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ID Number: 101483544 **Date: 14/January/2024**

Lab 2

Run full-stack Ethereum using Docker containers. You are basically using Docker Compose to run the application. (2 points)

Submissions should include a video demonstrating all four functionalities of the app.

A link or the video itself should be added under Lab 2 in the GitHub repo.

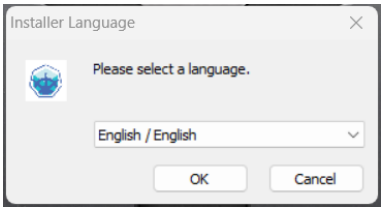
https://www.youtube.com/watch?v=GL9opD7XHOk

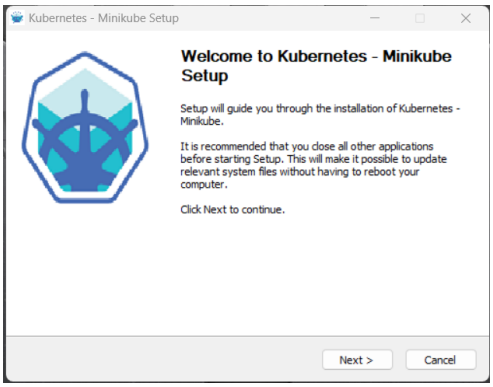
Install Kubernetes (2 points)

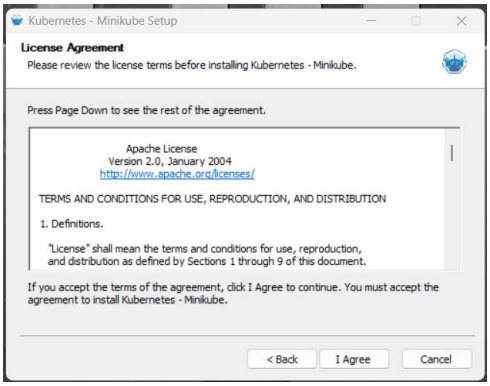
Submission should include screenshots that demonstrate the installation of both Kubectl and Minikube.

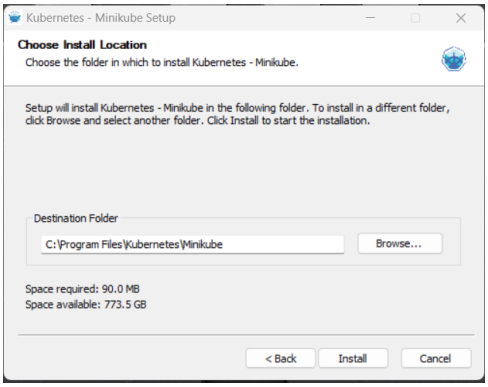
Screenshots should include your environment name.

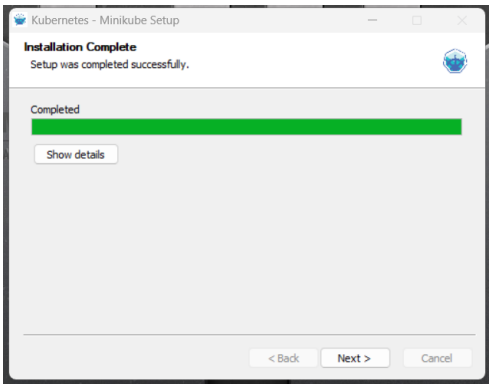
Submit screenshots as a PDF in the GitHub repo under Lab 2 folder.

