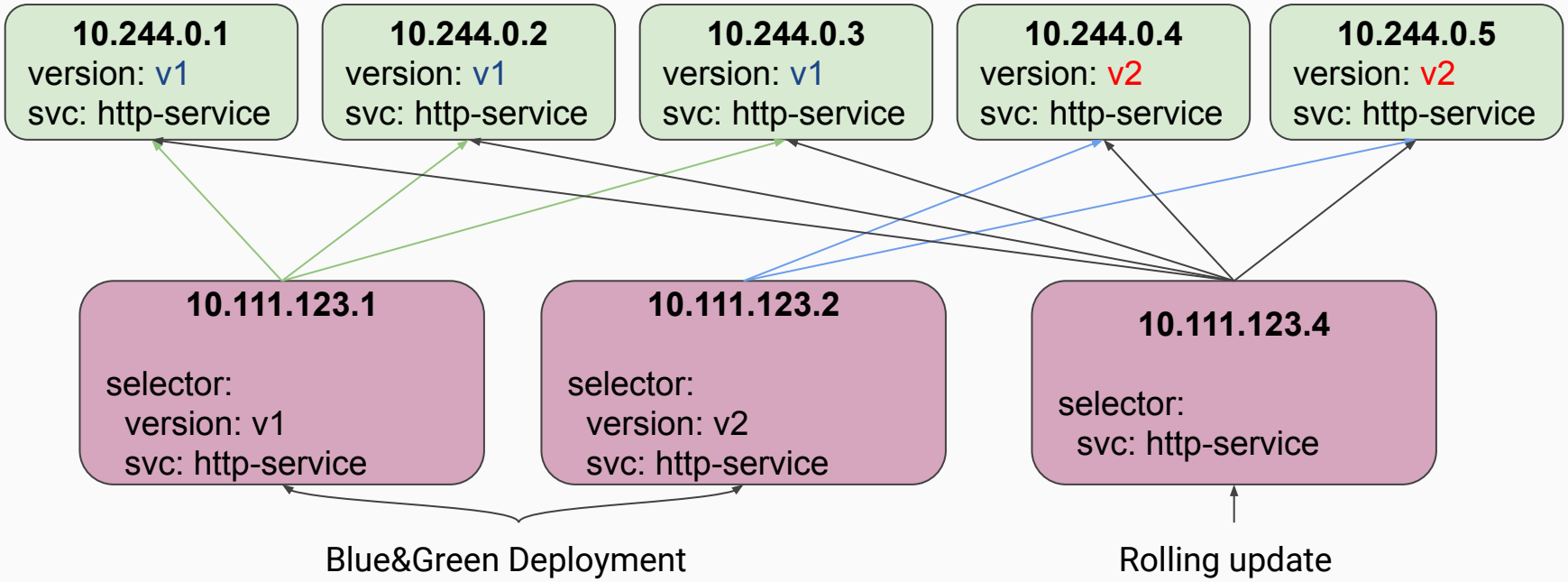
What is Replica Set?

- Manage a replicated set of pods
- Create pods from a template
- Ensure the desired number of pods running
- Online resizing and self-healing

