Kubernetes Introduction

Instructor: Asst. Prof. Dr. Praphan Pavarangkoon
Office: Room no. 418-5, 4th Floor
Email: praphan@it.kmitl.ac.th
Office hours: Thursday at 9:00 – 11:00 or
as an advance appointment

Agenda

- Installation of Kubernetes on Windows Platform
- Exploring KubeCTL

Installation of Kubernetes on Windows Platform

Installation of Kubernetes on windows is not straight forward, in its simplest form, which we are going to follow, has two steps:

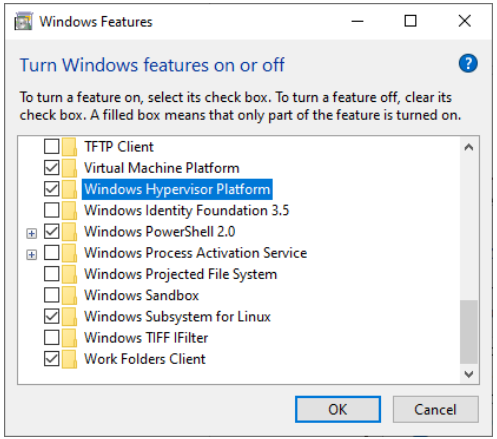
1. Installation of Kubernetes Cluster (Kubernetes Instance)
2. Installation of kubectl (Command Line Interface for interaction with Kubernetes)

Pre-requisite

- As Kubernetes from scratch is an application natively designed for the Linux, few setting needs to be confirmed before we proceed with installation.
    1. For **Windows 11**, In the Search bar, search for "apps", and select Apps and features. Select Optional features → Add a feature → scroll down to Windows features.
       or
       For **Windows 10**, You can also press Windows Key + R to open the Run dialog, type “optionalfeatures”, and press Enter

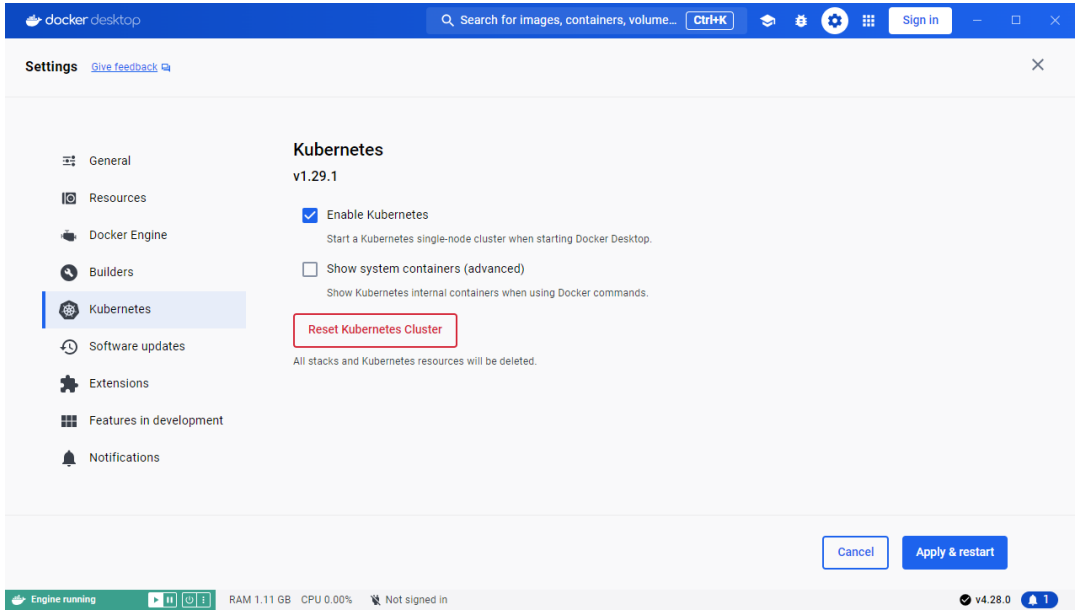
Pre-requisite (cont.)

- Select Windows Hypervisor Platform



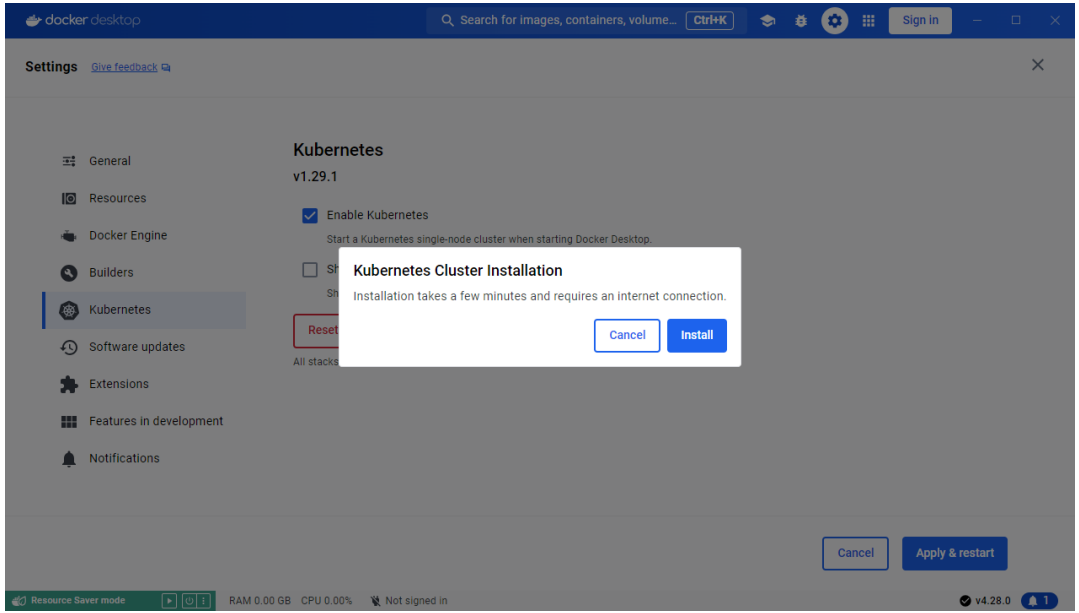
Pre-requisite (cont.)

2. Now start the Docker Desktop, and browse to the setting pane of the docker, click on Kubernetes, then check Enable Kubernetes, this will install standalone cluster of Kubernetes.



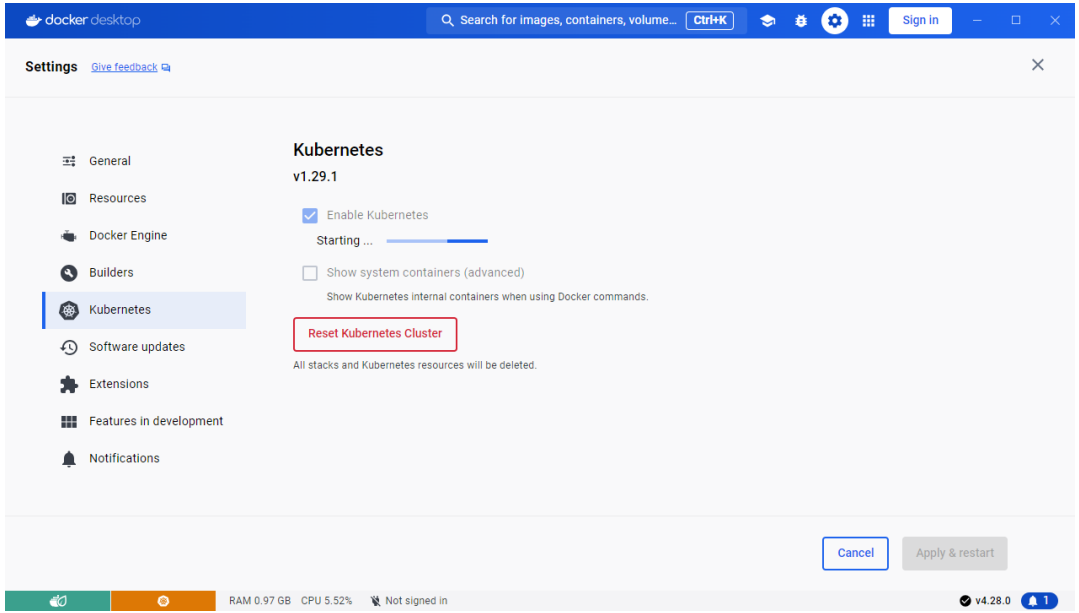
Pre-requisite (cont.)

3. Click on Apply & restart, this will install additional components required for running Kubernetes.



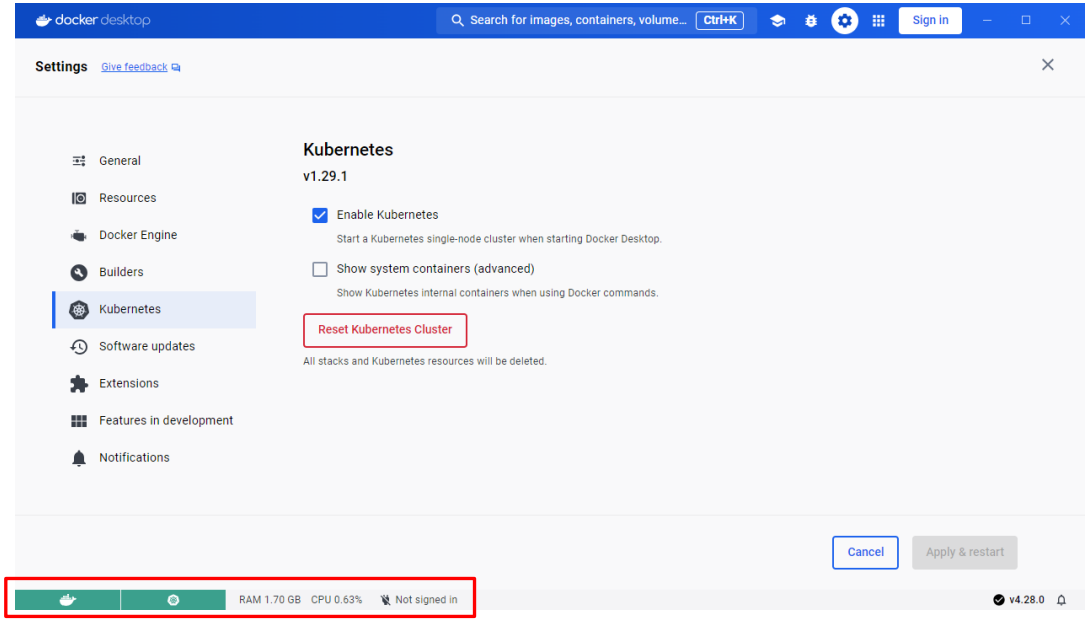
Pre-requisite (cont.)

An internet connection is required for downloading and installing required components.



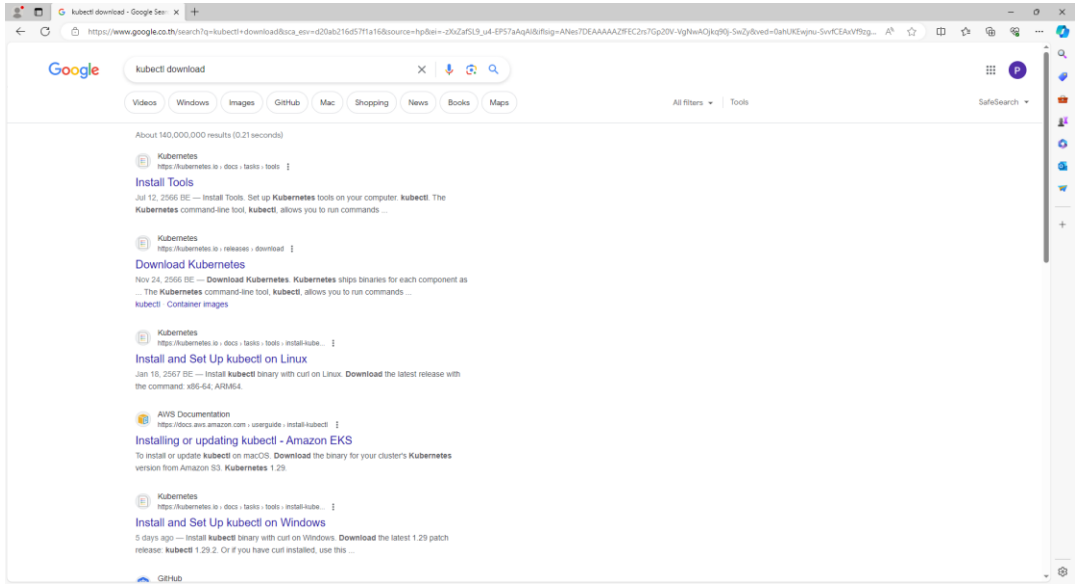
Pre-requisite (cont.)

4. Once finished, you can see bottom left corner of the Docker desktop interface, Kubernetes icon appears in green along with whale icon of the docker, indicating Kubernetes has been installed and running successfully.



