



如何以k8s替他國政府建立易維護 容錯的數位化開放資料系統

22, Dec. 2021

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Kubernetes Summit 21

演講大綱

- 我做了什麼?
- Opendata system介紹
- 這個計劃中我們做了哪些?
- 這個專案的架構
- 如何設定k8s?
- 如何開始這個專案?
- Program the world
- Q&A



Ivan

我做了什麼？

- 2020/09~2021/09

- [國合會](#)



財團法人國際合作發展基金會
International Cooperation and Development Fund

- 2022/01~ TBD

- [Program the world](#) 中華民國愛自造者學習協會



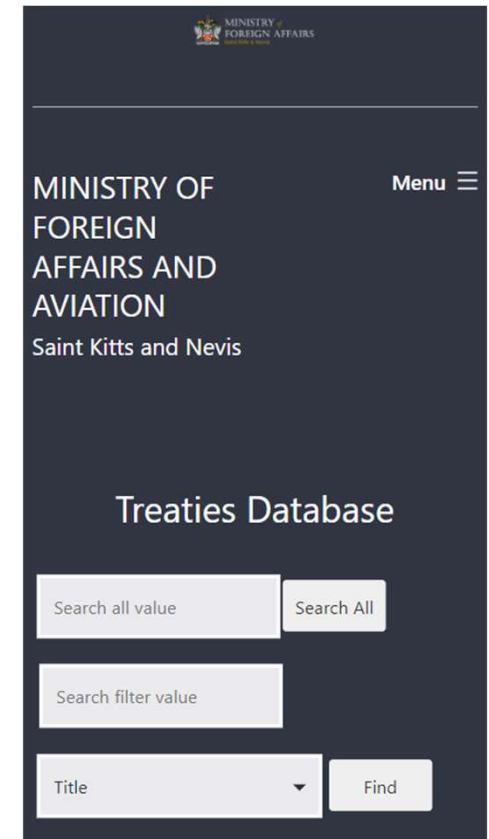
- 2020/07~ TBD

- [AlphaCamp](#)



The Opendata system

- A public platform for people searching and browsing open data on website
 - Developed from an open-source system, **WordPress**
 - Deployed via **Docker** and **K8S** technology
 - Located on **AWS** (Amazon Web Services)
- People can access it on **desktop and mobile**
- The IT operator or technician can easily **customize it**

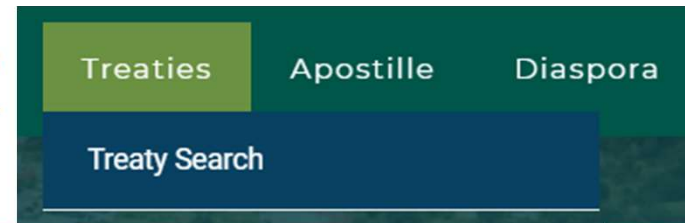


我(們)做了哪些 on Opendata?

- Implementation of Opendata system
 - [Treaty Search](#)
 - **Auto-crawl** Multilateral treaties from OAS [website](#)
 - [Desk Assignment](#)
 - [Apostille Verified](#)
 - [Email Search](#)
 - Leave application
 - Signature form
 - [SKN Honorary Consuls](#)
 - [Page for MOFA template](#)

Opendata system – Treaty Search

- <https://www.foreign.gov.kn/treaty-search/>



Treaties Database

Search all value

Search All

d

Title

Find

Title	Done Place	Done Date	Agreement Type	Upload File	Status
<div><div></div><div>Convention on Diplomatic Asylum (A-46)</div></div>	CARACAS, VENEZUELA	28 Mar, 1954	Multilateral		In Force
<div><div></div><div>Convention to Prevent and Punish the Acts of Terrorism Taking the Forms of Crimes Against Persons and Related Extortion that are of International Significance (A-49)</div></div>	WASHINGTON, D.C., UNITED STATES	2 Feb, 1971	Multilateral		In Force
<div><div></div><div>Protocol of Amendment to the Charter of the Organization of American States "Protocol of Cartagena de Indias (A-50)</div></div>	CARTAGENA DE INDIAS, COLOMBIA	5 Dec, 1985	Multilateral		In Force
<div><div></div><div>Inter-American Convention to Prevent and Punish Torture (A-51)</div></div>	CARTAGENA DE INDIAS, COLOMBIA	9 Dec, 1985	Multilateral		In Force