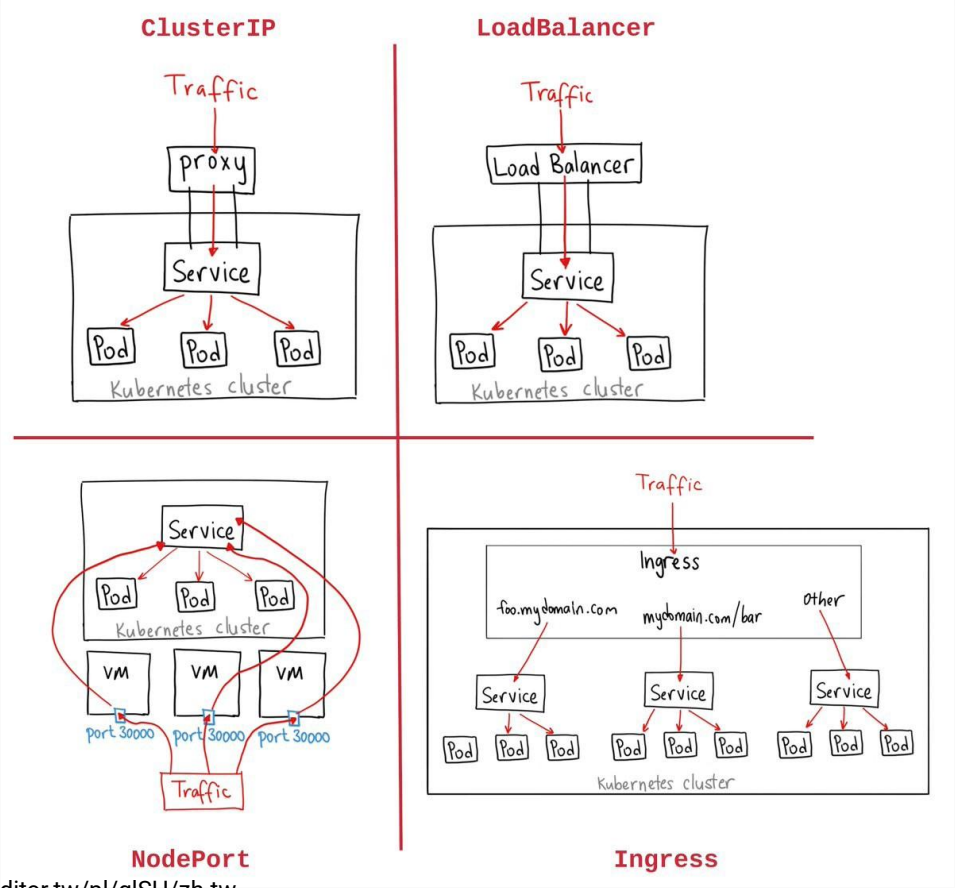


Replica = 3

What is Service?



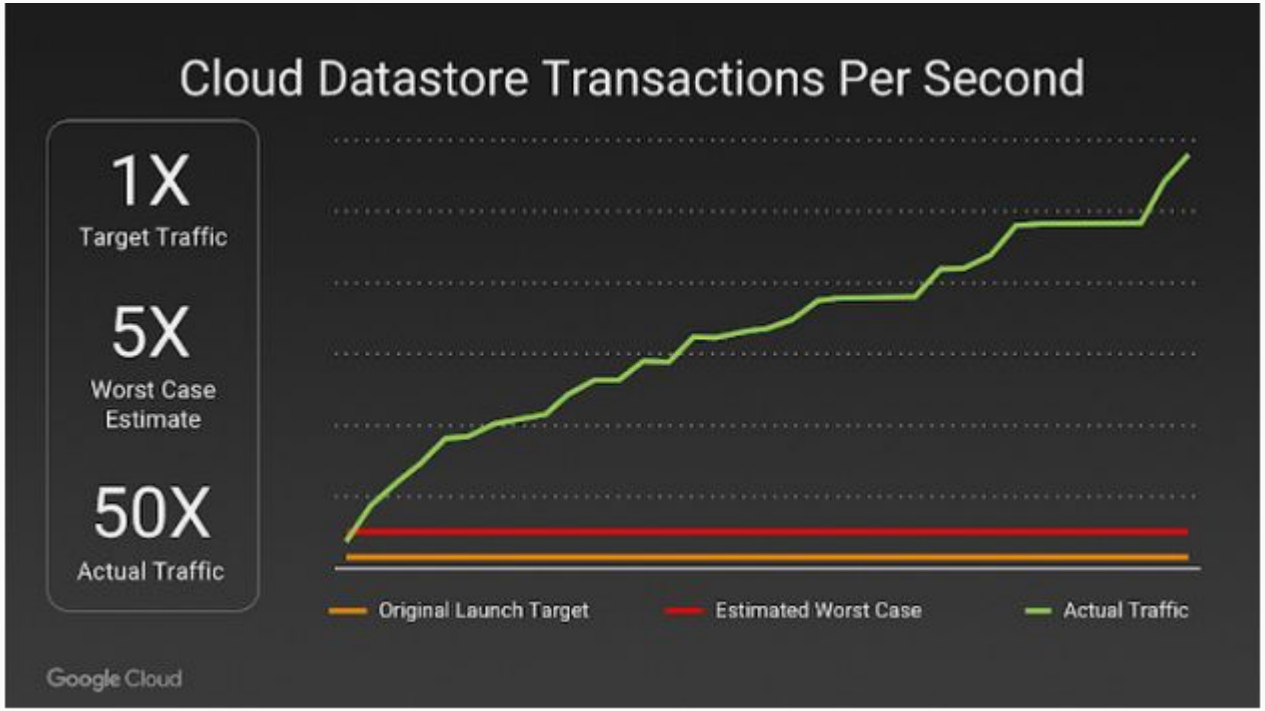
What is Service?