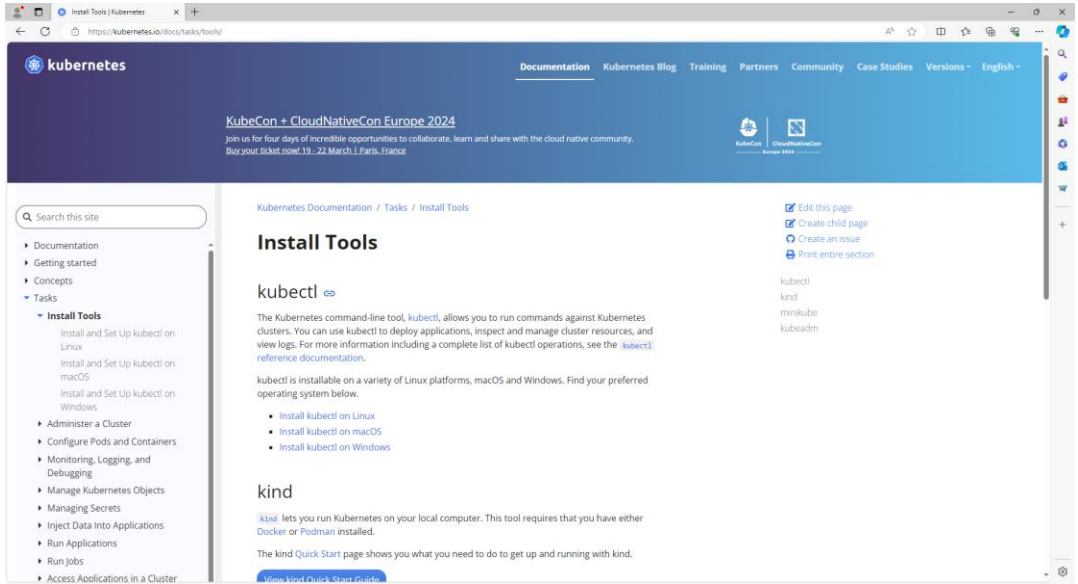
Pre-requisite (cont.)

5. Now for installation of kubectl, a CLI interface for the Kubernetes, search for “kubectl” on the Google. (You do not need to do this step for the latest version of Docker Desktop.)



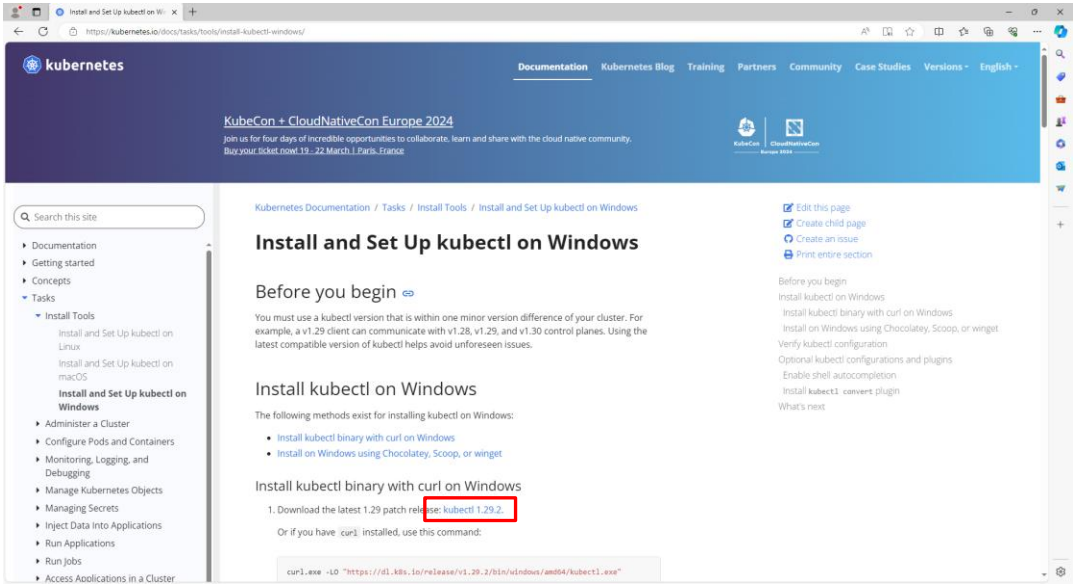
Pre-requisite (cont.)

On the page opened, click on “Install kubectl on Windows”.



Pre-requisite (cont.)

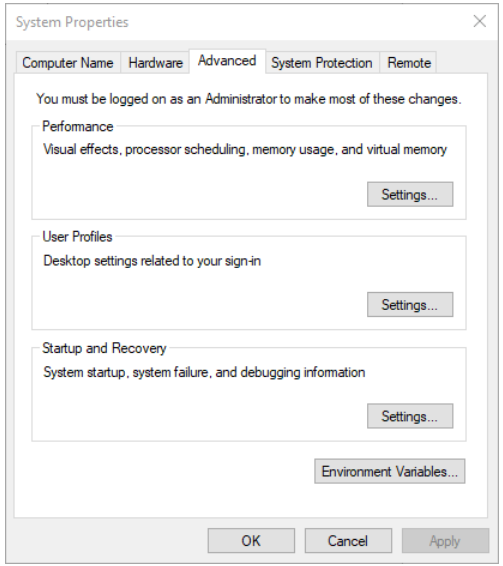
On the page opened, click on “lastest … patch release”.



Save kubectl binary (kubectl.exe) somewhere in your system, a preferred location is “C:\kubectl”.

Pre-requisite (cont.)

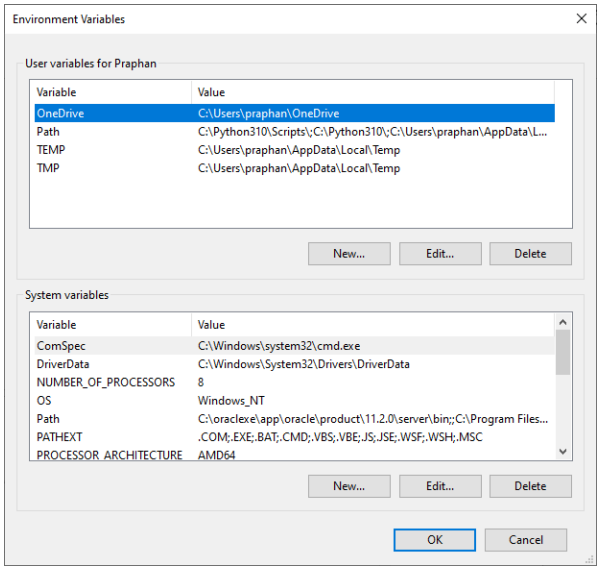
Now, on search, look for “Environment”, Environment Variable link will appear, click and open “Edit the system environment variables” setting of the system.



On the setting window opened thus, click on “Environment Variables…” at the bottom.

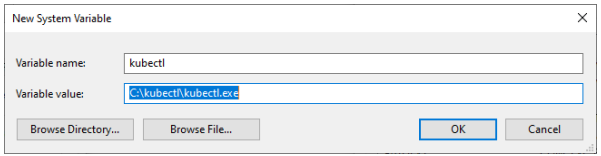
Pre-requisite (cont.)

On the subsequent window opened, either select “New…” on User variables section (if you want to make changes for current user only) or select “New…” on System variables section (this will make changes system wise for all user of the system)



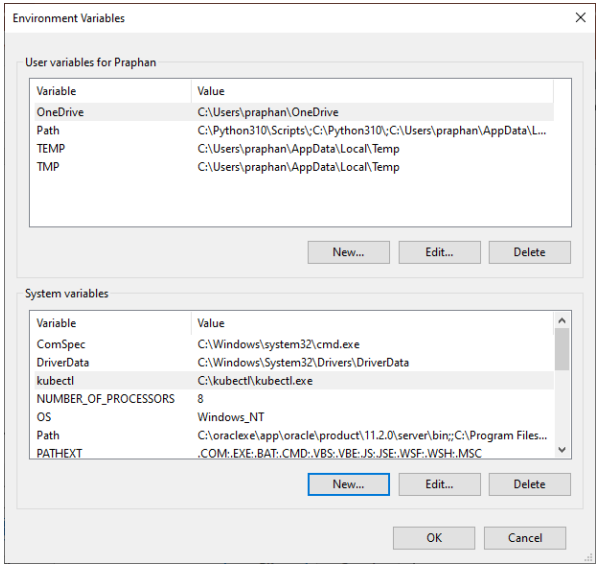
Pre-requisite (cont.)

Add variable, write kubectl for the variable name and either provide value for this or browse to the location where “kubectl.exe” file was saved.



Once done, click on “OK”, a new Environment Variable entry has been made, and it should be visible as well.

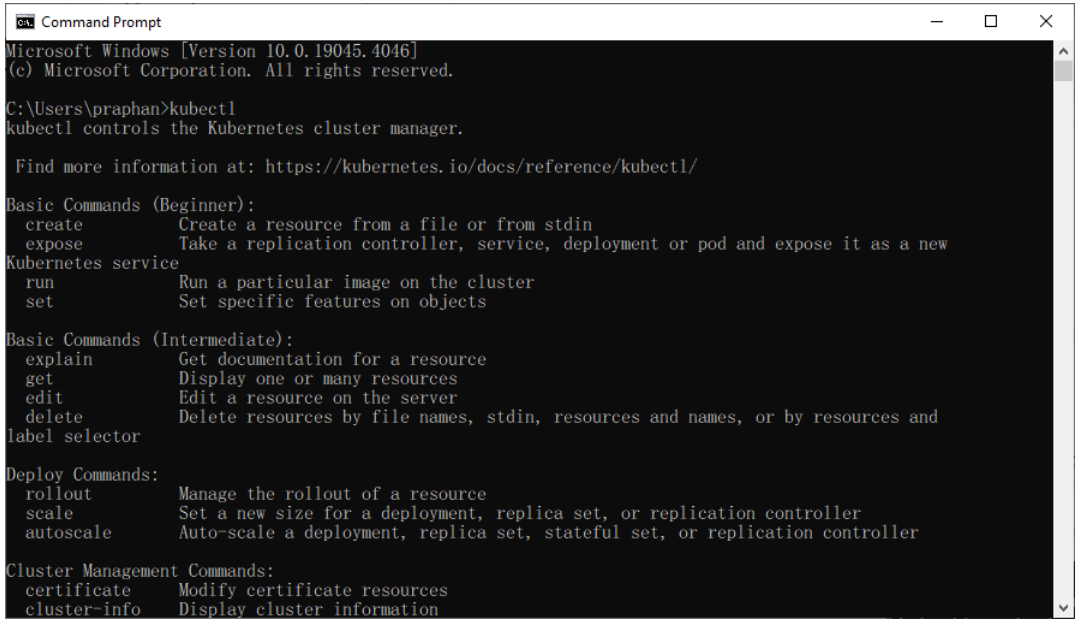
Pre-requisite (cont.)



Click on “OK” to finalize everything.

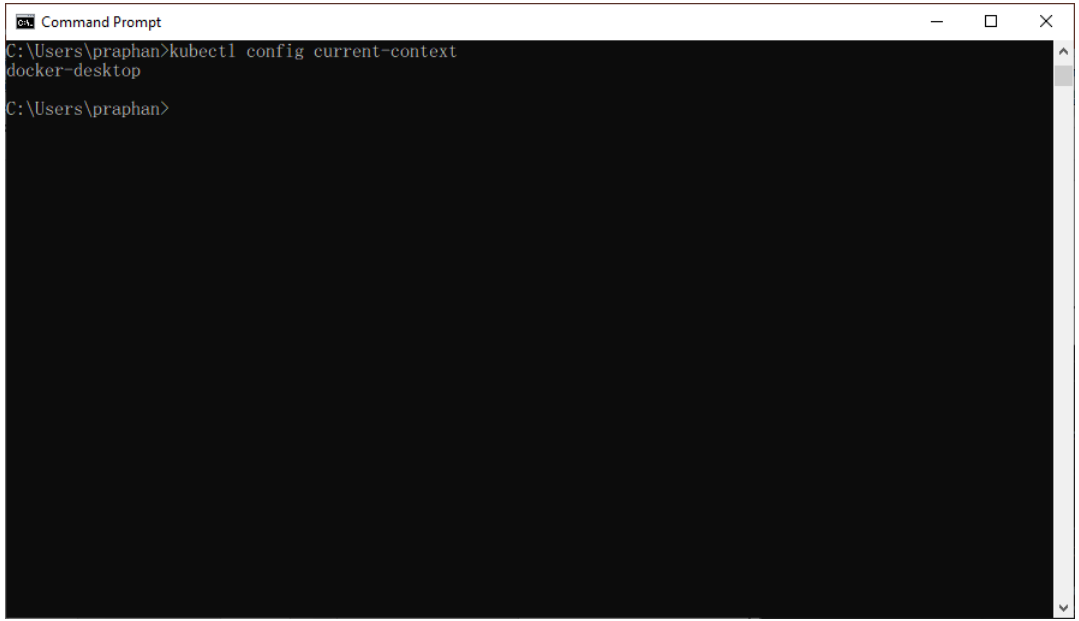
Pre-requisite (cont.)

6. Open “Command Prompt”, and type “kubectl”, if it responds with a verbose screen like below, means you have set everything perfectly.



Some Basic Commands (cont.)

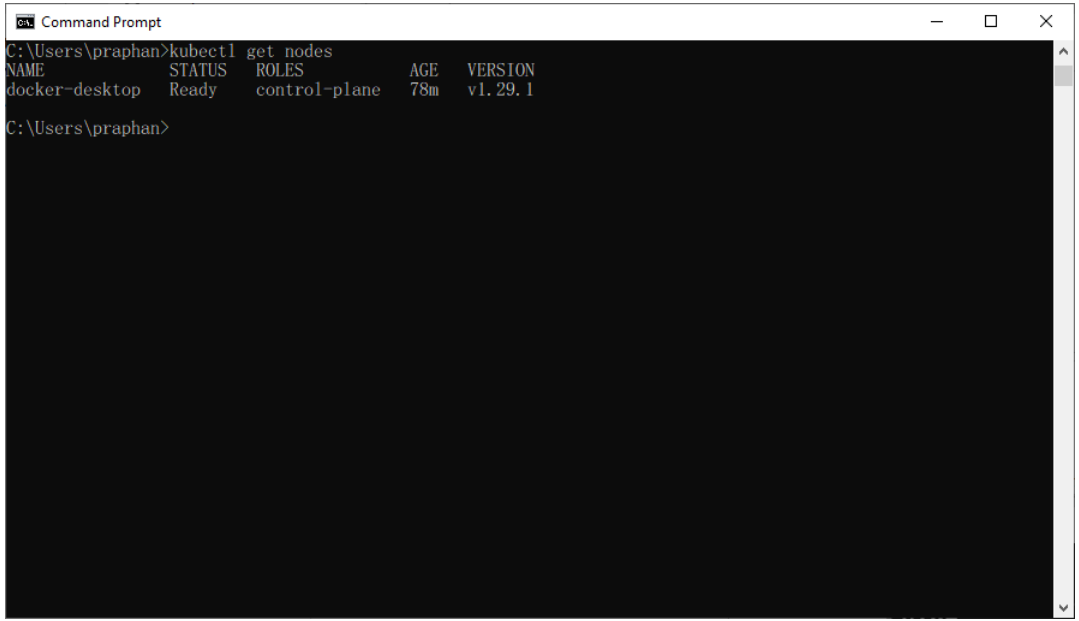
7. On Command Prompt window, write “kubectl config current-context”.