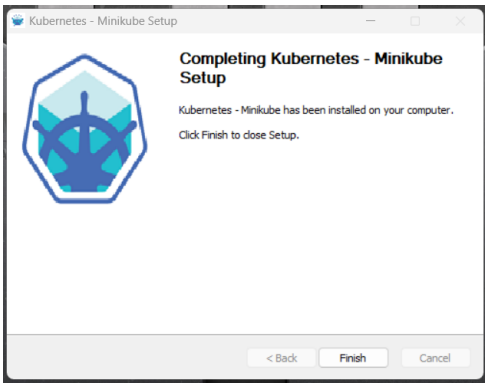


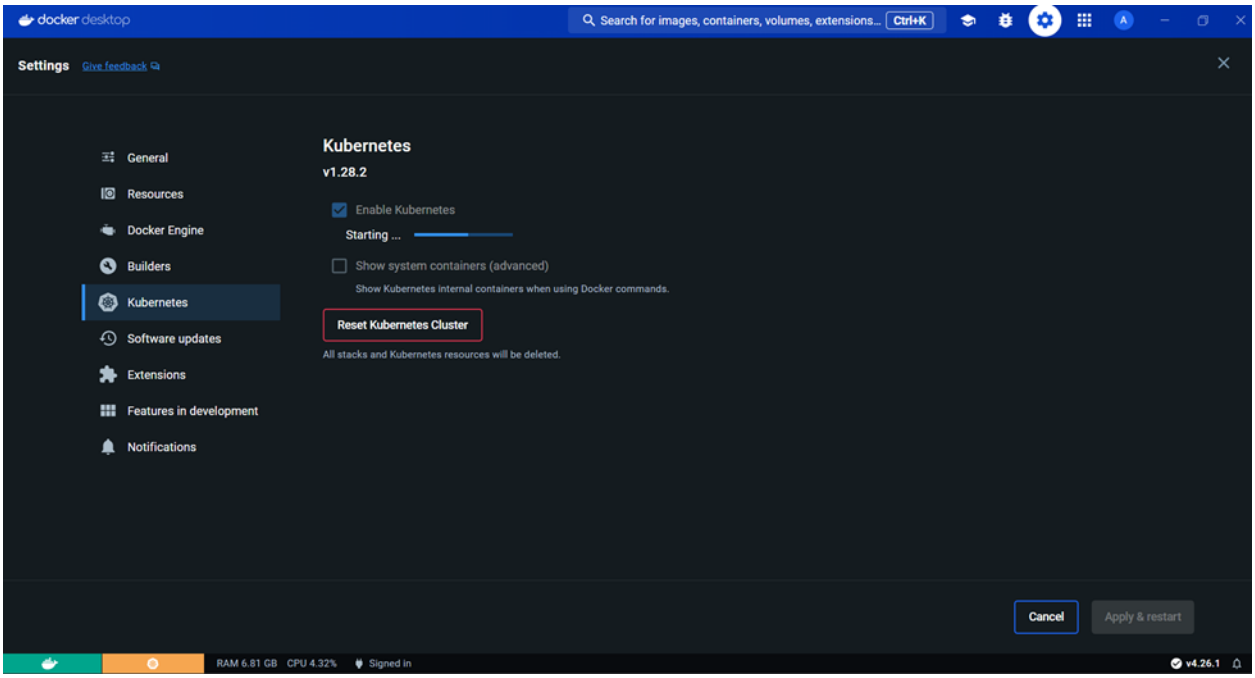

Kubernetes - Minikube Setup
Welcome to Kubernetes - Minikube Setup
Setup will guide you through the installation of Kubernetes - Minikube.
It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.
Click Next to continue.
Next >
Cancel

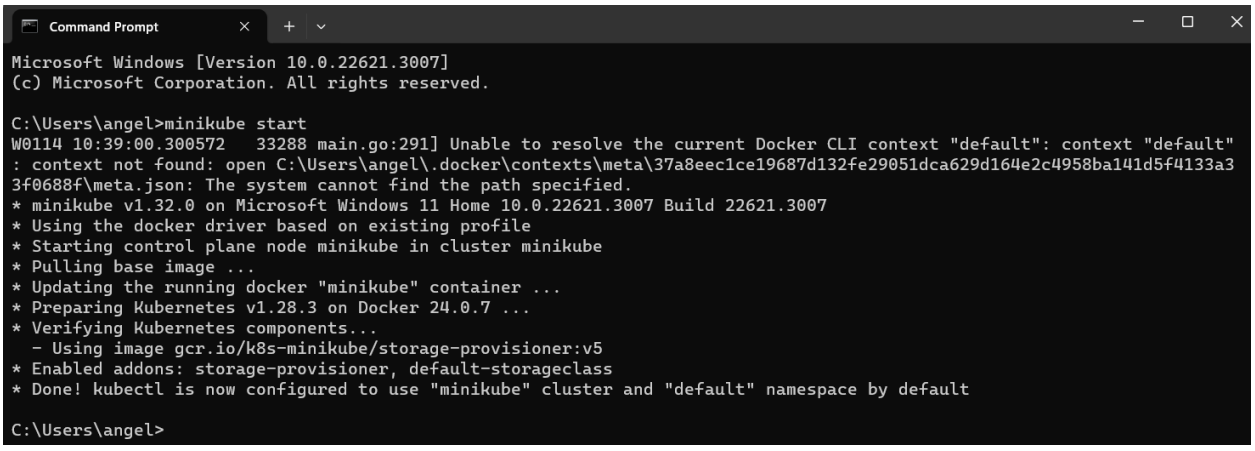

Kubernetes - Minikube Setup
License Agreement
Please review the license terms before installing Kubernetes - Minikube.
Press Page Down to see the rest of the agreement.
Apache License
Version 2.0, January 2004
http://www.apache.org/licenses/
TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION
1. Definitions.
"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.
If you accept the terms of the agreement, click I Agree to continue. You must accept the agreement to install Kubernetes - Minikube.
< Back
I Agree
Cancel