Ref: https://www.mdeditor.tw/pl/glSH/zh-tw

Industrial Use case Study

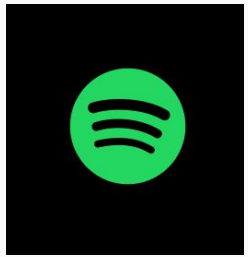
Case Study: Pokémon GO



https://cloud.google.com/blog/products/containers-kubernetes/bringing-pokemon-go-to-life-on-google-cloud

Case Study: Spotify

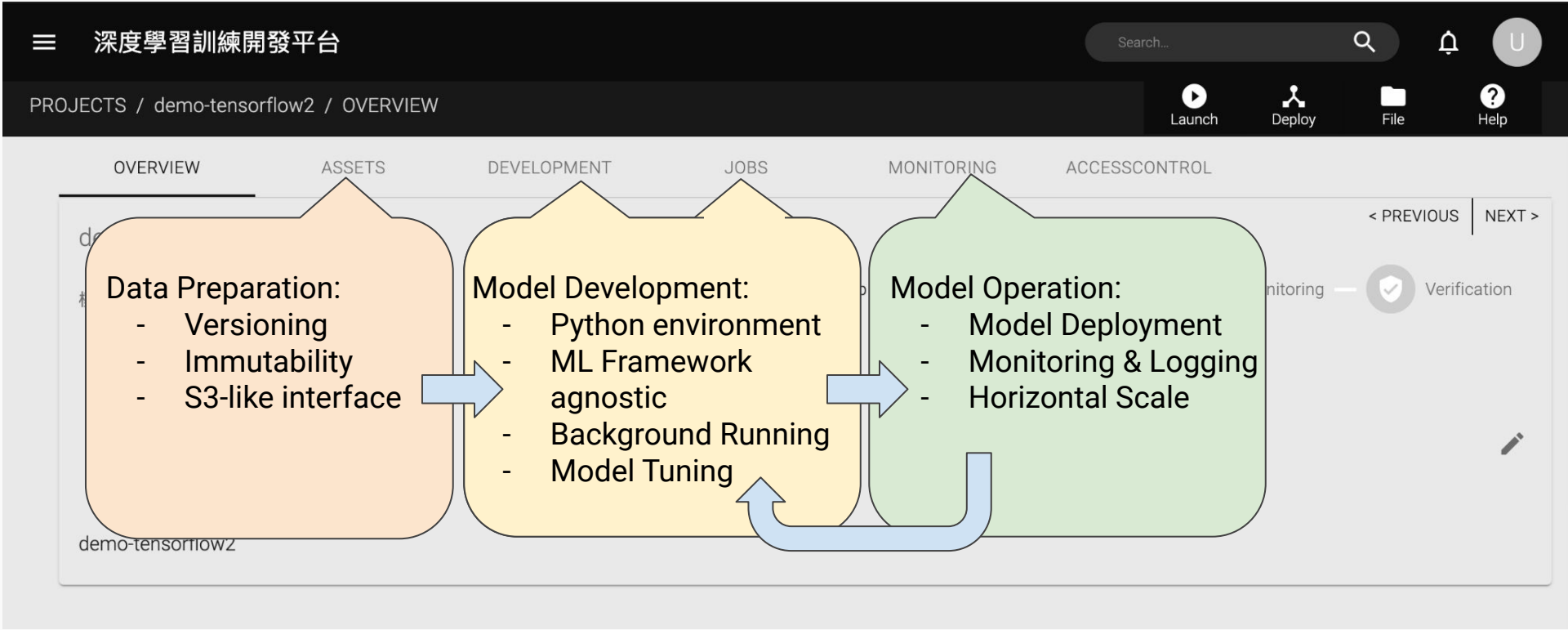
- Background
  - Use containerized technology with a homegrown container orchestration system called Helios.
  - Teams would have to wait for an hour to create a new service and get an operational host to run it in production.
- When user grows more than you expected
  - By late 2017, it became clear that "having a small team working on the features was just not as efficient as adopting something that was supported by a much bigger community," Jai Chakrabarti, Director of Engineering said.
- Impaction when moved to kubernetes
  - The biggest service currently running on Kubernetes takes over 10 million requests per second as an aggregate service and benefits greatly from autoscaling.
  - With Kubernetes, they can provision new services that on the order of seconds and minutes.