It shows current context of the Kubernetes instance, which in turn reveals that it is going to run on “docker-desktop” cluster.

Some Basic Commands (cont.)

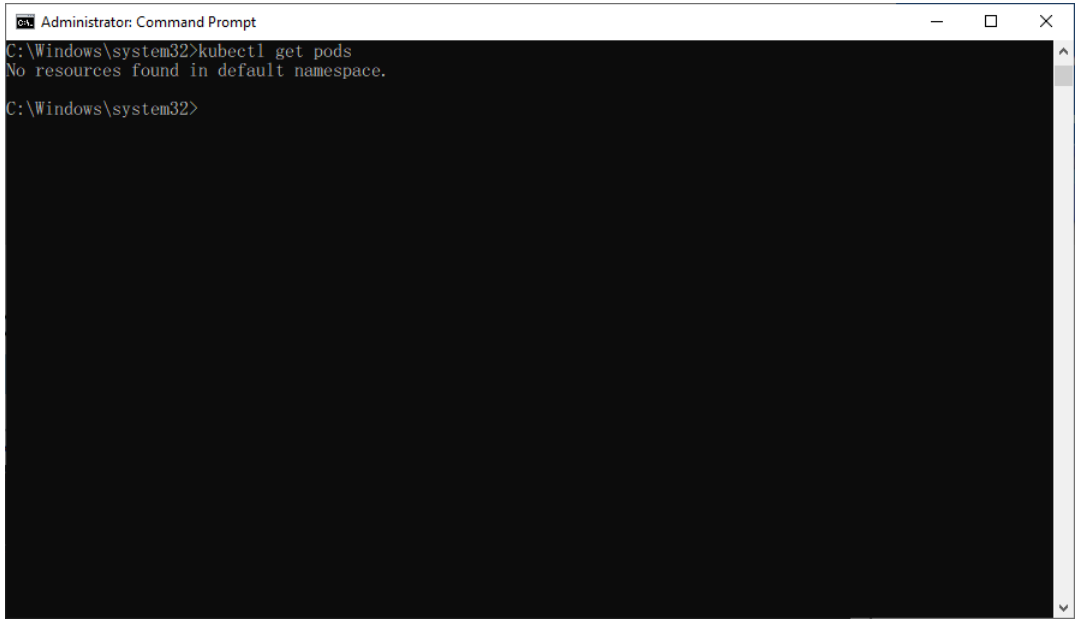
8. To know the information about the nodes available on current cluster, run this command “kubectl get nodes”.



It shows that only one machine is running.

Some Basic Commands (cont.)

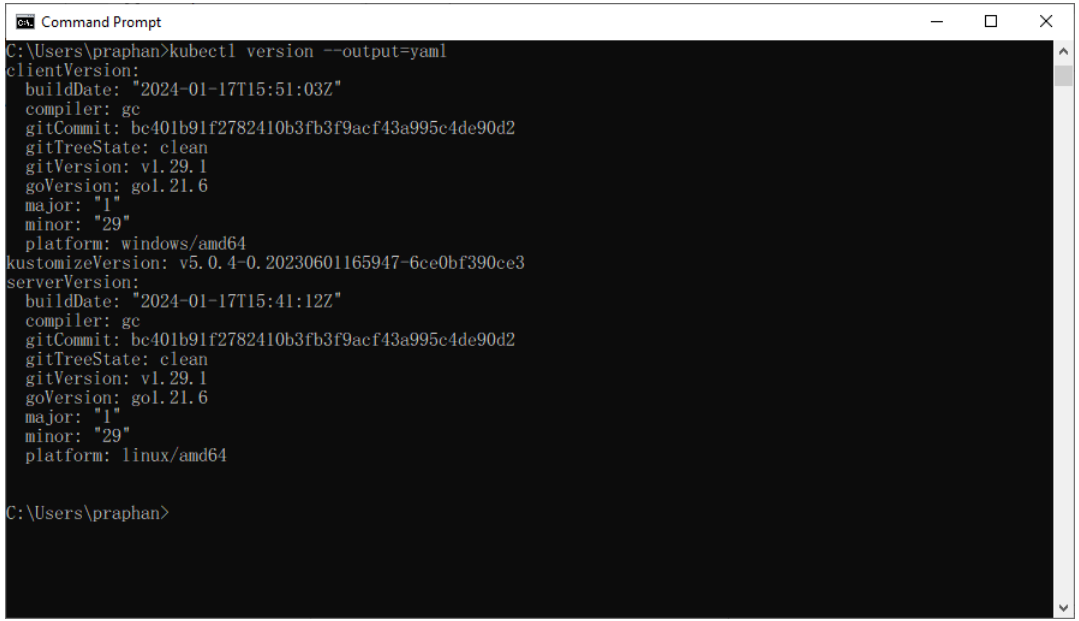
9. To know about pods available on the current cluster, use this command “kubectl get pods”.



It shows that currently no pods are available.

Some Basic Commands (cont.)

10. To know about all the details of the Kubernetes cluster, use this command “kubectl version --output=yaml”.



Exploring KubeCTL

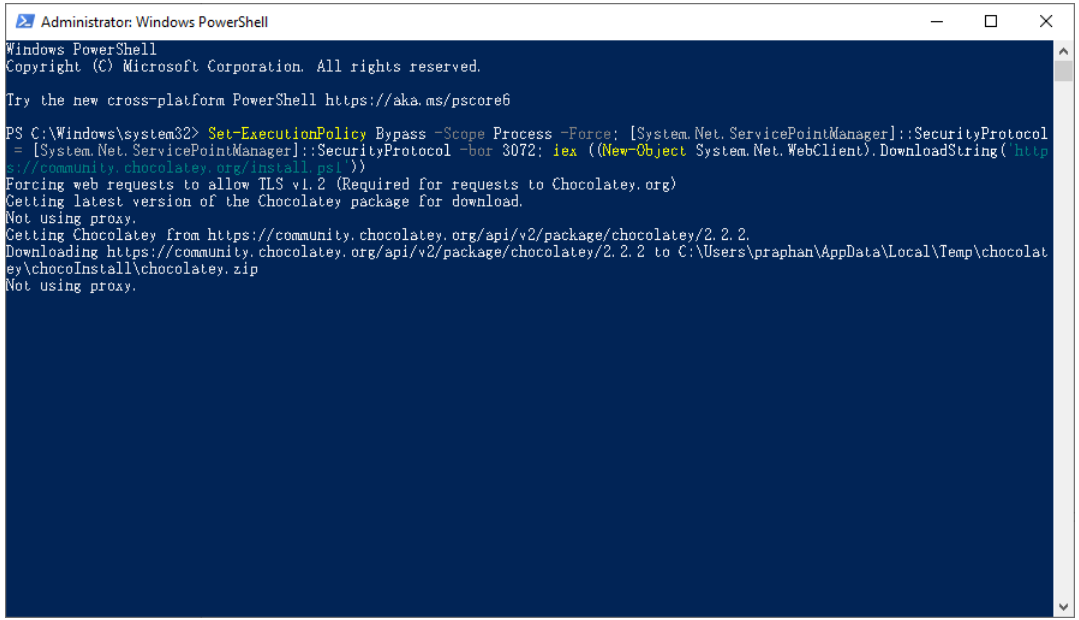
- Minikube is library which lets one use Kubernetes on one's computer without need of installing other things for using clusters and associated maneuvering.
- In a nutshell, Minikube is a one node Kubernetes cluster, which runs on your laptop.
- In its simplest form, we will first install "Chocolatey" Installer, and then with the help of this we will install Minikube.

Installation of Chocolatey

- Open “Windows PowerShell” in Administrator mode, and then run this script on the powershell, wait a few minutes for windows to complete the installation of the script.
  “Set-ExecutionPolicy Bypass -Scope Process -Force; [System.Net.ServicePointManager]::SecurityProtocol = [System.Net.ServicePointManager]::SecurityProtocol -bor 3072; iex ((New-Object System.Net.WebClient).DownloadString('https://community.chocolatey.org/install.ps1'))”

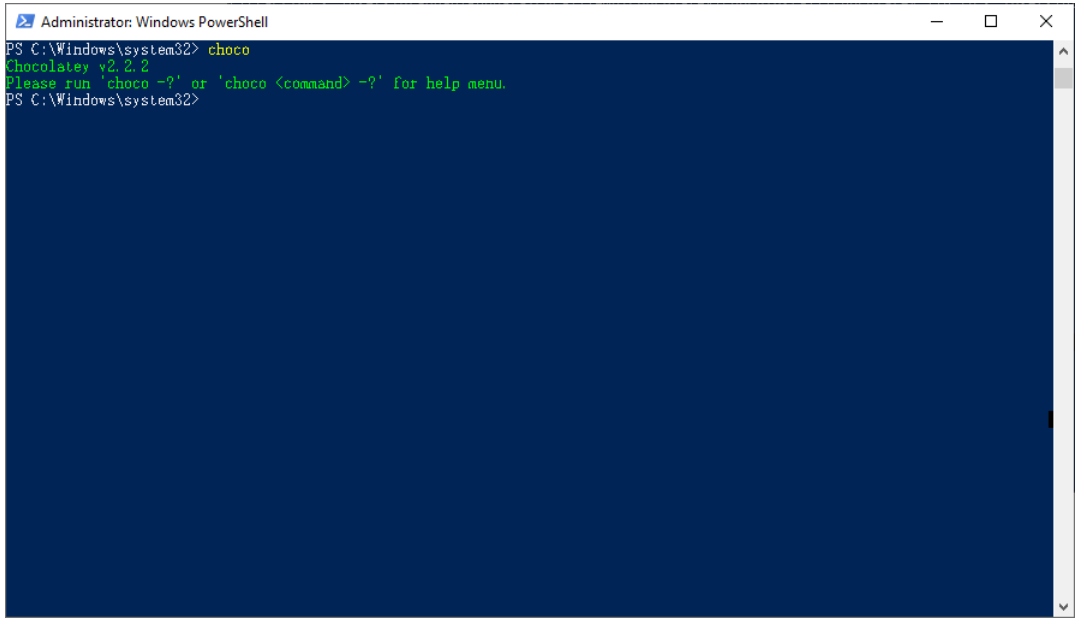
Installation of Chocolatey (cont.)

- Now paste the above script on the PowerShell prompt



Installation of Chocolatey (cont.)

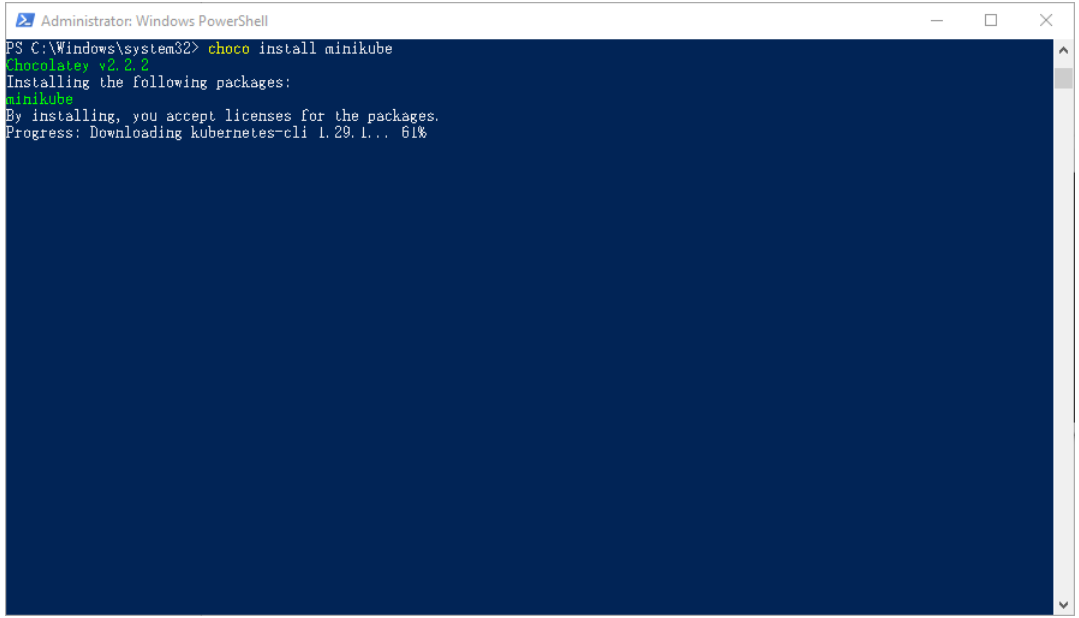
When installation finishes, run “choco” to check if everything worked properly



Obviously Chocolatey has been installed successfully on the system.