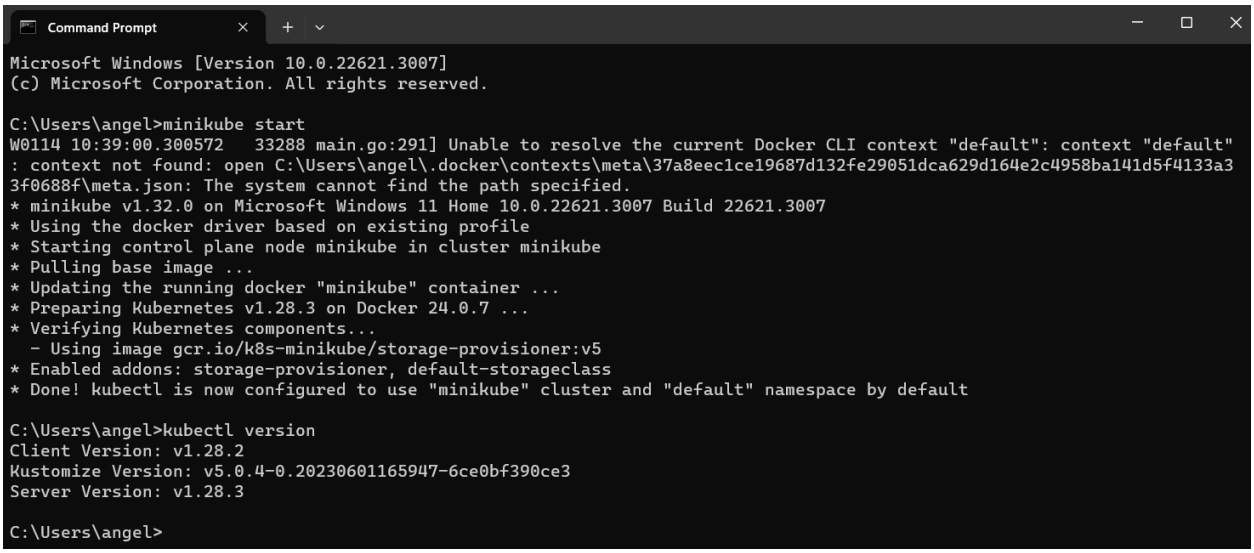

Kubernetes - Minikube Setup
Choose Install Location
Choose the folder in which to install Kubernetes - Minikube.
Setup will install Kubernetes - Minikube in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.
Destination Folder
C:\Program Files\Kubernetes\Minikube
Browse...
Space required: 90.0 MB
Space available: 773.5 GB
< Back
Install
Cancel

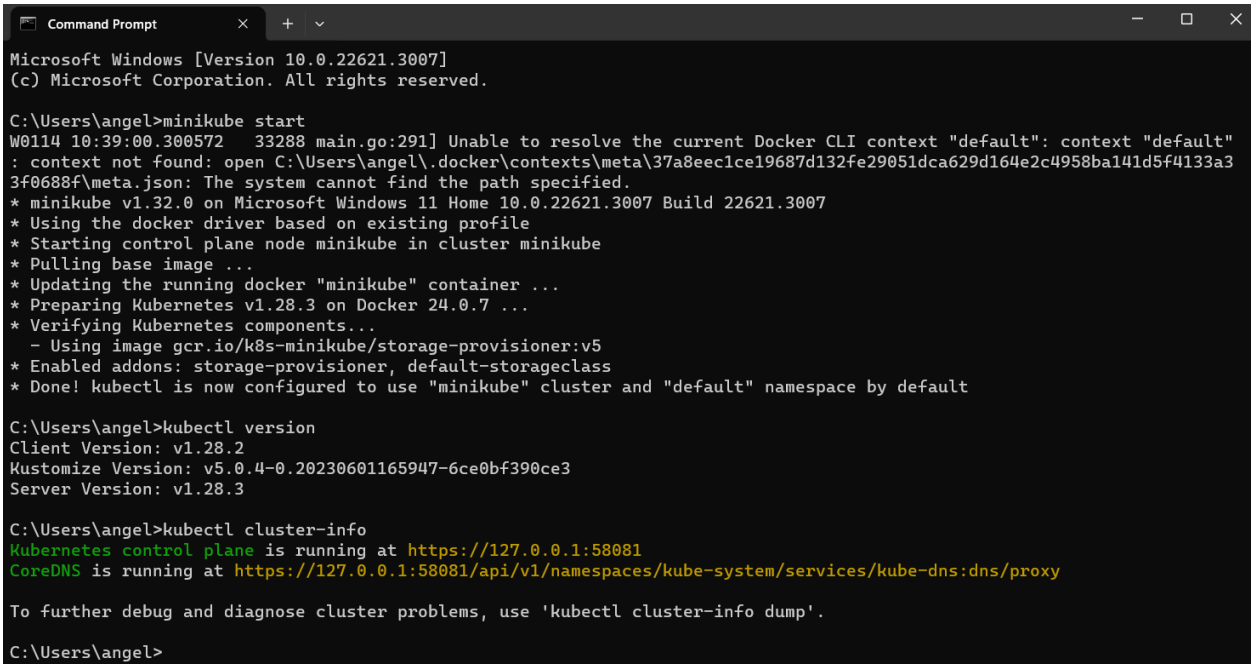

Kubernetes - Minikube Setup
Installation Complete
Setup was completed successfully.
Completed
Show details
< Back
Next >
Cancel