https://kubernetes.io/case-studies/spotify/

Case Study 1: Xinchen Fintech Co. LTD

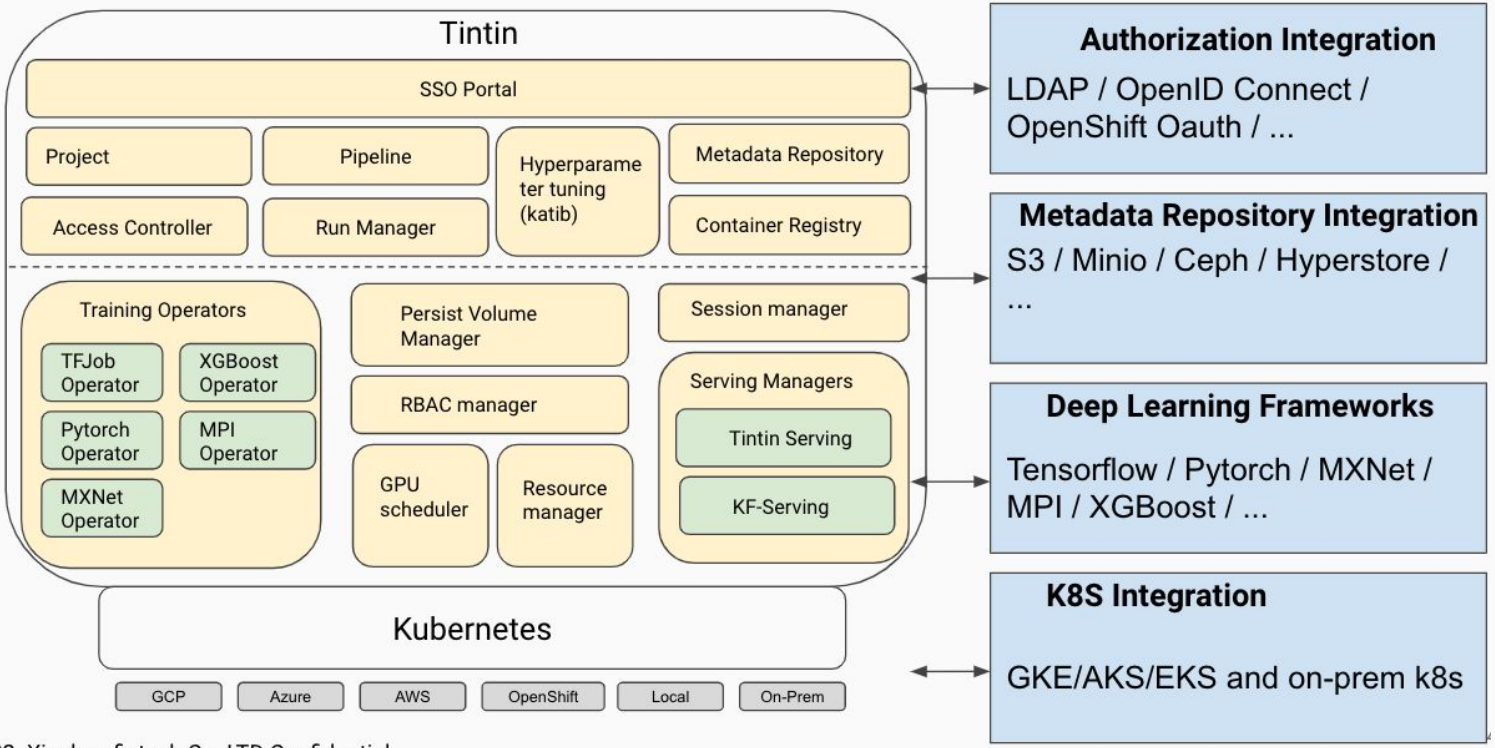
信誠金融科技股份有限公司
XINCHEN FINTECH CO., LTD.