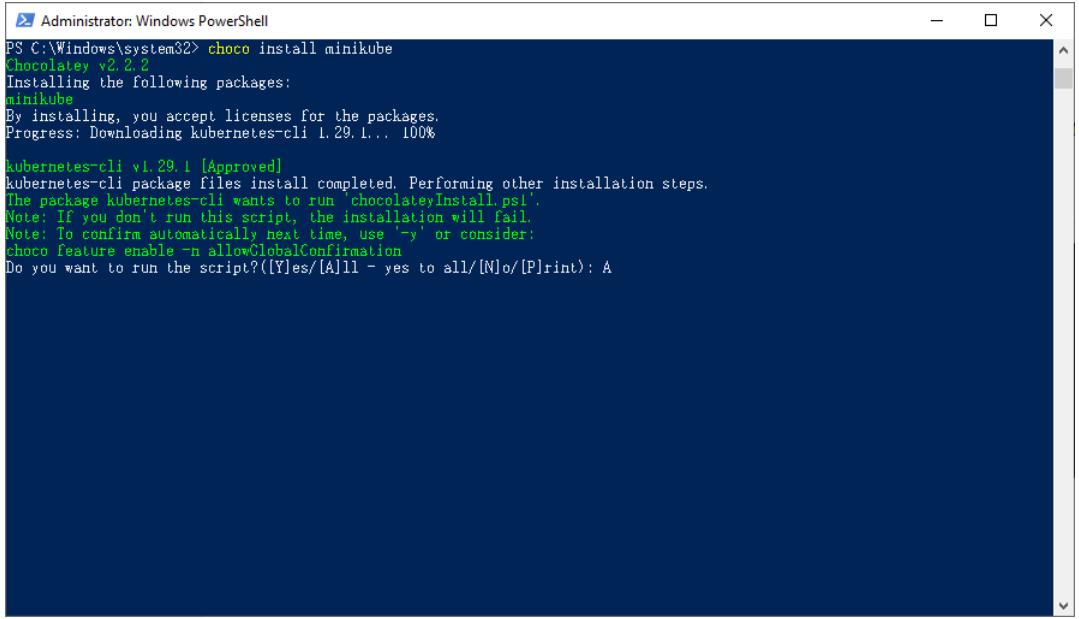
Installation of Minikube

- On the PowerShell terminal (opened as Administrator) run following command to install Minikube on the system.
  “choco install minikube”



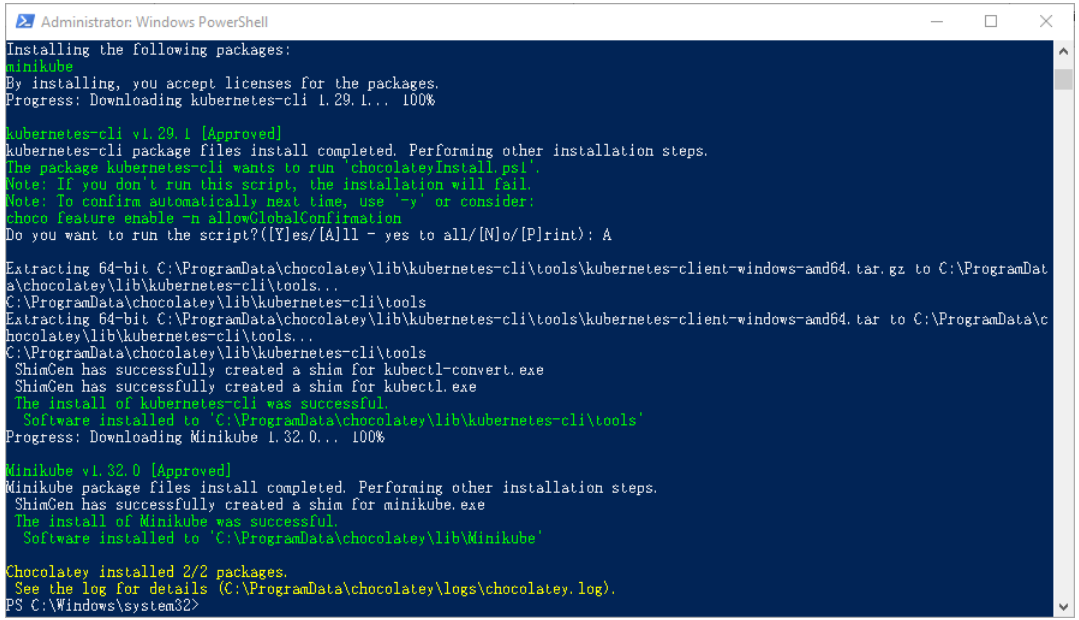
Installation of Minikube (cont.)

When asked give permission as “A”



Installation of Minikube (cont.)

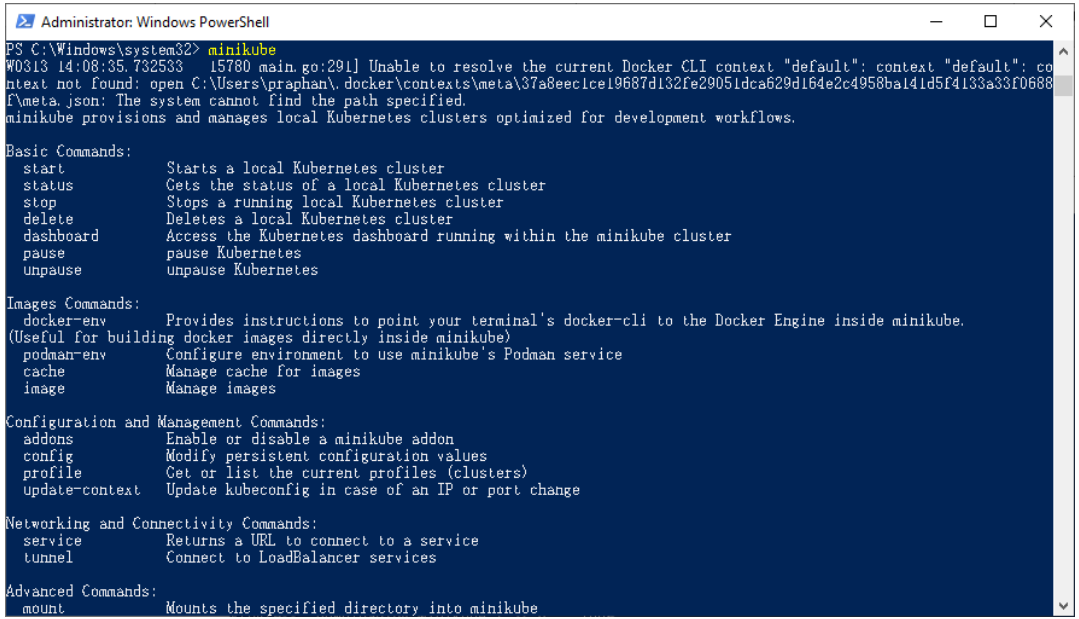
When installation has been completed successfully, above screen will appear.



Installation of Minikube (cont.)

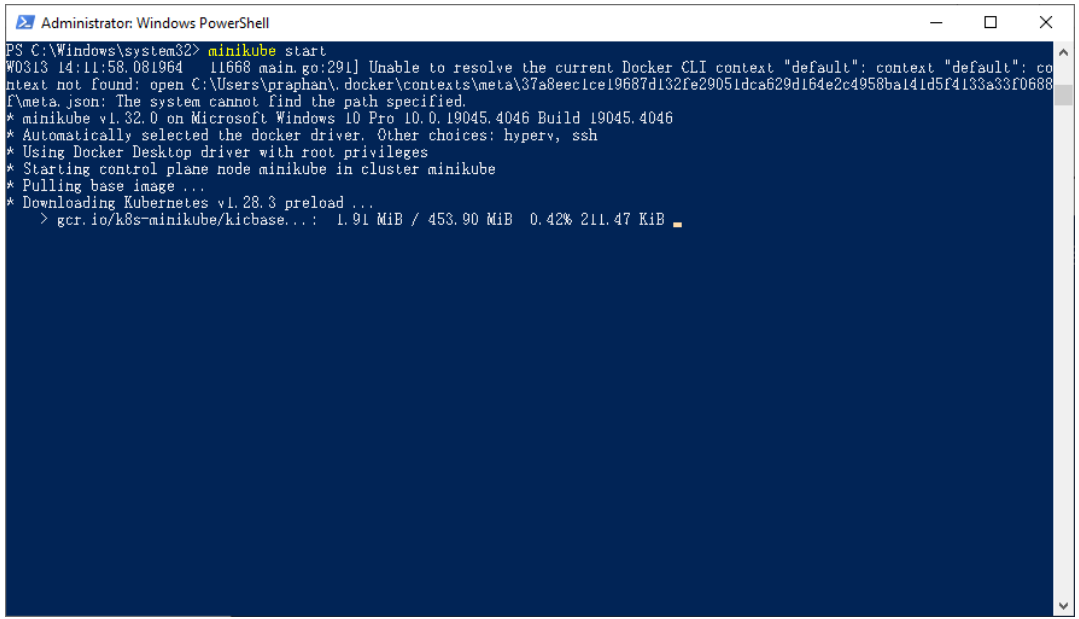
A verbose screen is evidence of successful installation of Minikube.

You have installed a usecase cluster on Kubernetes of your system.



Exploring KubeCTL (cont.)

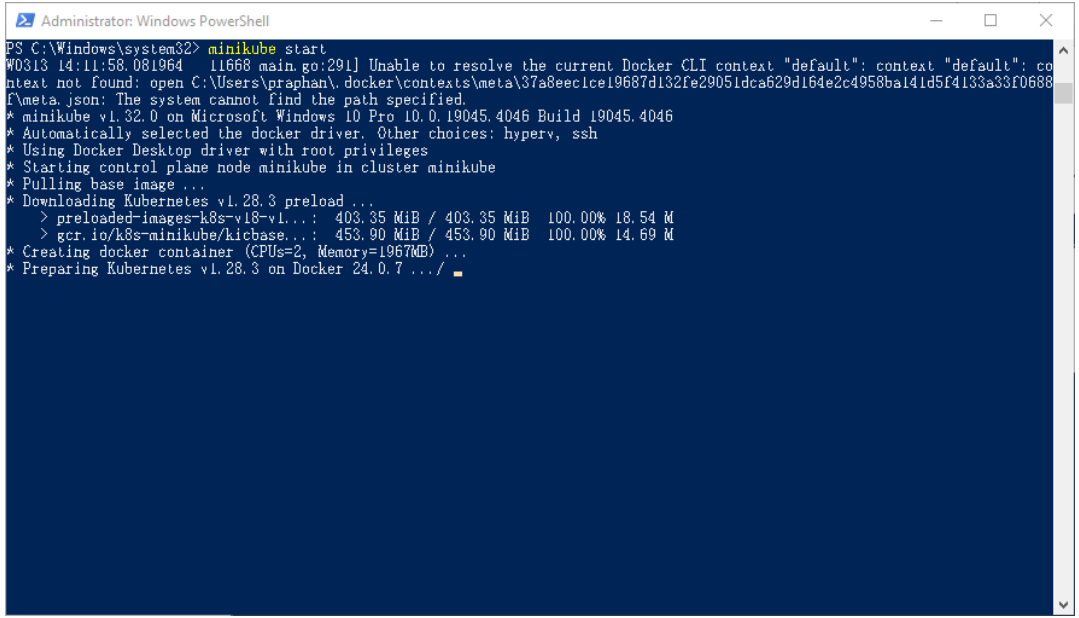
- To start cluster, run “minikube start”



Minikube will start downloading required packages and libraries, depending upon network speed, it may take a few to several minutes.

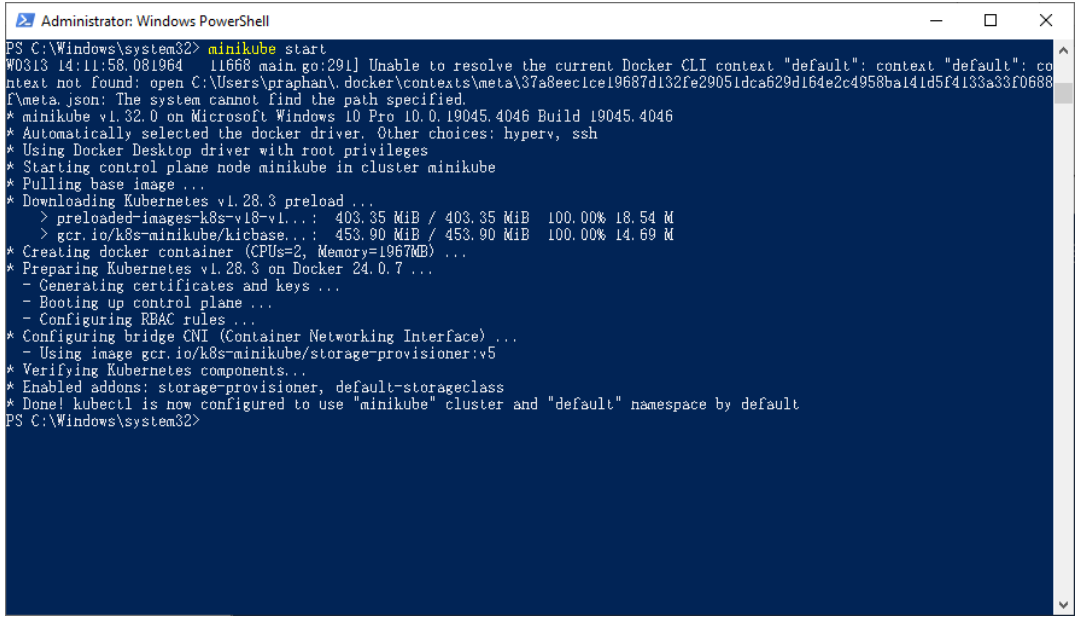
Exploring KubeCTL (cont.)

Once download is complete, cluster preparation will begin.