Search all value	Search All
Bilateral	treaty_agree
Treaty Title	Treaty Status
+ Treaty of Extradition between Saint Chris and Nevis and the Republic of China	In Force
+ Agreement between the Federation of Saint Christopher (St. Kitts) and Nevis and Canada for the exchange of information on Tax Matters	In Force
+ Joint Communique Concerning the Establishment of Diplomatic Relations between the Federation of St. Christopher & Nevis and the Republic of Rwanda	In Force
+ Agreement between the Government of Saint Christopher (Saint Kitts) and Nevis and the Government of Iceland Concerning the Exchange of Information Relating to Tax Matters	In Force

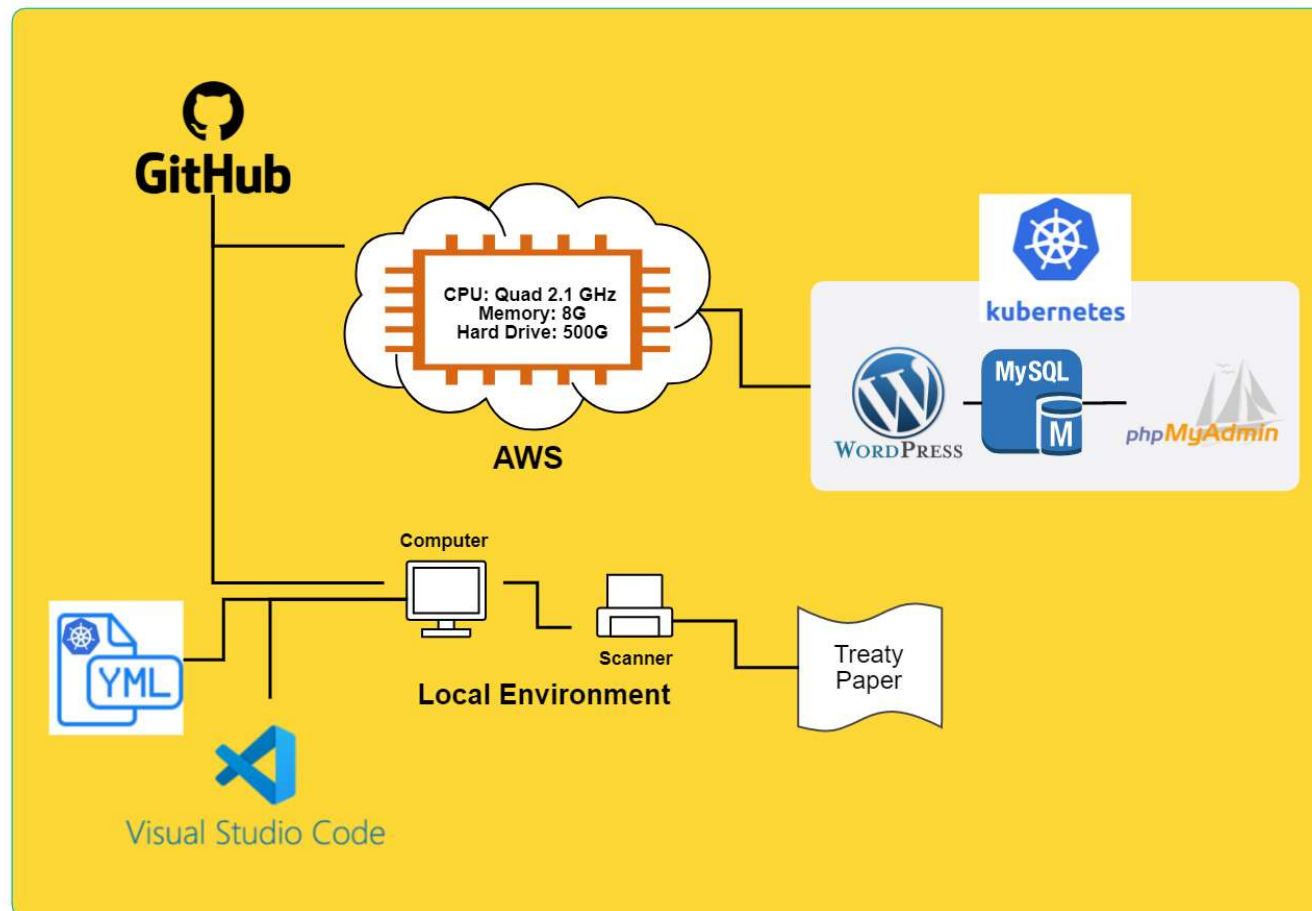
Search Treaty Title	Search Treaty Done Place	Search Treaty Done Date	Search Agreement Type	Search Treaty Status
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Details	
Treaty Title	Agreement between the Federation of Saint Christopher (St. Kitts) and Nevis and Canada for the exchange of information on Tax Matters
Treaty Done Place	Basseterre
Treaty Done Date	June 14, 2010
Agreement Type	Bilateral
Treaty Status	In Force
Subject	Agreement
Series Number	[2010] AGREEMENT TO CANADA
Treaty Status List Site	N/A