Case Study 1: Xinchen Fintech Co. LTD

信誠金融科技股份有限公司
XINCHEN FINTECH CO., LTD.

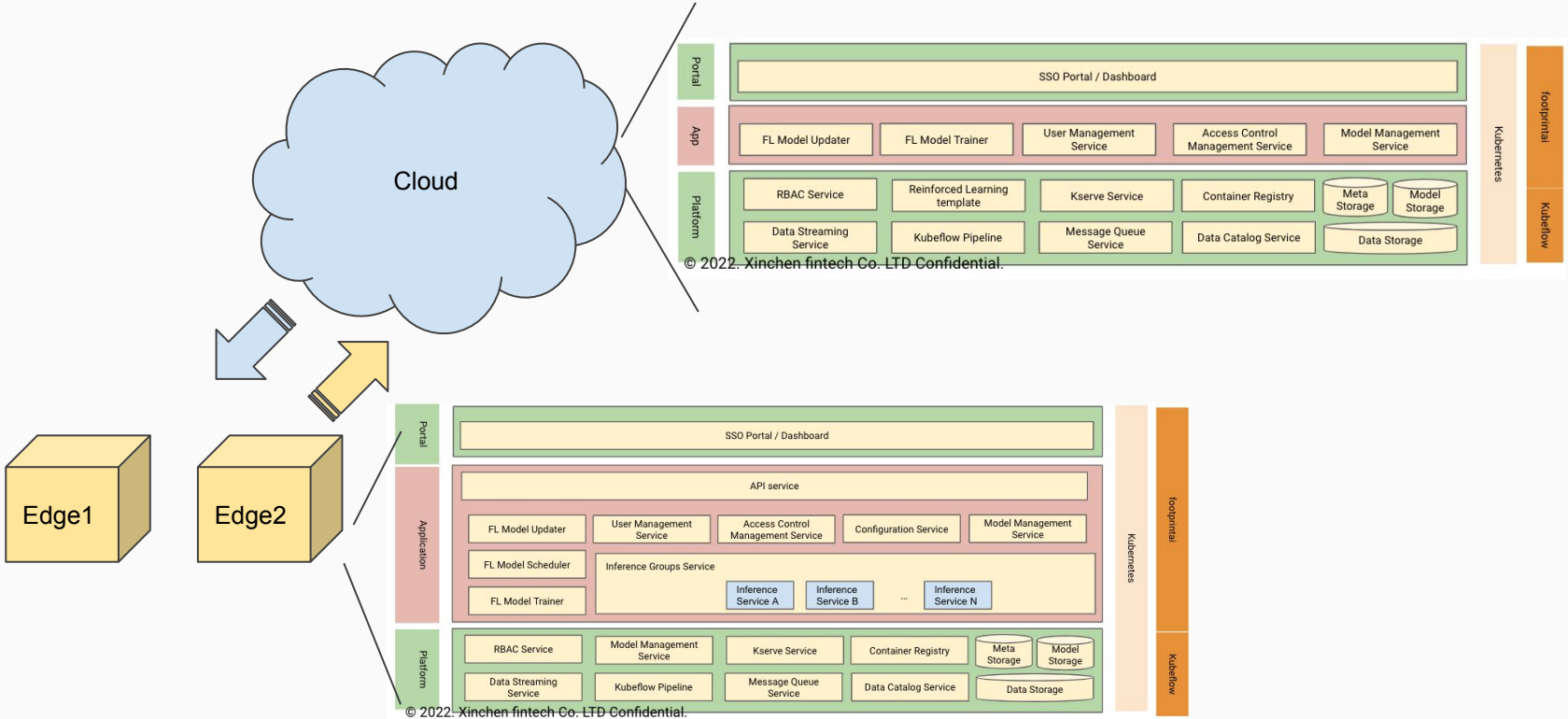
Empower EVERYONE to build and deploy model easily with Kubeflow and Kubernetes



Case Study 2: Xinchen Fintech Co. LTD

信誠金融科技股份有限公司
XINCHEN FINTECH CO., LTD.