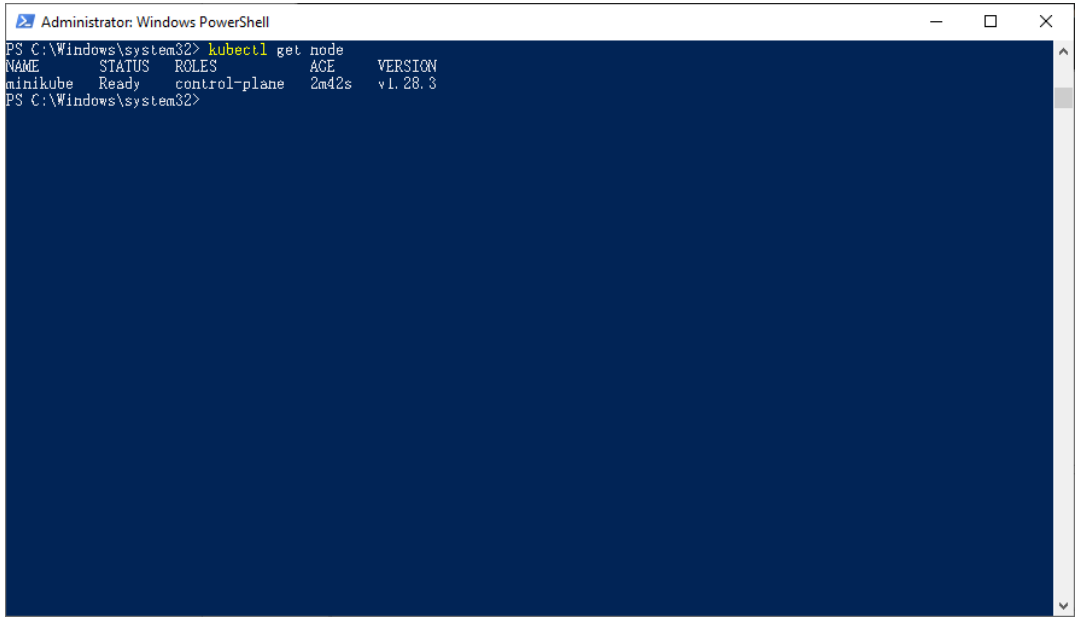
Exploring KubeCTL (cont.)

Once done, following message will appear



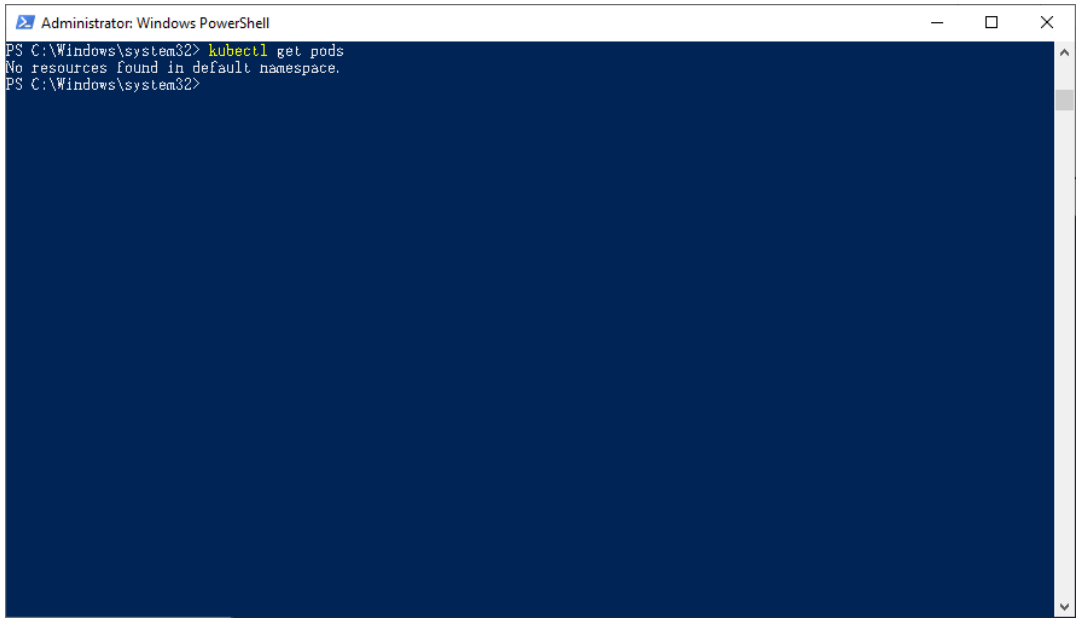
Exploring KubeCTL (cont.)

- Now check the number of nodes in the Kubernetes, with “kubectl get node”



Exploring KubeCTL (cont.)

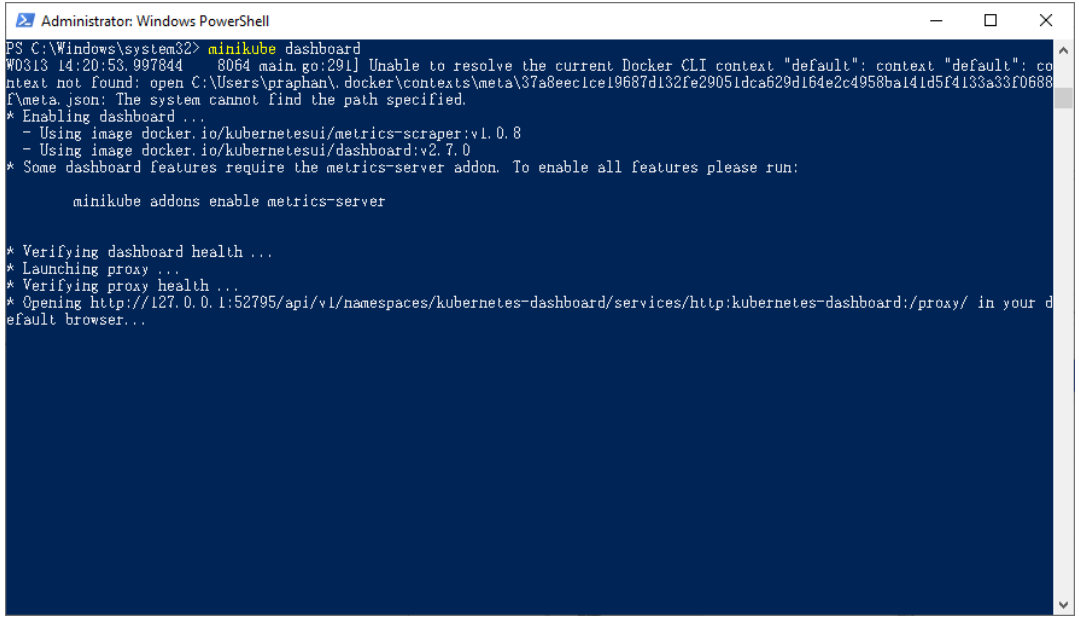
- Check for pods, with “kubectl get pods”



which means there are no active pods in the deployment.

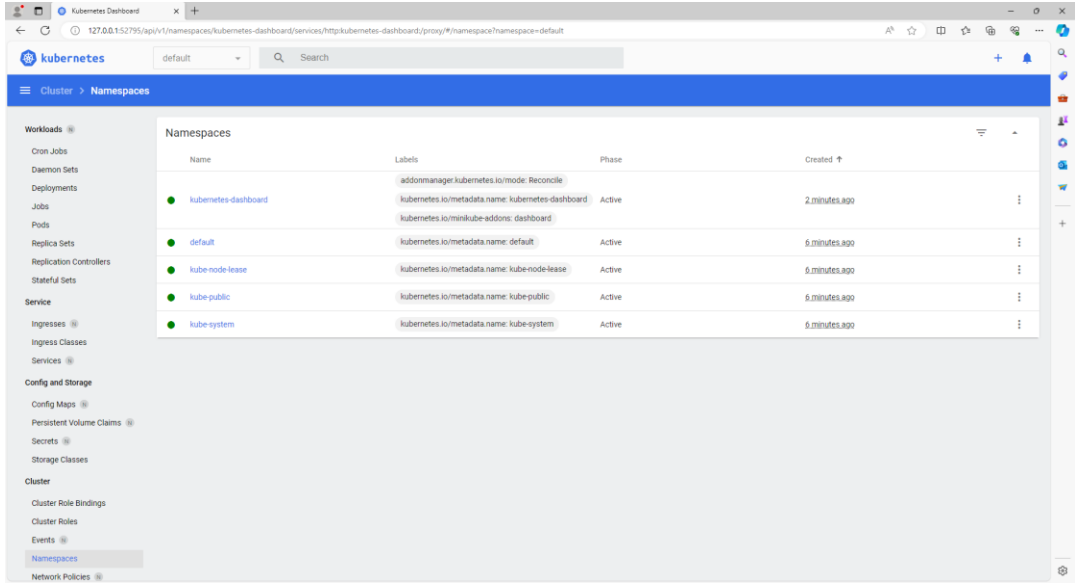
Exploring KubeCTL (cont.)

- Minikube is bundled with a dashboard for further investigation and accurate information about cluster, let's launch this dashboard. "minikube dashboard"



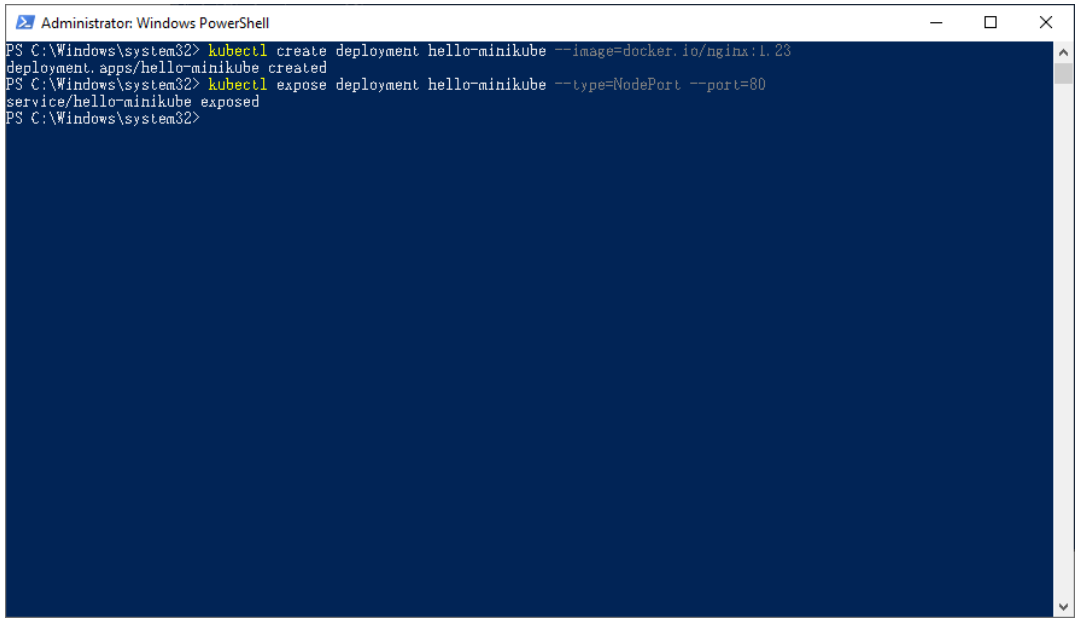
Exploring KubeCTL (cont.)

- A default web browser window will open, showing Kubernetes dashboard with various information and insight into the cluster, click on “Namespaces” on the left pane, all the information about namespaces will be displayed.



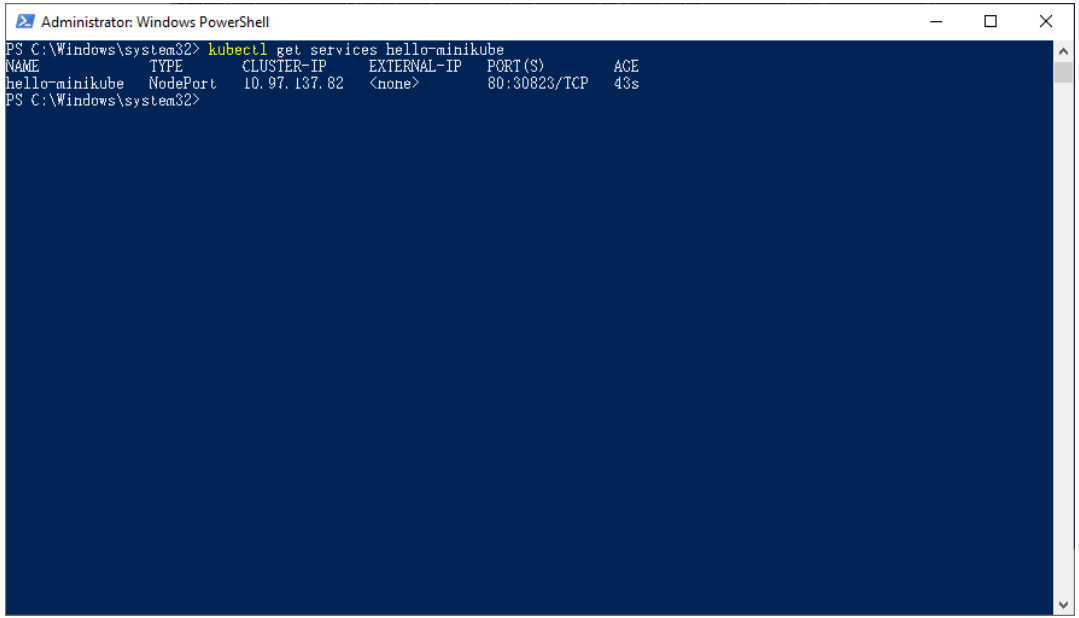
Exploring KubeCTL (cont.)

- Let’s create a sample application, and deploy it on this cluster, and expose this to port 80
  “kubectl create deployment hello-minikube --image=docker.io/nginx:1.23”
  “kubectl expose deployment hello-minikube --type=NodePort --port=80”



Exploring KubeCTL (cont.)