The Infrastructure

- Server(Hardware) Requirements
 - Domain name:
 - opendata.foreign.gov.kn
 - Machine:
 - CPU: Quad 2.1 GHz (minimize)
 - Memory: 8G (minimize)
 - Hard Drive: 500G (minimize)
 - OS: Linux(Ubuntu)
- Software Requirements
 - Kubernetes (free)
 - Wordpress (free)
 - Mysql (free)
 - Code base repository – github(free)
 - IDE tools – Visual Studio Code(free)

The Infrastructure on cloud

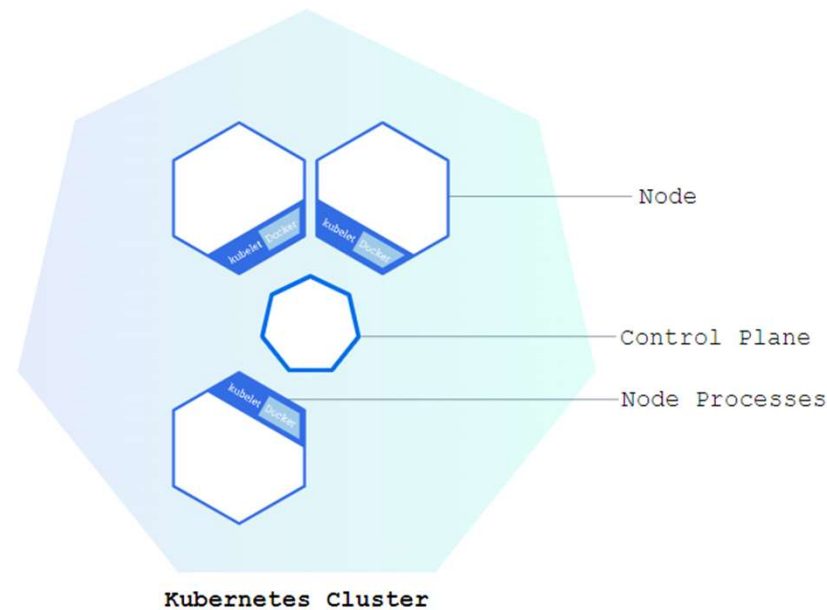




What is Kubernetes?

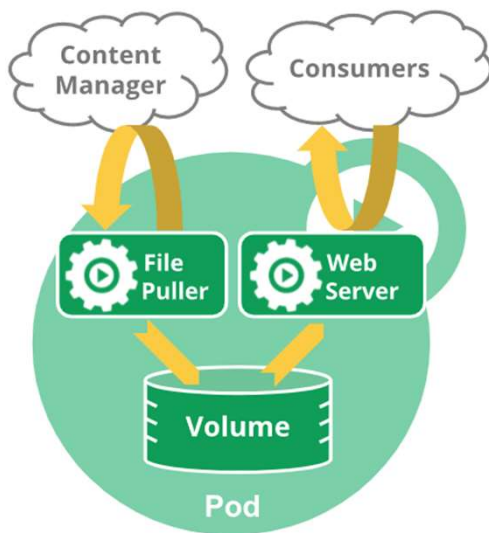
Cluster

- Kubernetes is a portable, extensible, open-source platform for managing containerized workloads and services, that facilitates both declarative configuration and automation.