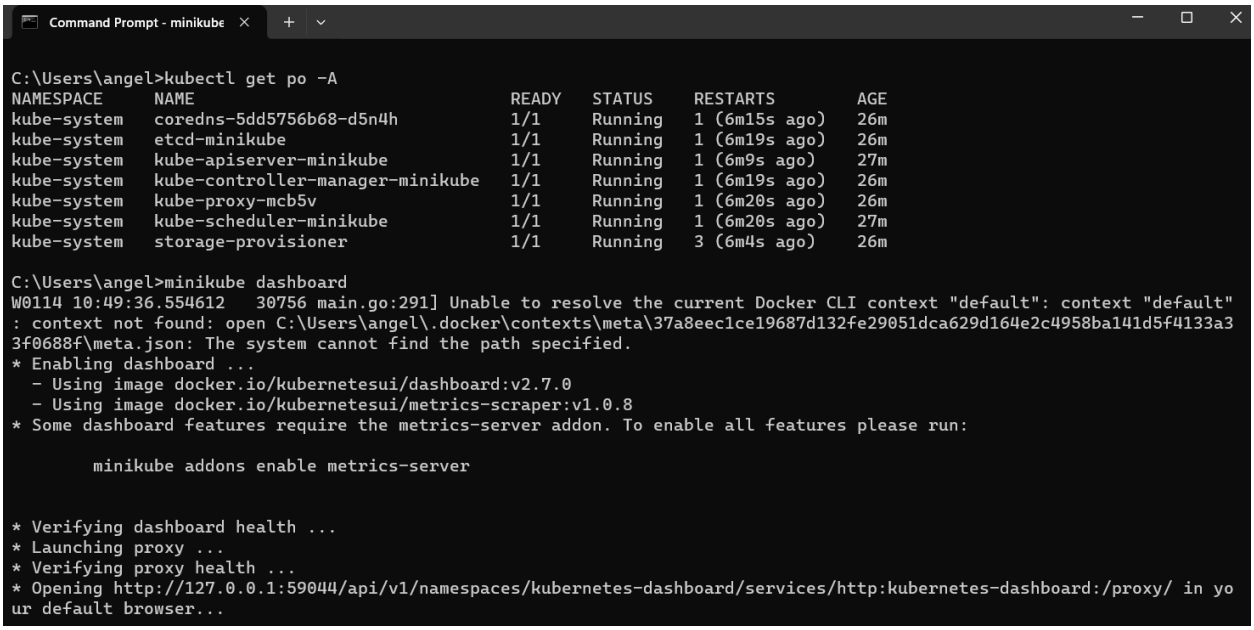

Kubernetes - Minikube Setup
Completing Kubernetes - Minikube Setup
Kubernetes - Minikube has been installed on your computer.
Click Finish to close Setup.
< Back
Finish
Cancel