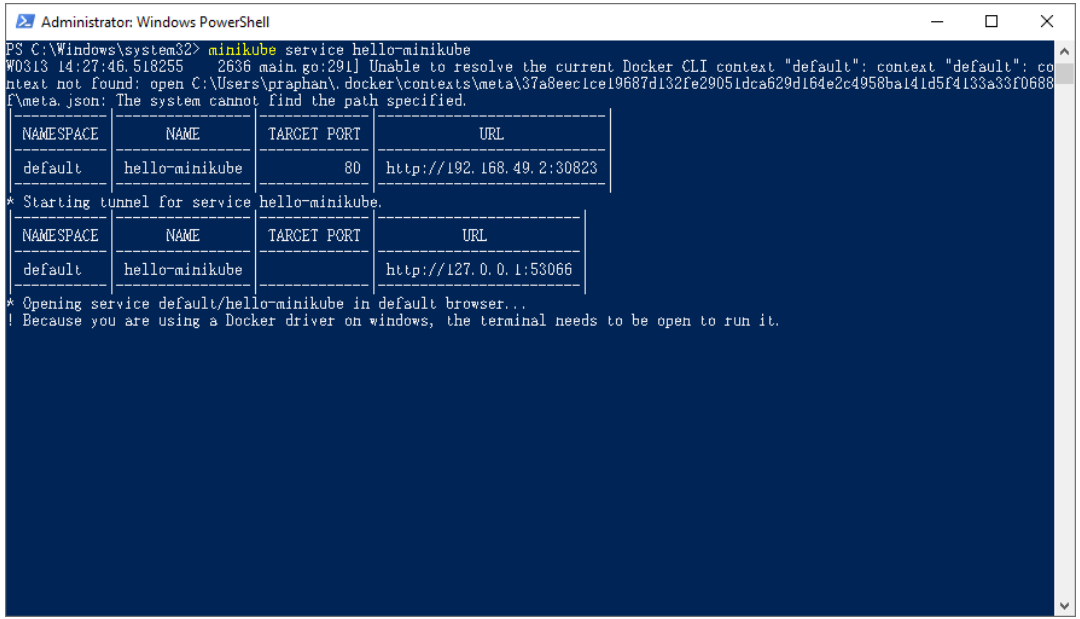
- Let’s check the cluster again for the deployment, we have just created with following command, “kubectl get services hello-minikube”



We can see that Kubernetes has assigned an internal IP to our cluster and port mapping is also there.

Exploring KubeCTL (cont.)

- Let’s launch this service and see the output of this service, run this command on the PowerShell, “minikube service hello-minikube”



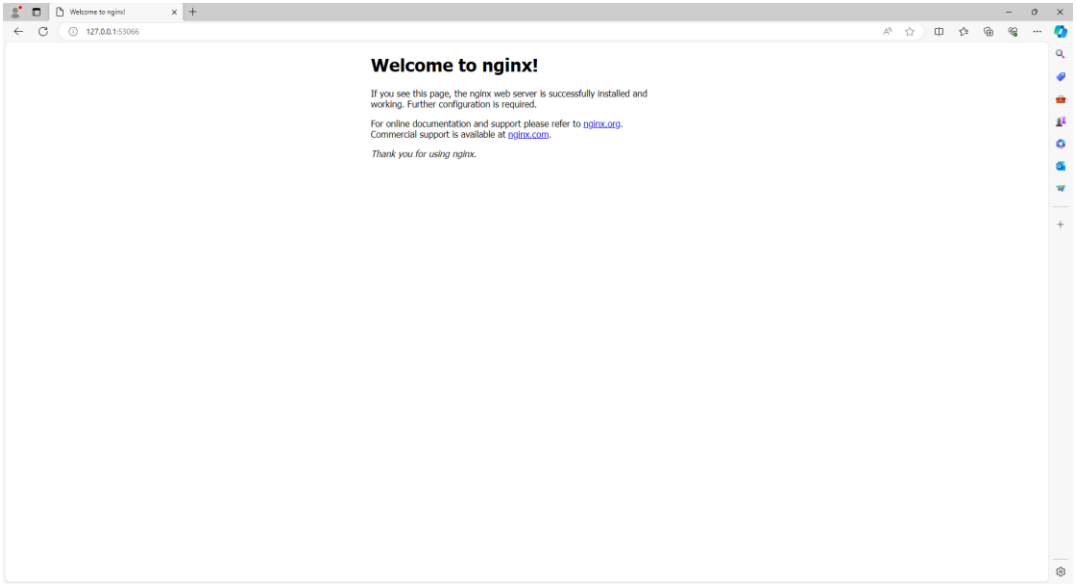
A mapping table is displayed on the console screen showing namespace, name target port and URL of the service.

Exploring KubeCTL (cont.)

- It is to note that, once run this command, we can't use the PowerShell terminal further, we need to open another window or terminate this command.
- To terminate the current ongoing job, press "Ctrl + C"

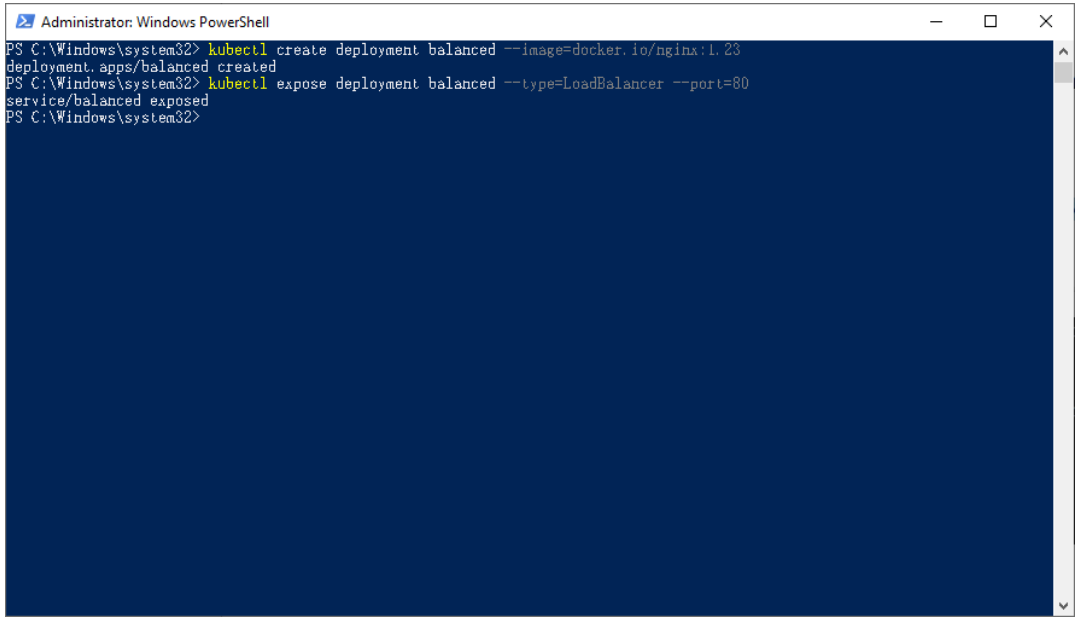
Exploring KubeCTL (cont.)

- Because of previous command a new default web browser window will open, showing home page for nginx server



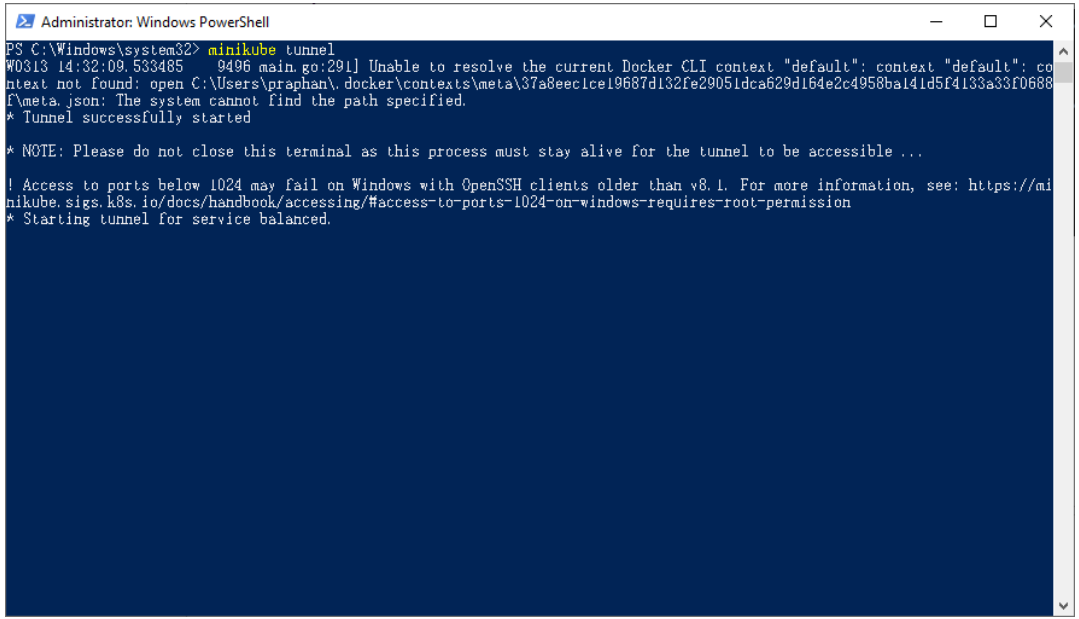
LoadBalancer Deployment Commands

- To start and use LoadBalancer deployment, use the “minikube tunnel” command.
  “kubectl create deployment balanced --image=docker.io/nginx:1.23”
  “kubectl expose deployment balanced --type=LoadBalancer --port=80”



LoadBalancer Deployment Commands (cont.)

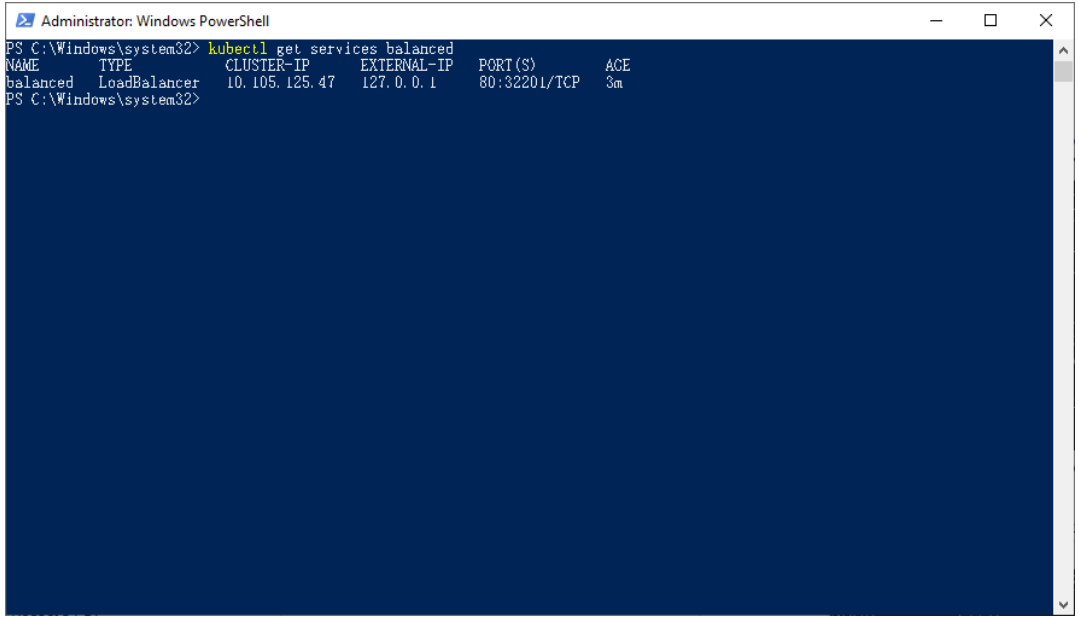
- Now to create a routable IP for balanced deployment, start tunnel command in another window.



This window should remain open, in order to tunnel be available.

LoadBalancer Deployment Commands (cont.)

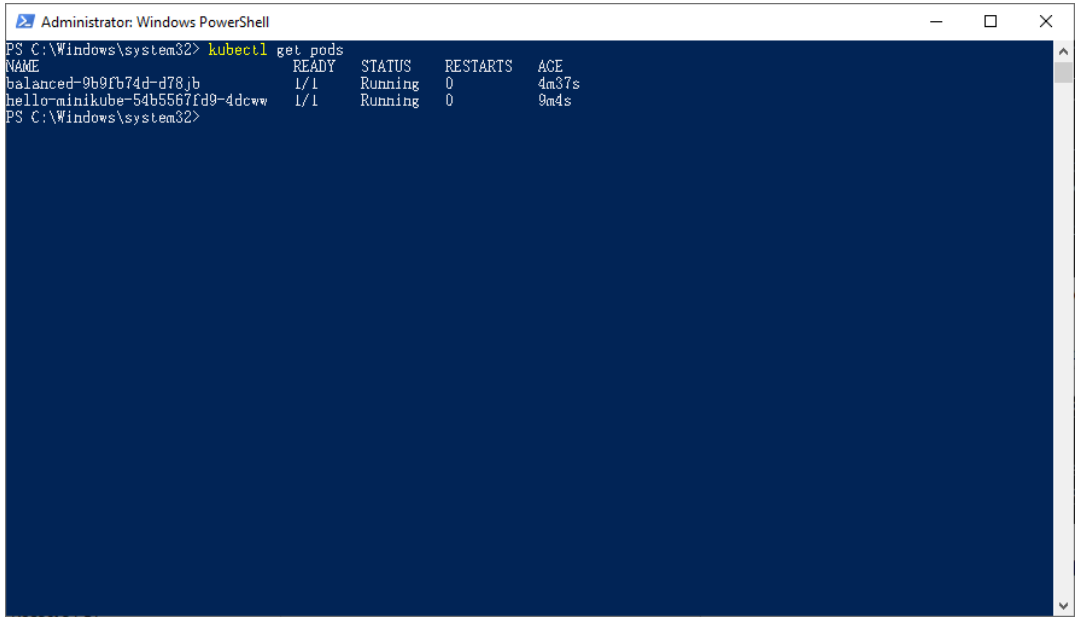
- To know the external IP, run “kubectl get services balanced”



Deployment can be accessed with http://<External IP>:80

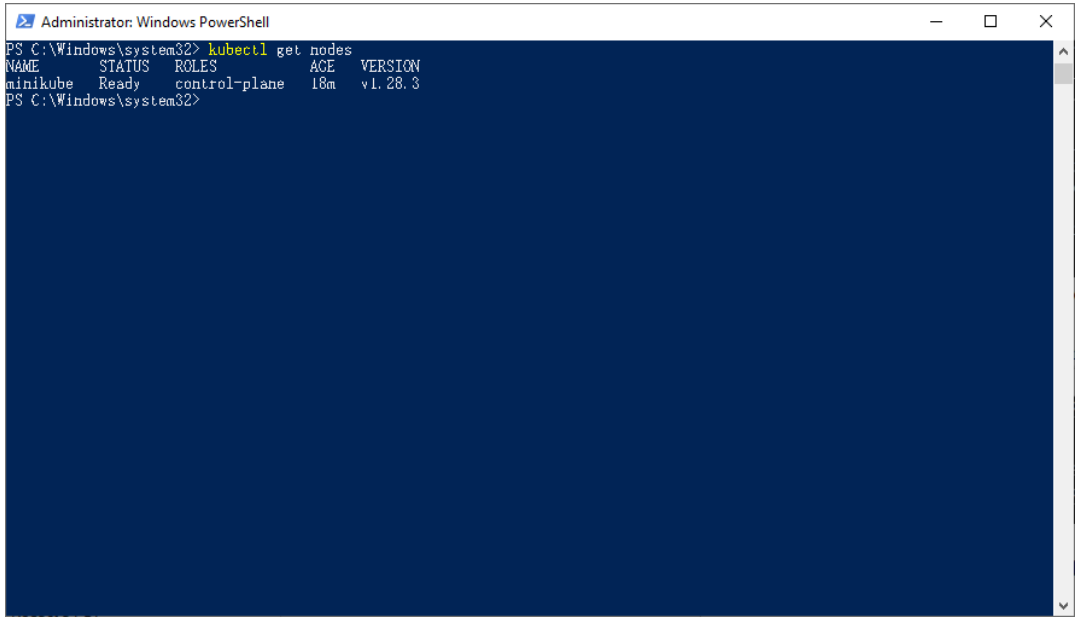
Some Administrative Commands

- To know about the pods in the cluster, run this command “kubectl get pods”.