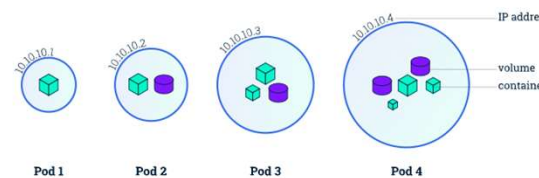


Pods & Nodes

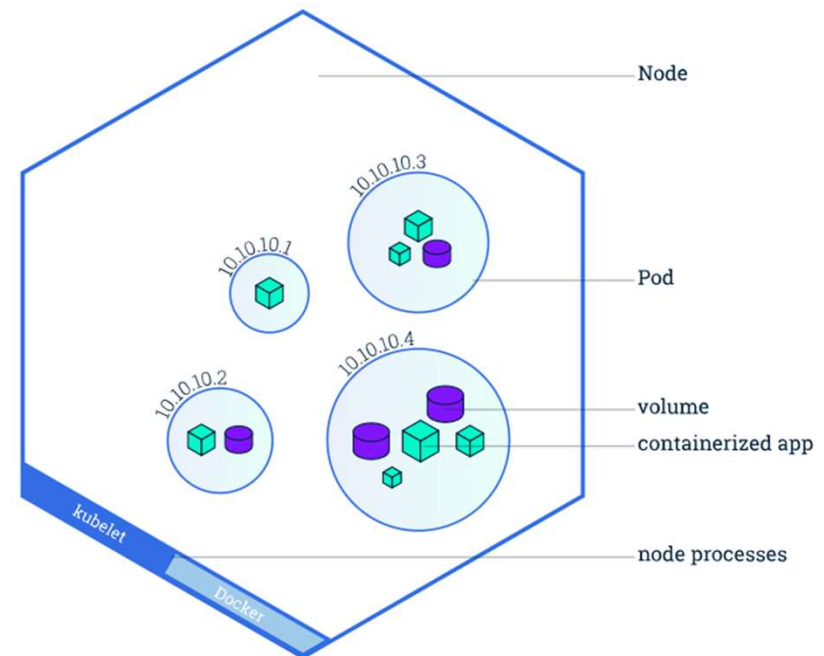
- A Pod is a Kubernetes abstraction that represents a group of one or more application containers (such as Docker)