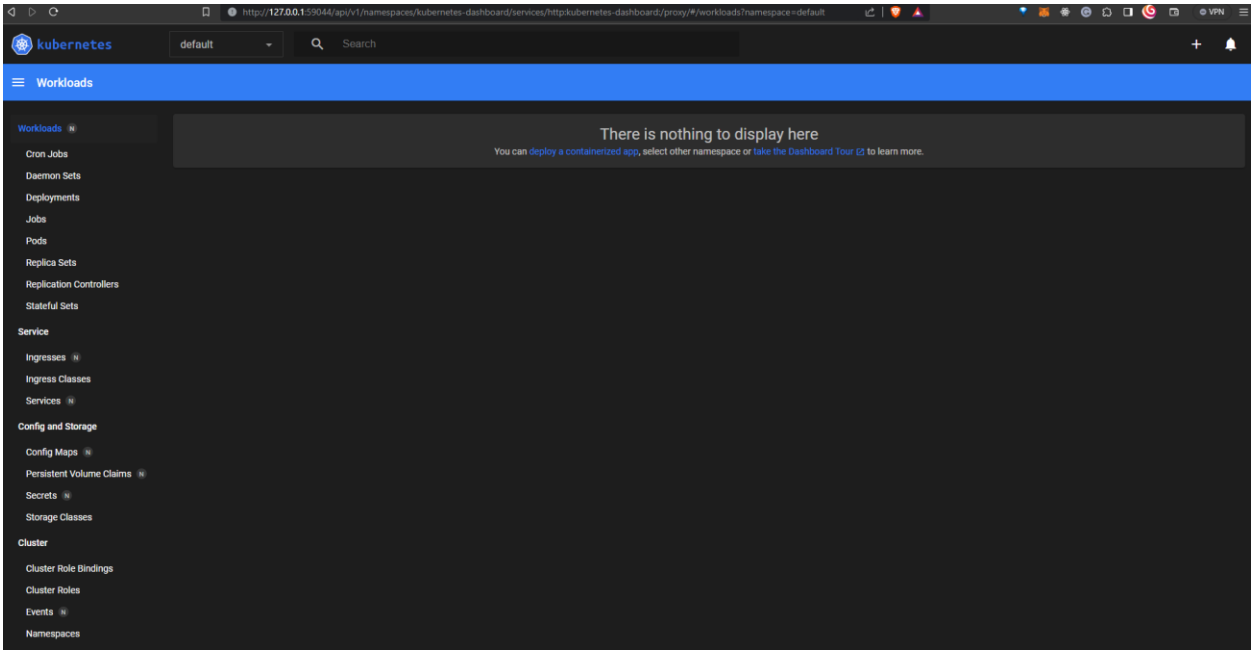

docker desktop
Search for images, containers, volumes, extensions... Ctrl+K
Settings
Give feedback
General
Resources
Docker Engine
Builders
Kubernetes
Software updates
Extensions
Features in development
Notifications
Kubernetes
v1.28.2
Enable Kubernetes
Starting ...
Show system containers (advanced)
Show Kubernetes internal containers when using Docker commands.
Reset Kubernetes Cluster
All stacks and Kubernetes resources will be deleted.
Cancel
Apply & restart
RAM 6.81 GB CPU 4.32%
Signed in
v4.26.1


Command Prompt
Microsoft Windows [Version 10.0.22621.3007]
(c) Microsoft Corporation. All rights reserved.
C:\Users\angel>minikube start
W0114 10:39:00.300572 33288 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\angel\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a3
3f0688f\meta.json: The system cannot find the path specified.
* minikube v1.32.0 on Microsoft Windows 11 Home 10.0.22621.3007 Build 22621.3007
* Using the docker driver based on existing profile
* Starting control plane node minikube in cluster minikube
* Pulling base image ...
* Updating the running docker "minikube" container ...
* Preparing Kubernetes v1.28.3 on Docker 24.0.7 ...
* Verifying Kubernetes components...
- Using image gcr.io/k8s-minikube/storage-provisioner:v5
* Enabled addons: storage-provisioner, default-storageclass
* Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
C:\Users\angel>


Command Prompt
Microsoft Windows [Version 10.0.22621.3007]
(c) Microsoft Corporation. All rights reserved.
C:\Users\angel>minikube start
W0114 10:39:00.300572 33288 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\angel\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a3
3f0688f\meta.json: The system cannot find the path specified.
* minikube v1.32.0 on Microsoft Windows 11 Home 10.0.22621.3007 Build 22621.3007
* Using the docker driver based on existing profile
* Starting control plane node minikube in cluster minikube
* Pulling base image ...
* Updating the running docker "minikube" container ...
* Preparing Kubernetes v1.28.3 on Docker 24.0.7 ...
* Verifying Kubernetes components...
- Using image gcr.io/k8s-minikube/storage-provisioner:v5
* Enabled addons: storage-provisioner, default-storageclass
* Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
C:\Users\angel>kubectl version
Client Version: v1.28.2
Kustomize Version: v5.0.4-0.20230601165947-6ce0bf390ce3
Server Version: v1.28.3
C:\Users\angel>


Command Prompt
Microsoft Windows [Version 10.0.22621.3007]
(c) Microsoft Corporation. All rights reserved.
C:\Users\angel>minikube start
W0114 10:39:00.300572 33288 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\angel\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a3
3f0688f\meta.json: The system cannot find the path specified.
* minikube v1.32.0 on Microsoft Windows 11 Home 10.0.22621.3007 Build 22621.3007
* Using the docker driver based on existing profile
* Starting control plane node minikube in cluster minikube
* Pulling base image ...
* Updating the running docker "minikube" container ...
* Preparing Kubernetes v1.28.3 on Docker 24.0.7 ...
* Verifying Kubernetes components...
- Using image gcr.io/k8s-minikube/storage-provisioner:v5
* Enabled addons: storage-provisioner, default-storageclass
* Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
C:\Users\angel>kubectl version
Client Version: v1.28.2
Kustomize Version: v5.0.4-0.20230601165947-6ce0bf390ce3
Server Version: v1.28.3
C:\Users\angel>kubectl cluster-info
Kubernetes control plane is running at https://127.0.0.1:58081
CoreDNS is running at https://127.0.0.1:58081/api/v1/namespaces/kube-system/services/kube-dns:dns/proxy
To further debug and diagnose cluster problems, use 'kubectl cluster-info dump'.
C:\Users\angel>