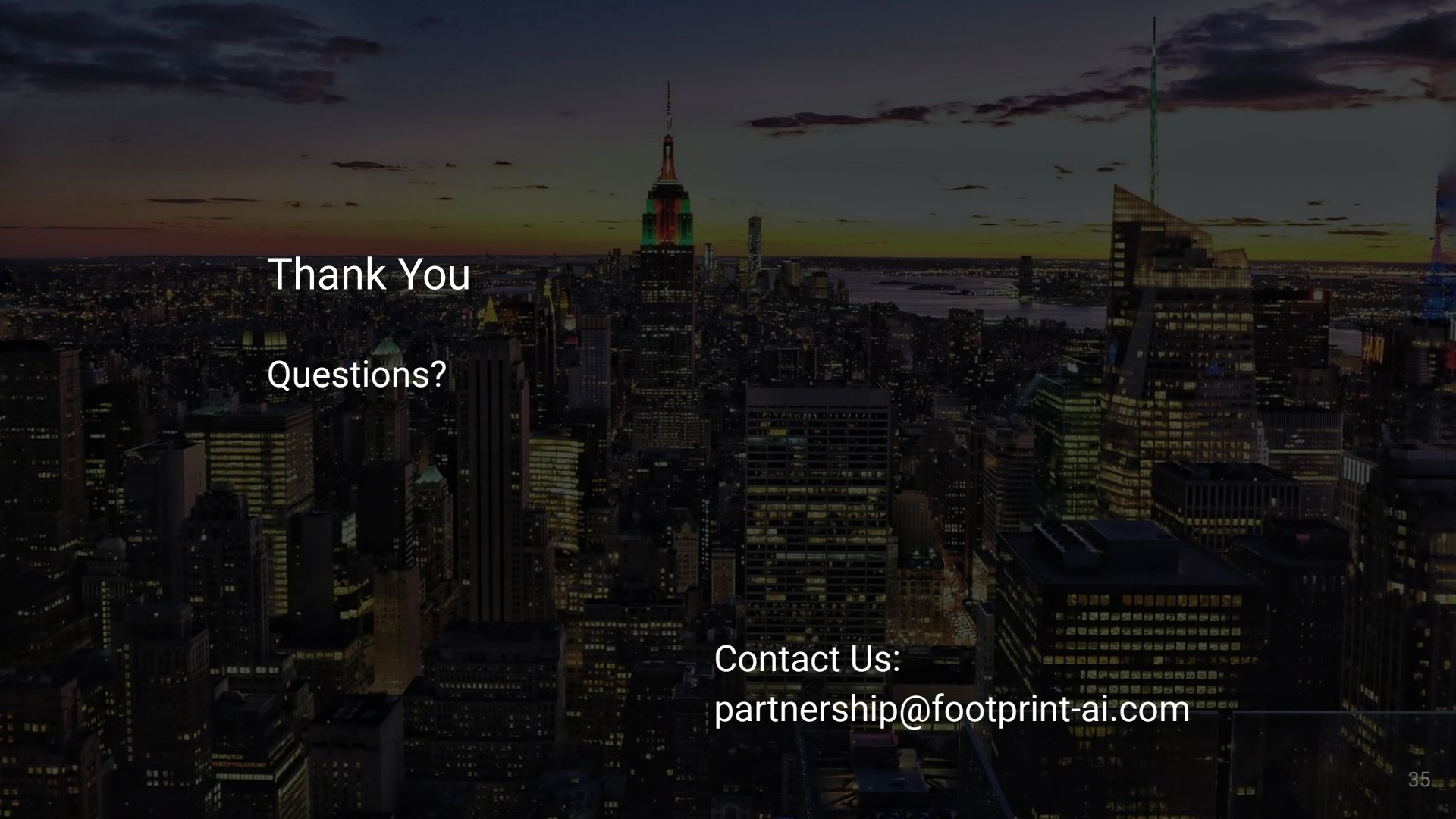
Empower OUR PARTNERS to customize their own machine solution with Kubeflow and Kubernetes



© 2022. Xinchen fintech Co. LTD Confidential.

Conclusion

- Cost and Growth are two major factors for industrial applications.
- Containerized application and containerized orchestration has been dominated a decade of technology landscape.
- Kubernetes has proven that users or industrials could benefit from its ability to horizontally scale to face potential growing pain.


Thank You
Questions?
Contact Us:
partnership@footprint-ai.com