Pods overview

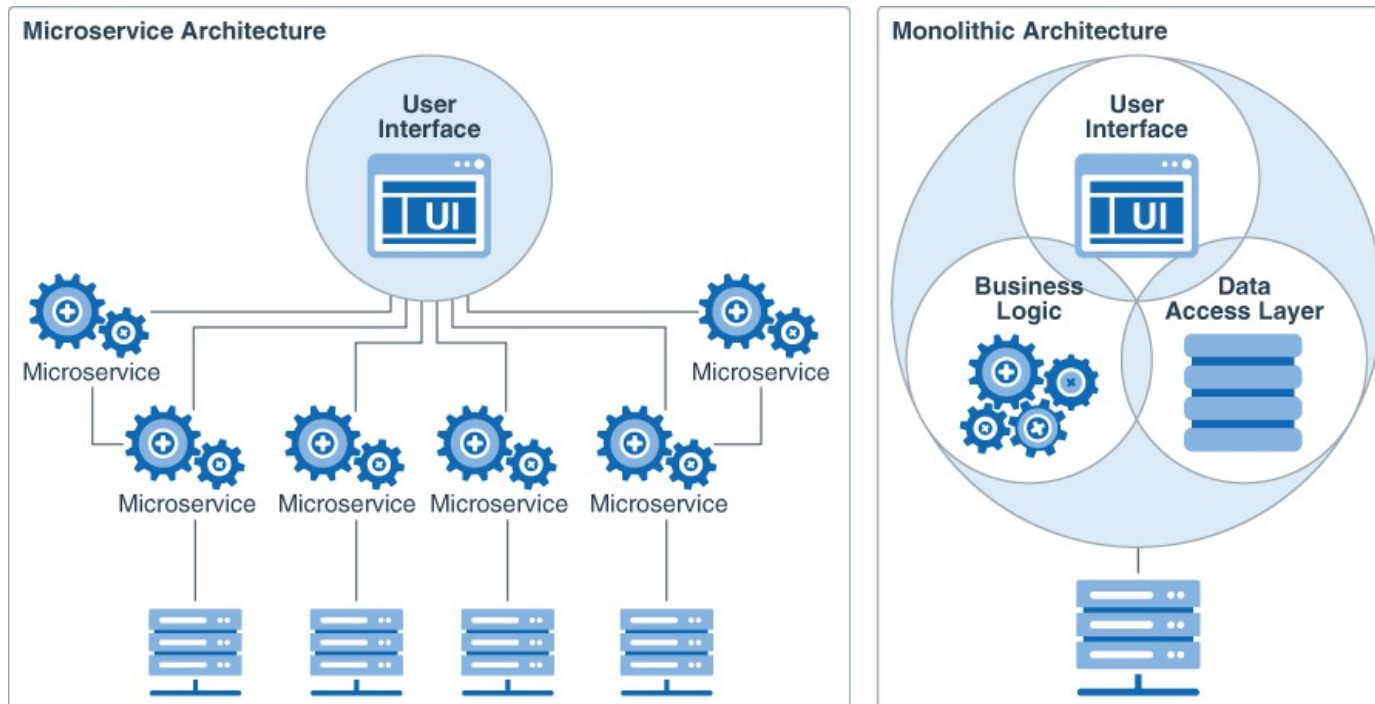


from <https://kubernetes.io/>



Opendata system with Kubernetes

- Wordpress / mysql / phpmyadmin are Microservices



from <https://kubernetes.io/>

Steps to deploy on cloud

- Deploying WordPress and MySQL
- Deploying loadbalancer to auto-reconnect pods of wordpress(service) when it is out of capacity
 - The Kubernetes load balancer sends connections to the first server in the pool until it is at capacity, and then sends new connections to the next available server. This algorithm is ideal where virtual machines incur a cost, such as in hosted environments.
- Deploying kubernetes dashboard

先使用docker-compose試一次

- docker-compose.yml

```
version: '3.7'

services:
  ##
  # The web server container.
  ##
  wordpress-develop:
    image: nginx:alpine
    restart: always
    networks:
      - wpdevnet

    ports:
      - ${LOCAL_PORT-8889}:80

    environment:
      LOCAL_DIR: ${LOCAL_DIR-src}

    volumes:
      - ./tools/local-env/default.template:/etc/nginx/conf.d/default.template
      - ./:/var/www

    # Load our config file, substituting environment variables into the config.
    command: /bin/sh -c "envsubst '$$LOCAL_DIR' < /etc/nginx/conf.d/default.template > /etc/nginx/conf.d/default.conf && exec nginx -g 'daemon off;'"

    depends_on:
      - php
```

Install docker-compose

- `sudo curl -L "https://github.com/docker/compose/releases/download/1.27.4/docker-compose-$(uname -s)-$(uname -m)" -o /usr/local/bin/docker-compose`