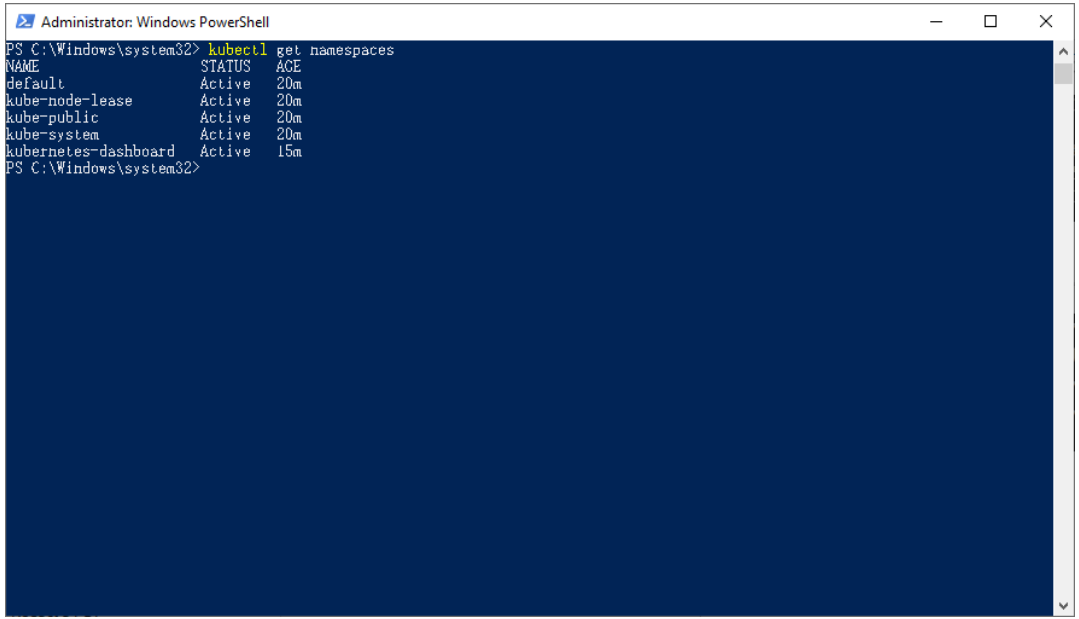
Some Administrative Commands (cont.)

- To know about the nodes in the cluster, run this command "kubectl get nodes".



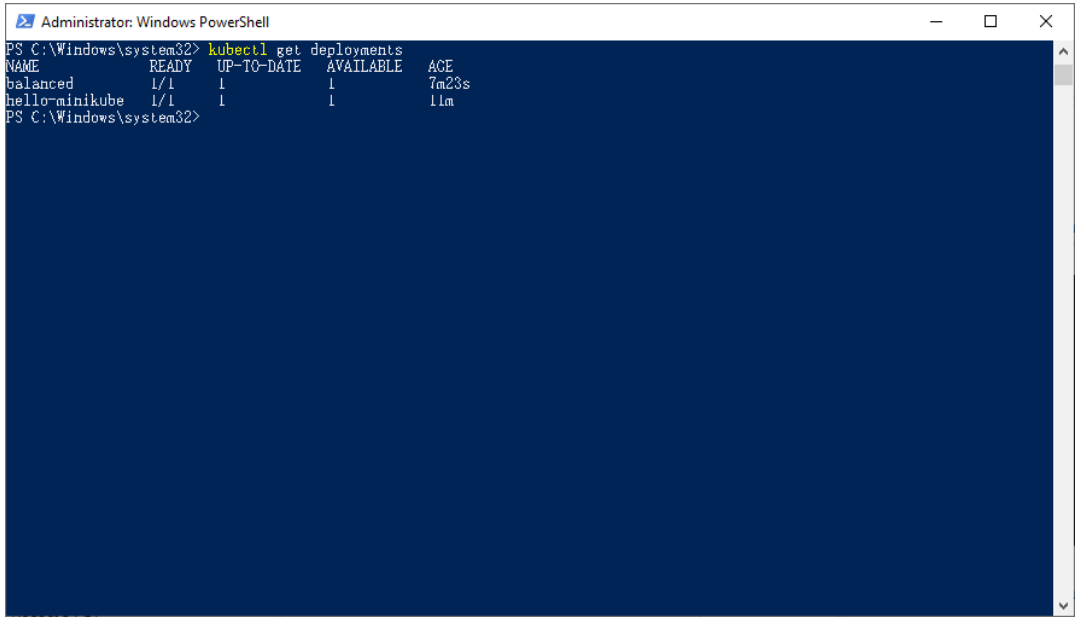
Some Administrative Commands (cont.)

- To know about the namespaces, run this command “kubectl get namespaces”.



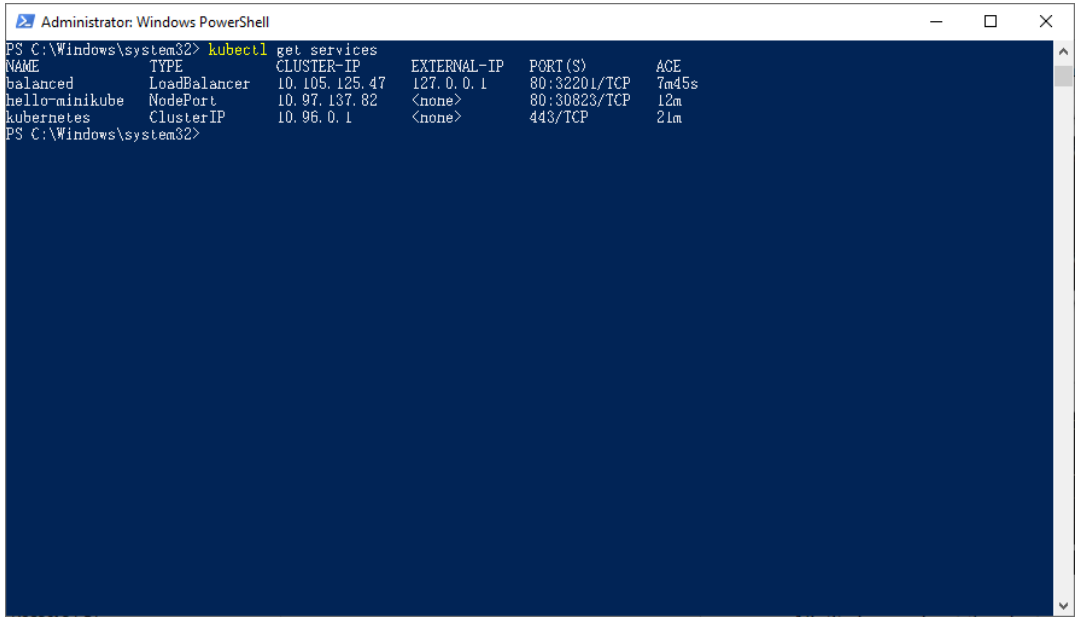
Some Administrative Commands (cont.)

- To know about the deployments in the cluster, run this command "kubectl get deployments".



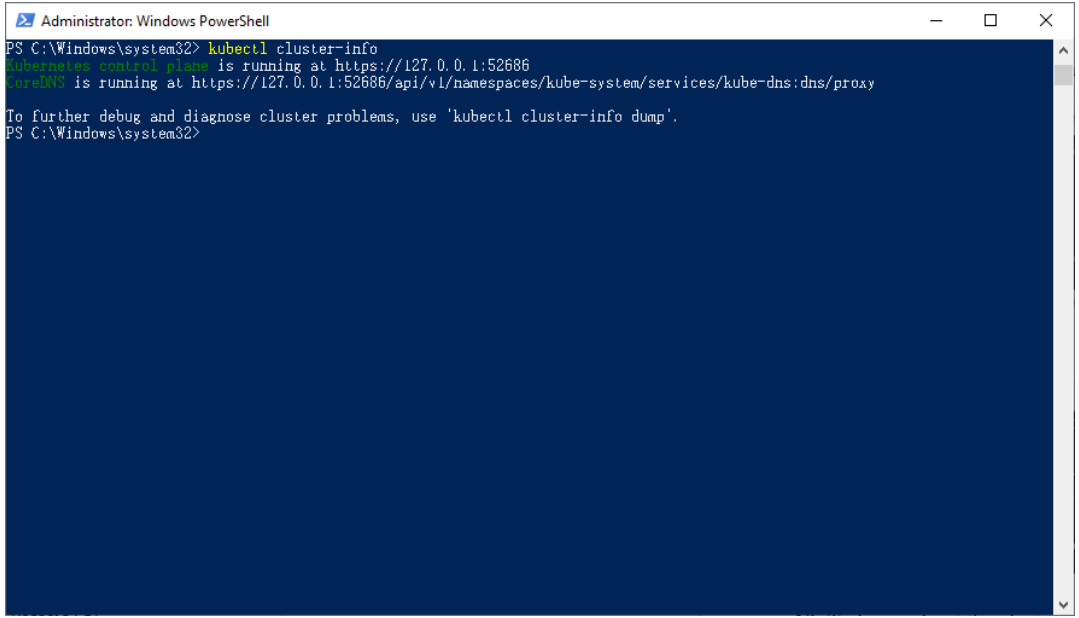
Some Administrative Commands (cont.)

- To know about the services in the cluster, run this command "kubectl get services".



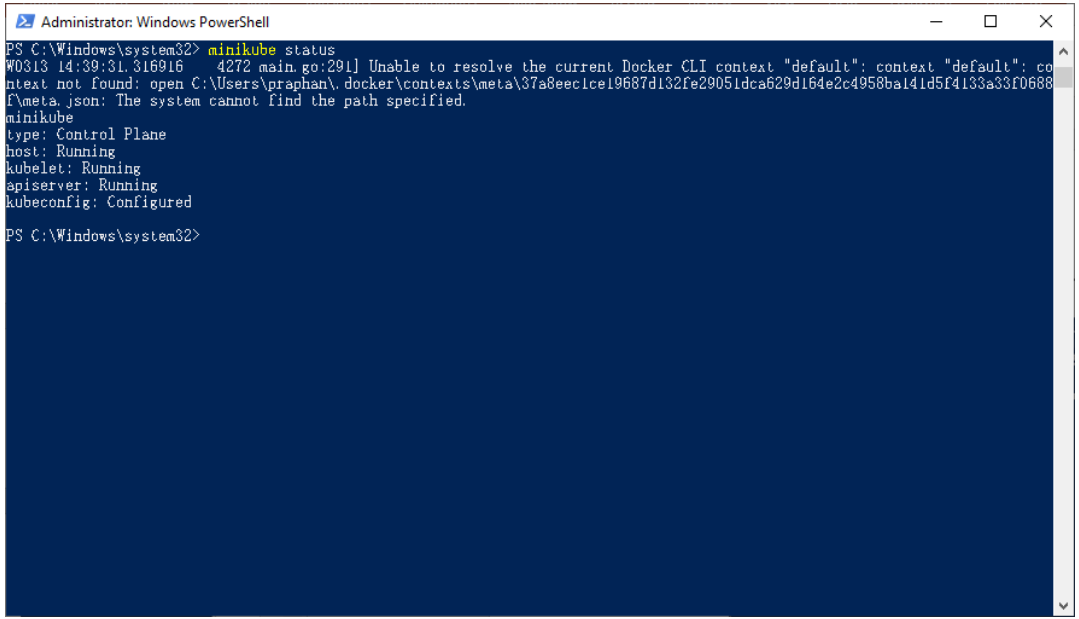
Some Administrative Commands (cont.)

- To know about the cluster, run this command “kubectl cluster-info”.