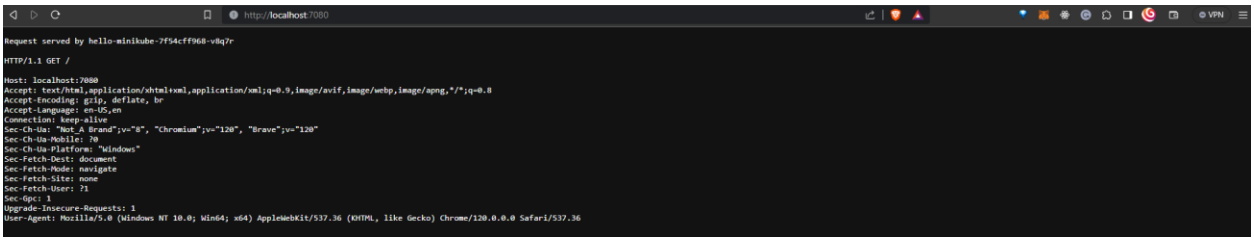

Command Prompt - minikube
C:\Users\angel>kubectl get po -A
NAMESPACE NAME READY STATUS RESTARTS AGE
kube-system coredns-5dd5756b68-d5n4h 1/1 Running 1 (6m15s ago) 26m
kube-system etcd-minikube 1/1 Running 1 (6m19s ago) 26m
kube-system kube-apiserver-minikube 1/1 Running 1 (6m9s ago) 27m
kube-system kube-controller-manager-minikube 1/1 Running 1 (6m19s ago) 26m
kube-system kube-proxy-mcb5v 1/1 Running 1 (6m20s ago) 26m
kube-system kube-scheduler-minikube 1/1 Running 1 (6m20s ago) 27m
kube-system storage-provisioner 1/1 Running 3 (6m4s ago) 26m
C:\Users\angel>minikube dashboard
W0114 10:49:36.554612 30756 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\angel\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a3
3f0688f\meta.json: The system cannot find the path specified.
* Enabling dashboard ...
- Using image docker.io/kubernetesui/dashboard:v2.7.0
- Using image docker.io/kubernetesui/metrics-scraper:v1.0.8
* Some dashboard features require the metrics-server addon. To enable all features please run:
minikube addons enable metrics-server
* Verifying dashboard health ...
* Launching proxy ...
* Verifying proxy health ...
* Opening http://127.0.0.1:59044/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/ in yo
ur default browser...


kubernetes
default
Search
Workloads
Workloads
Cron Jobs
Daemon Sets
Deployments
Jobs
Pods
Replica Sets
Replication Controllers
Stateful Sets
Service
Ingresses
Ingress Classes
Services
Config and Storage
Config Maps
Persistent Volume Claims
Secrets
Storage Classes
Cluster
Cluster Role Bindings
Cluster Roles
Events
Namespaces
There is nothing to display here
You can deploy a containerized app, select other namespace or take the Dashboard Tour to learn more.

```
Command Prompt - minikube

C:\Users\angel>kubectl create deployment hello-minikube --image=kicbase/echo-server:1.0
deployment.apps/hello-minikube created

C:\Users\angel>kubectl expose deployment hello-minikube --type=NodePort --port=8080
service/hello-minikube exposed

C:\Users\angel>kubectl get services hello-minikube
NAME             TYPE       CLUSTER-IP      EXTERNAL-IP   PORT(S)          AGE
hello-minikube   NodePort   10.102.110.15   <none>        8080:30099/TCP   29s

C:\Users\angel>minikube service hello-minikube
W0114 11:14:01.868951   16108 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\angel\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a3
3f0688f\meta.json: The system cannot find the path specified.
|-----------|----------------|-------------|---------------------------|
| NAMESPACE |      NAME      | TARGET PORT |            URL            |
|-----------|----------------|-------------|---------------------------|
| default   | hello-minikube |        8080 | http://192.168.49.2:30099 |
|-----------|----------------|-------------|---------------------------|
* Starting tunnel for service hello-minikube.
|-----------|----------------|-------------|------------------------|
| NAMESPACE |      NAME      | TARGET PORT |          URL           |
|-----------|----------------|-------------|------------------------|
| default   | hello-minikube |             | http://127.0.0.1:59652 |
|-----------|----------------|-------------|------------------------|
* Opening service default/hello-minikube in default browser...
! Because you are using a Docker driver on windows, the terminal needs to be open to run it.
```

```
http://127.0.0.1:59652

Request served by hello-minikube-7f54cff968-v8q7r

HTTP/1.1 GET /

Host: 127.0.0.1:59652
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8
Accept-Encoding: gzip, deflate, br
Accept-Language: es-US,en
Connection: keep-alive
Sec-Ch-Ua: "Not_A Brand";v="8", "Chromium";v="120", "Brave";v="120"
Sec-Ch-Ua-Mobile: ?0
Sec-Ch-Ua-Platform: "Windows"
Sec-Fetch-Dest: document
Sec-Fetch-Mode: navigate
Sec-Fetch-Site: none
Sec-Fetch-User: ?1
Sec-Gpc: 1
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/120.0.0.0 Safari/537.36
```

```
Command Prompt - kubectl

C:\Users\angel>kubectl get services hello-minikube
NAME             TYPE       CLUSTER-IP      EXTERNAL-IP   PORT(S)          AGE
hello-minikube   NodePort   10.102.110.15   <none>        8080:30099/TCP   29s

C:\Users\angel>minikube service hello-minikube
W0114 11:14:01.868951   16108 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\angel\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a3
3f0688f\meta.json: The system cannot find the path specified.
|-----------|----------------|-------------|---------------------------|
| NAMESPACE |      NAME      | TARGET PORT |            URL            |
|-----------|----------------|-------------|---------------------------|
| default   | hello-minikube |        8080 | http://192.168.49.2:30099 |
|-----------|----------------|-------------|---------------------------|
* Starting tunnel for service hello-minikube.
|-----------|----------------|-------------|------------------------|
| NAMESPACE |      NAME      | TARGET PORT |          URL           |
|-----------|----------------|-------------|------------------------|
| default   | hello-minikube |             | http://127.0.0.1:59652 |
|-----------|----------------|-------------|------------------------|
* Opening service default/hello-minikube in default browser...
! Because you are using a Docker driver on windows, the terminal needs to be open to run it.
* Stopping tunnel for service hello-minikube.

C:\Users\angel>kubectl port-forward service/hello-minikube 7080:8080
Forwarding from 127.0.0.1:7080 -> 8080
Forwarding from [::1]:7080 -> 8080
Handling connection for 7080
```