- `sudo chmod +x /usr/local/bin/docker-compose`

Execute docker compose file

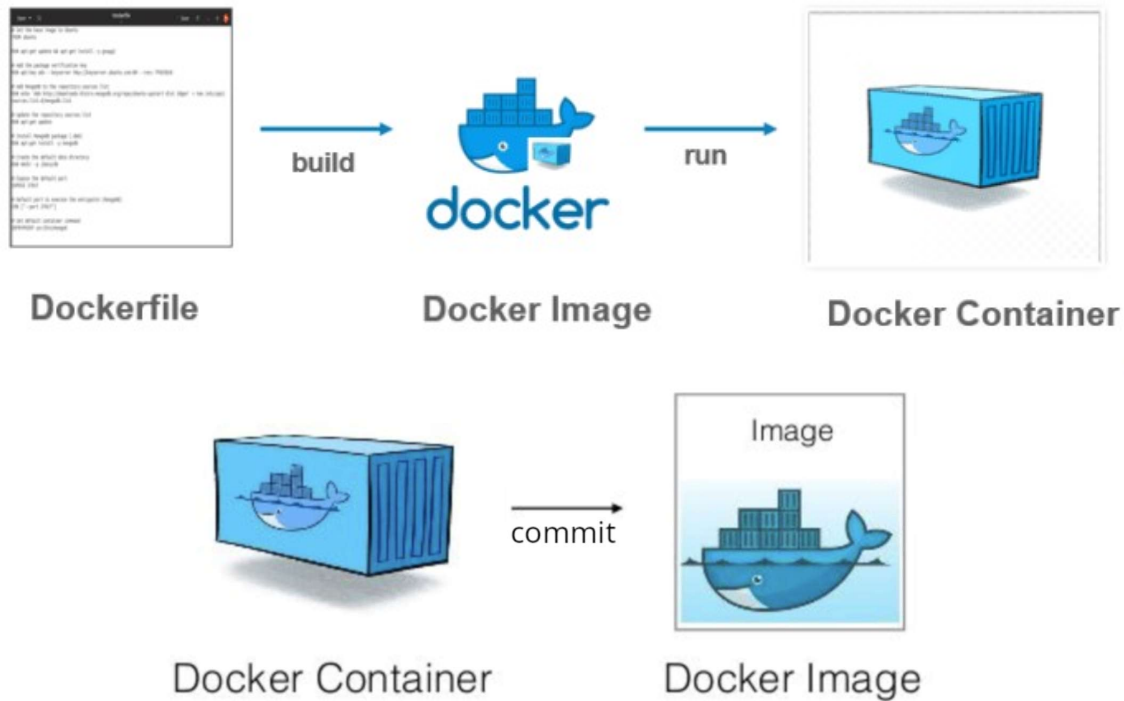
- `sudo npm run env:start`

or

- `sudo docker-compose up -d`

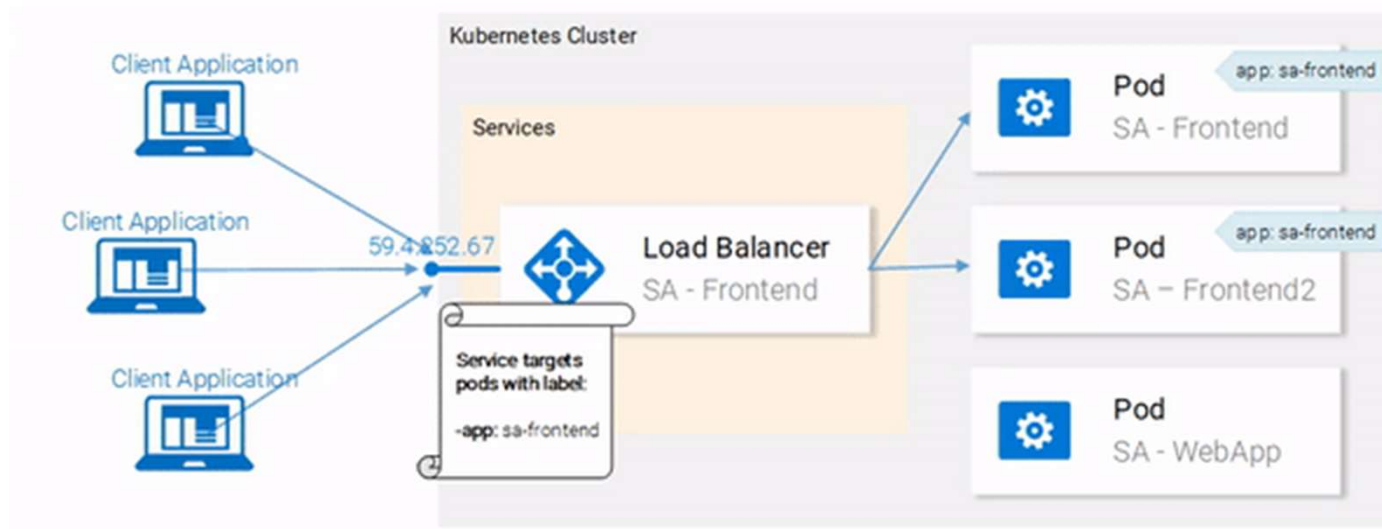
產生docker images給k8s使用

- `docker commit [CONTAINER_ID] [new_image_name]`



How to set kubernetes

- Use Kubernetes(K8S) to build up load balancer of our own system



from <https://kubernetes.io/>

How to set kubernetes – apply yaml file

- `kubectl apply -k ./`
- It will do as follows
- `kubectl apply -f wpdevnet-networkpolicy.yaml,wordpress-develop-service.yaml,wordpress-develop-deployment.yaml,phpunit-deployment.yaml,phpmyadmin-service.yaml,phpmyadmin-deployment.yaml,php-deployment.yaml,mysql-service.yaml,mysql-deployment.yaml,cli-deployment.yaml`

```
wordpress-deployment.yaml
1  apiVersion: v1
2  kind: Service
3  metadata:
4    name: wordpress
5    labels:
6      app: wordpress
7  spec:
8    ports:
9      - port: 80
10   selector:
11     app: wordpress
12     tier: frontend
13   type: LoadBalancer
---
4  apiVersion: v1
5  kind: PersistentVolumeClaim
6  metadata:
7    name: wp-pv-claim
8    labels:
9      app: wordpress
10  spec:
11    accessModes:
12      - ReadWriteOnce
13    resources:
14      requests:
15        storage: 20Gi
---
```