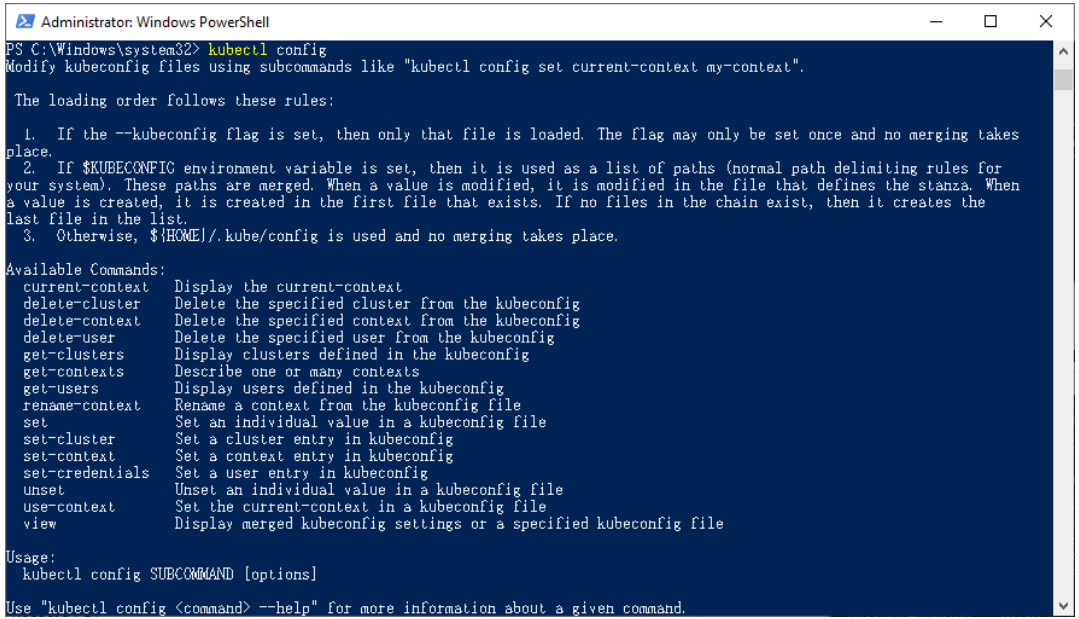
Some Administrative Commands (cont.)

- To know about the status of the cluster, run this command “minikube status”.



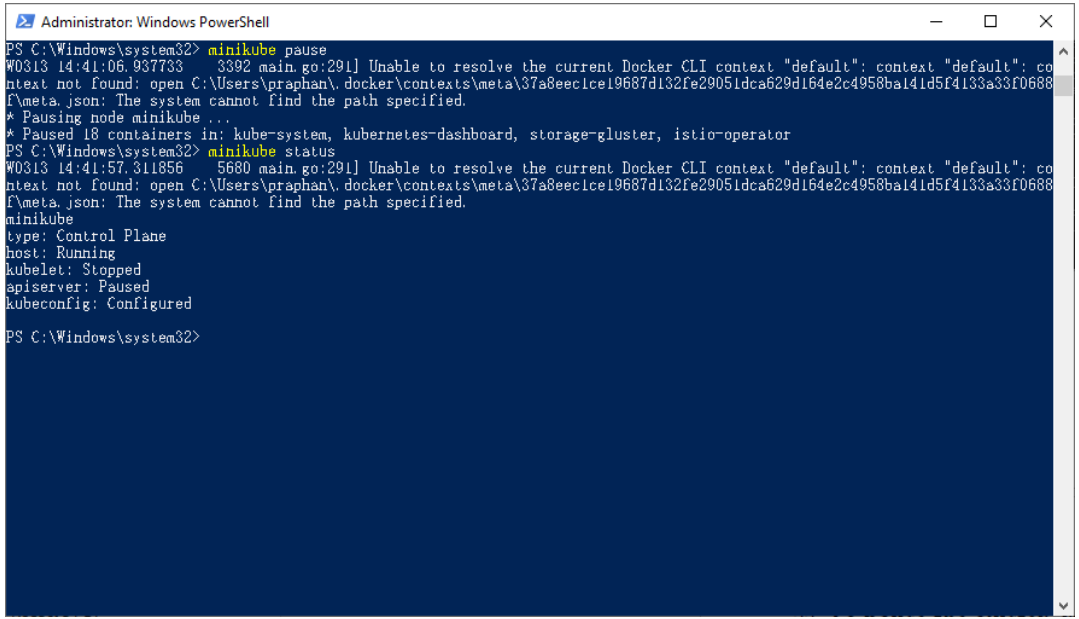
Some Administrative Commands (cont.)

- To learn about configuration detail, run this command "kubectl config"



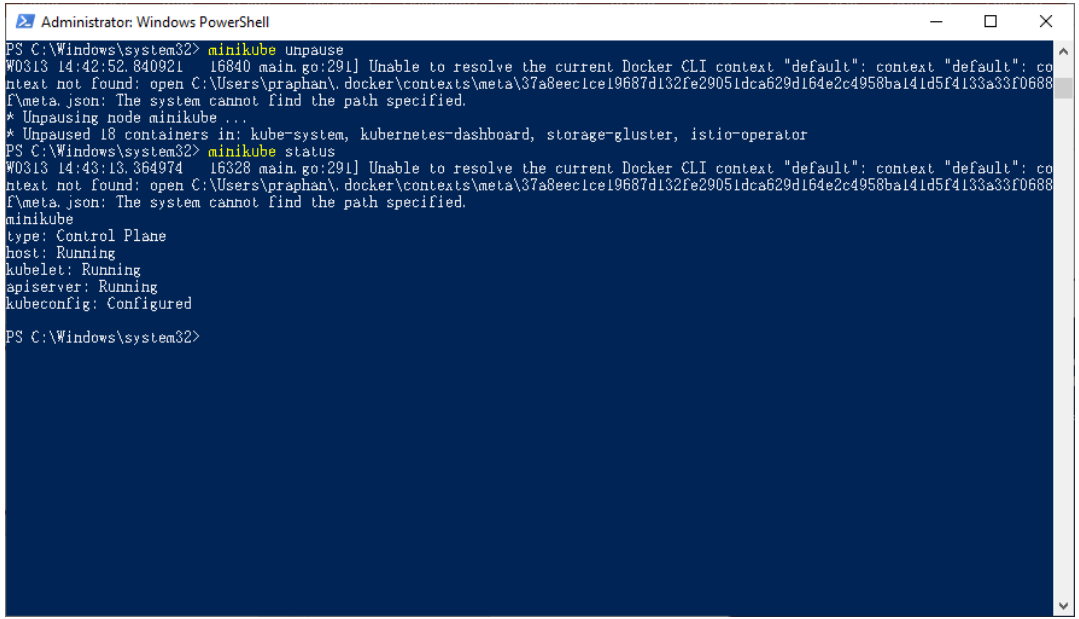
Some Administrative Commands (cont.)

- To pause the cluster, run “minikube pause”, followed by “minikube status”.



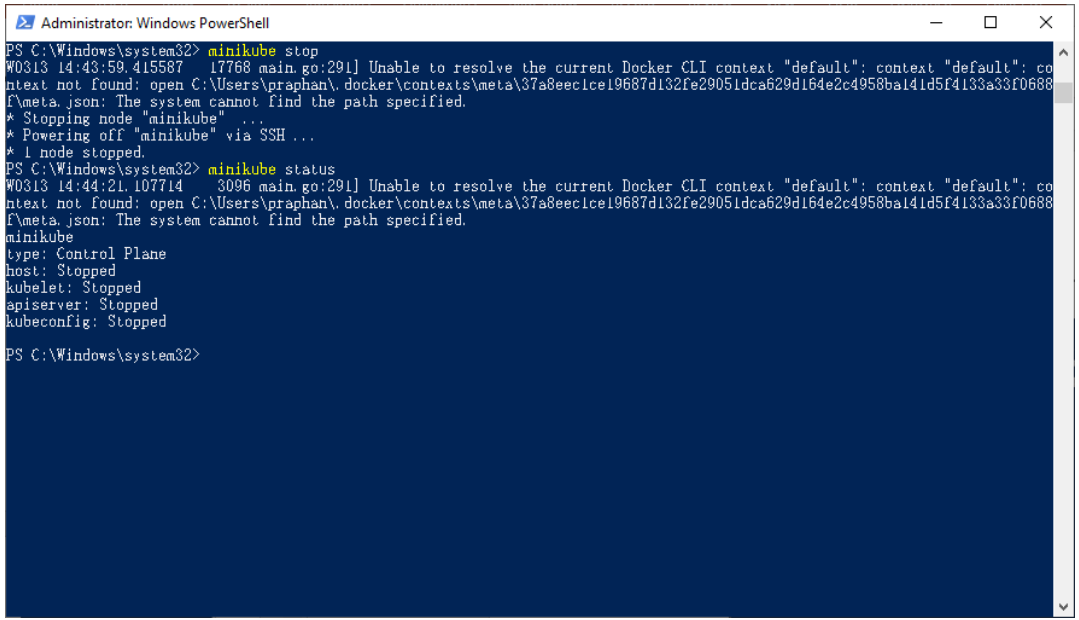
Some Administrative Commands (cont.)

- To resume the cluster, run “minikube unpause”, followed by “minikube status”



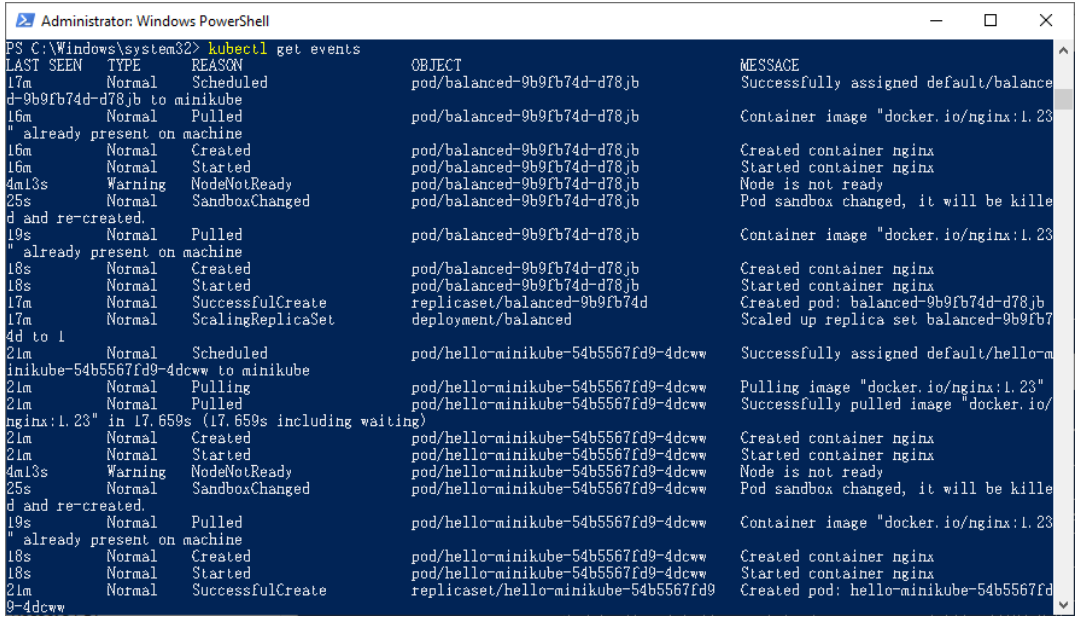
Some Administrative Commands (cont.)

- To stop the cluster, run “minikube stop”, followed by “minikube status”.



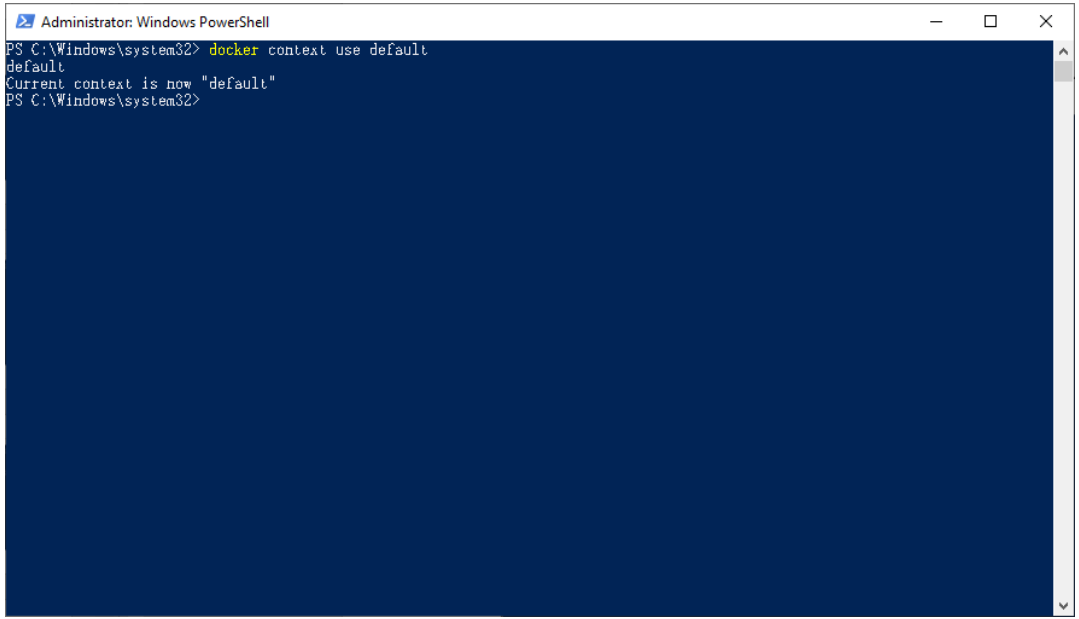
Some Administrative Commands (cont.)

- To list the event log, run this command “kubectl get events”.



Some Administrative Commands (cont.)

- To update the active context, run this command “docker context use default”.



Uninstallation of Minikube

```
# PowerShell elevated privilages
minikube stop
minikube delete

# Delete the .minikube and .kube directories under user
C:\users\{user}\.minikube   (rm $HOME/.minikube)
C:\users\{user}\.kube       (rm $HOME/.kube)

# If one has installed it via Chocolatey
minikube stop
minikube delete
choco uninstall minikube
choco uninstall kubectl
```

Q & A