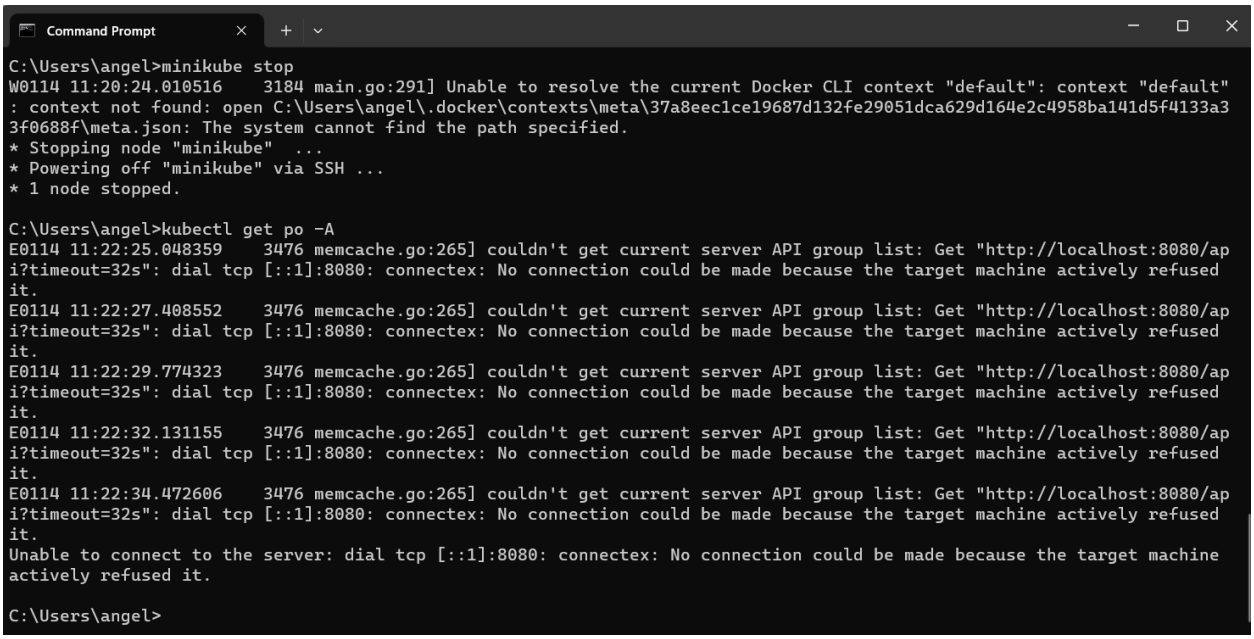


Command Prompt

```
|-----------|----------------|-------------|------------------------|
| NAMESPACE |      NAME      | TARGET PORT |          URL           |
|-----------|----------------|-------------|------------------------|
| default   | hello-minikube |             | http://127.0.0.1:59652 |
|-----------|----------------|-------------|------------------------|
* Opening service default/hello-minikube in default browser...
! Because you are using a Docker driver on windows, the terminal needs to be open to run it.
* Stopping tunnel for service hello-minikube.

C:\Users\angel>kubectl port-forward service/hello-minikube 7080:8080
Forwarding from 127.0.0.1:7080 -> 8080
Forwarding from [::1]:7080 -> 8080
Handling connection for 7080

C:\Users\angel>kubectl get po -A
NAMESPACE              NAME                                         READY   STATUS    RESTARTS      AGE
default                hello-minikube-7f54cff968-v8q7r              1/1     Running   0             7m42s
kube-system            coredns-5dd5756b68-d5n4h                     1/1     Running   1 (40m ago)   60m
kube-system            etcd-minikube                                1/1     Running   1 (40m ago)   61m
kube-system            kube-apiserver-minikube                      1/1     Running   1 (40m ago)   61m
kube-system            kube-controller-manager-minikube             1/1     Running   1 (40m ago)   61m
kube-system            kube-proxy-mcb5v                             1/1     Running   1 (40m ago)   60m
kube-system            kube-scheduler-minikube                      1/1     Running   1 (40m ago)   61m
kube-system            storage-provisioner                          1/1     Running   3 (40m ago)   61m
kubernetes-dashboard   dashboard-metrics-scraper-7fd5cb4ddc-4dx45   1/1     Running   0             29m
kubernetes-dashboard   kubernetes-dashboard-8694d4445c-cbc7w        1/1     Running   0             29m

C:\Users\angel>
```