How to set kubernetes

- `kubectl port-forward service/wordpress 80:80`
- Or
- `kubectl expose deployment/my-nginx`
- Then
- `kubectl proxy`
- `wget http://localhost:8001/`

Configuration of reverse proxy

- Let use domain name can access localhost

```
location [REDACTED] / {  
    proxy_set_header Host $host;  
    proxy_pass https://localhost:8001/;  
    proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;  
    proxy_set_header X-Forwarded-Proto https;  
    proxy_set_header X-Forwarded-Port 443;  
    proxy_redirect off;  
}
```

Create Kubernetes dashboard

Creating a Service Account

We are creating Service Account with the name `admin-user` in namespace `kubernetes-dashboard` first.

```
apiVersion: v1
kind: ServiceAccount
metadata:
  name: admin-user
  namespace: kubernetes-dashboard
```

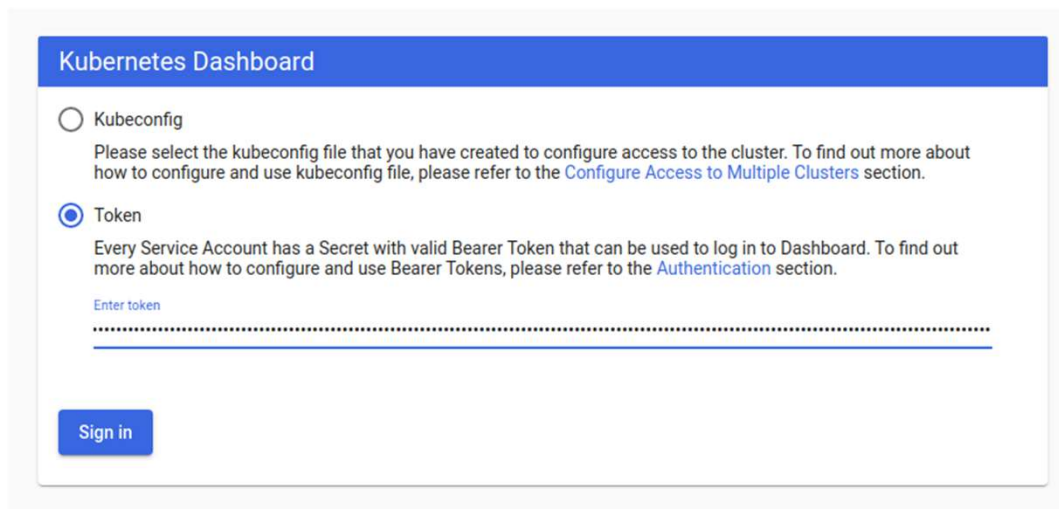
Creating a ClusterRoleBinding

In most cases after provisioning the cluster using `kops`, `kubeadm` or any other popular tool, the `ClusterRole` `cluster-admin` already exists in the cluster. We can use it and create only a `ClusterRoleBinding` for our `ServiceAccount`. If it does not exist then you need to create this role first and grant required privileges manually.

```
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRoleBinding
metadata:
  name: admin-user
roleRef:
  apiGroup: rbac.authorization.k8s.io
  kind: ClusterRole
  name: cluster-admin
subjects:
- kind: ServiceAccount
  name: admin-user
  namespace: kubernetes-dashboard
```

Create token

- `kubectl -n kubernetes-dashboard get secret $(kubectl -n kubernetes-dashboard get sa/admin-user -o jsonpath="{.secrets[0].name}") -o go-template="{{.data.token | base64decode}}"`



The screenshot shows the 'Kubernetes Dashboard' login interface. It has a blue header bar with the text 'Kubernetes Dashboard'. Below the header, there are two radio button options for authentication. The first option is 'Kubeconfig', which is unselected. The second option is 'Token', which is selected with a blue dot. Below the 'Token' option, there is a paragraph of text explaining that every Service Account has a Secret with a valid Bearer Token. Below this text, there is a label 'Enter token' followed by a dotted line for input. At the bottom left, there is a blue button labeled 'Sign in'.

Kubernetes Dashboard

☐ Kubeconfig

Please select the kubeconfig file that you have created to configure access to the cluster. To find out more about how to configure and use kubeconfig file, please refer to the [Configure Access to Multiple Clusters](#) section.

☒ Token

Every Service Account has a Secret with valid Bearer Token that can be used to log in to Dashboard. To find out more about how to configure and use Bearer Tokens, please refer to the [Authentication](#) section.

Enter token

.....

Sign in

Dashboard

- kubectl proxy

The screenshot displays the Kubernetes Dashboard interface. The top navigation bar includes the Kubernetes logo, a dropdown menu set to 'default', a search bar, and icons for adding resources, notifications, and user profile. The left sidebar lists various Kubernetes resources under categories like 'Overview', 'Workload', 'Service', 'Config and Storage', and 'Cluster'. The main content area is titled 'Overview' and features a 'Workload Status' section with three large green circles representing the status of Deployments, Pods, and Replica Sets. Below this, a 'Deployments' table lists active deployments with columns for name, namespace, labels, pods, creation time, and image.

名字	命名空間	標籤	Pods	創建時間 ↑	映像
✓ phpmyadmin	default	app: phpmyadmin	1 / 1	8 months ago	phpmyadmin/phpmyadmin
✓ wordpress-mysql	default	app: wordpress	1 / 1	8 months ago	mysql:5.6
✓ wordpress	default	app: wordpress	1 / 1	8 months ago	wordpress:4.8-apache
✓ balanced	default	app: balanced	1 / 1	8 months ago	k8s.gcr.io/echoserver:1.4



Demo

Minikube

- Minikube 是由Google 發布的一個輕量級工具。讓開發者可以在本機上輕易架設一個Kubernetes Cluster，快速上手Kubernetes 的指令與環境。
 - *minikube start*
 - *minikube dashboard*
 - *minikube service wordpress --url*
 - *minikube stop*
- Alternative solutions: Microk8s, k3s

Pros and Cons of k8s

- Pros
 - Improve your workflow of deployment
 - Make your website more stable
 - Free solution to coordinate your containers well
- Cons
 - Too powerful for simple website
 - Too complex and hard to learn
 - More heavily dependence on k8s technology



But how to start on
real project?

How to start the project

- Plans in 3-phase
 - Short-term: use freeware ([Ragic](#))
 - Middle-term: we create our own system (Opendata system)
 - Long-term: let our customers use it

How to start the project

- Three principles of cooperation
 - *Make more close connection and good relationship with your supervisors and stakeholders.*
 - *Attend all activities with staff whatever it is related to the project or not. For example, I went to the church every week because my colleagues were there event thought I am not Christian*
 - *You should co-work with them on other business like teaching them Mandarin and helping them solve issues of computer*

How to start the project

- Solid technical skills
- Experienced soft skills — always smile :)
- Patient, patient and more patient

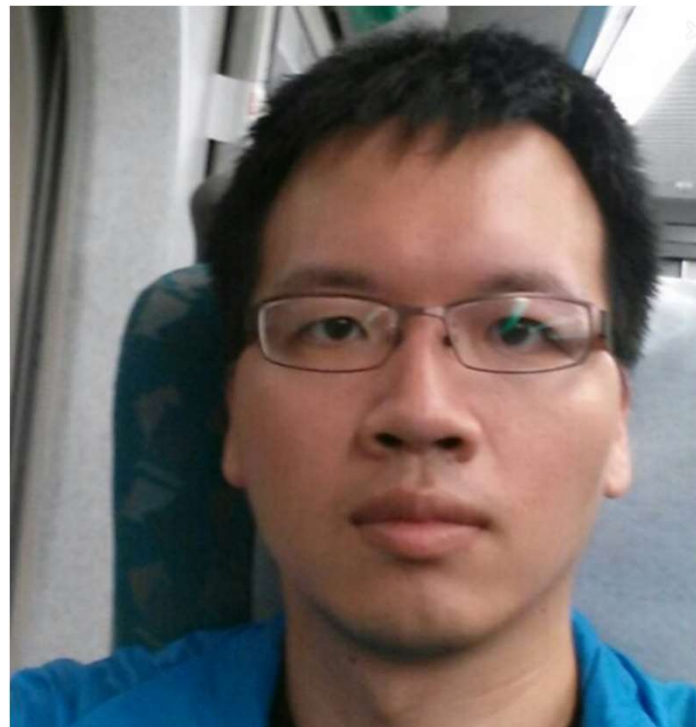


特別感謝 - 專案期間指導

- 熙哥 - 專案指導



- Tony Ko - K8S指導



Program the world

- 社團法人中華民國愛自造者學習協會 – 蘇文鈺 教授



PAIA – AI Game Learning platform

- <https://www.paia-arena.com/>





Q&A