Command Prompt

```
C:\Users\angel>kubectl port-forward service/hello-minikube 7080:8080
Forwarding from 127.0.0.1:7080 -> 8080
Forwarding from [::1]:7080 -> 8080
Handling connection for 7080

C:\Users\angel>kubectl get po -A
NAMESPACE              NAME                                         READY   STATUS    RESTARTS      AGE
default                hello-minikube-7f54cff968-v8q7r              1/1     Running   0             7m42s
kube-system            coredns-5dd5756b68-d5n4h                     1/1     Running   1 (40m ago)   60m
kube-system            etcd-minikube                                1/1     Running   1 (40m ago)   61m
kube-system            kube-apiserver-minikube                      1/1     Running   1 (40m ago)   61m
kube-system            kube-controller-manager-minikube             1/1     Running   1 (40m ago)   61m
kube-system            kube-proxy-mcb5v                             1/1     Running   1 (40m ago)   60m
kube-system            kube-scheduler-minikube                      1/1     Running   1 (40m ago)   61m
kube-system            storage-provisioner                          1/1     Running   3 (40m ago)   61m
kubernetes-dashboard   dashboard-metrics-scraper-7fd5cb4ddc-4dx45   1/1     Running   0             29m
kubernetes-dashboard   kubernetes-dashboard-8694d4445c-cbc7w        1/1     Running   0             29m

C:\Users\angel>minikube stop
W0114 11:20:24.010516    3184 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\angel\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a3
3f0688f\meta.json: The system cannot find the path specified.
* Stopping node "minikube"  ...
* Powering off "minikube" via SSH ...
* 1 node stopped.

C:\Users\angel>
```



Quiz (1 point)

Understand what Kubernetes doesn't do from here (https://kubernetes.io/docs/concepts/overview/) and explain in your own words. Do not copy and paste from the website.

Kubernetes doesn't do:

- **A Conventional Platform:** Although it shares some characteristics with PaaS, such as deployments, scaling, load balancing, logging, and monitoring, it is not monolithic, and the default solutions are optional and interchangeable.
- **Limiting in Supported Application Types:** It is not restricted to certain types of applications, seeking to support a wide variety, including stateful and stateless applications, as well as those that process data.
- **A Source Code Deployment or Application Compilation Tool:** The processes of integration, delivery, and continuous deployment (CI/CD) are not directly managed by Kubernetes.
- **An Application Layer Service Provider:** It does not natively offer services such as middleware, data processing frameworks, databases, caches, or storage systems, although it allows running these applications or accessing them.
- **A Dictator of Logging, Monitoring, or Alert Solutions:** Although it offers some integrations as proof of concept, it does not impose specific solutions for logging, monitoring, or alerting.
- **An Imposer of a Specific System or Configuration Language:** It offers a declarative API that can be used with any form of declarative specification, without forcing the use of a particular system or language.

- **A Comprehensive System for Maintenance, Administration, or Automatic Error Correction:** It does not provide an integrated system for these tasks.
- **An Orchestration System:** It goes beyond traditional orchestration, functioning through independent and combinable control processes that move the current state towards the desired state without requiring centralized control.

What other Orchestration tools are available other than Kubernetes?

Docker Swarm: It is a native Docker orchestration tool, easier to configure and use than Kubernetes. Although it is not as feature-rich as Kubernetes, it is a good option for those who prefer tighter integration with the Docker ecosystem and easier configuration.

OpenShift: Based on Kubernetes, Red Hat's OpenShift adds additional security and usability features. It is a PaaS solution that integrates development tools, process automation, and container management.

Amazon Elastic Container Service (ECS): It is a managed service of Amazon Web Services (AWS). ECS is a container orchestration platform provided by AWS that manages Docker containers. It provides a serverless architecture where Docker containers run on EC2 instances managed and scaled by ECS. Amazon ECS has built-in security backed by AWS Identity Access Management (IAM).

Nomad: It is used to deploy and manage legacy or containerized application workloads. Nomad can run Docker, non-containerized, microservices, and batch application workloads and is one of the Kubernetes alternatives. It runs as a single binary, requires no external services for storage or orchestration, and can be deployed to an entire system as easily as cloud environments.

Apache Mesos: It is a cluster manager that provides an efficient way to manage resources in a cluster of machines. It is often used in combination with Marathon, which acts as an orchestration layer. Mesos is designed to be scalable to thousands of nodes and is used in very large systems.

References

Fashakin, A. (2024, January 3). *Kubernetes Alternatives 2024: Top 8 Container Orchestration Tools - ServerTribe*. ServerTribe. https://www.servertribe.com/kubernetes-alternatives/