

Lab 6 Report

Course: Cloud_Computing

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GitHub Repo: *yangzheng.github.io — Repository for personal website project using GitHub Pages*

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1. Objectives

Install and run a local single-node Kubernetes cluster using Minikube.

Deploy, explore, expose, scale, and update an application using `kubectl`.

Document the steps with screenshots and explanations.

2. Environment & Prerequisites

Operating System: windows11

Minikube Version: minikube version: v1.37.0

Kubectl Version:

Client Version: v1.34.0

Kustomize Version: v5.7.1

Server Version: v1.34.0

Driver: docker

Hardware: ≥ 2 CPUs, ≥ 2 GB RAM, ≥ 20 GB disk space

3. Lab Steps & Observations

For each section below, include your **commands**, **screenshots**, **observations**, and **notes**.

3.1 Start Minikube Cluster

Commands:

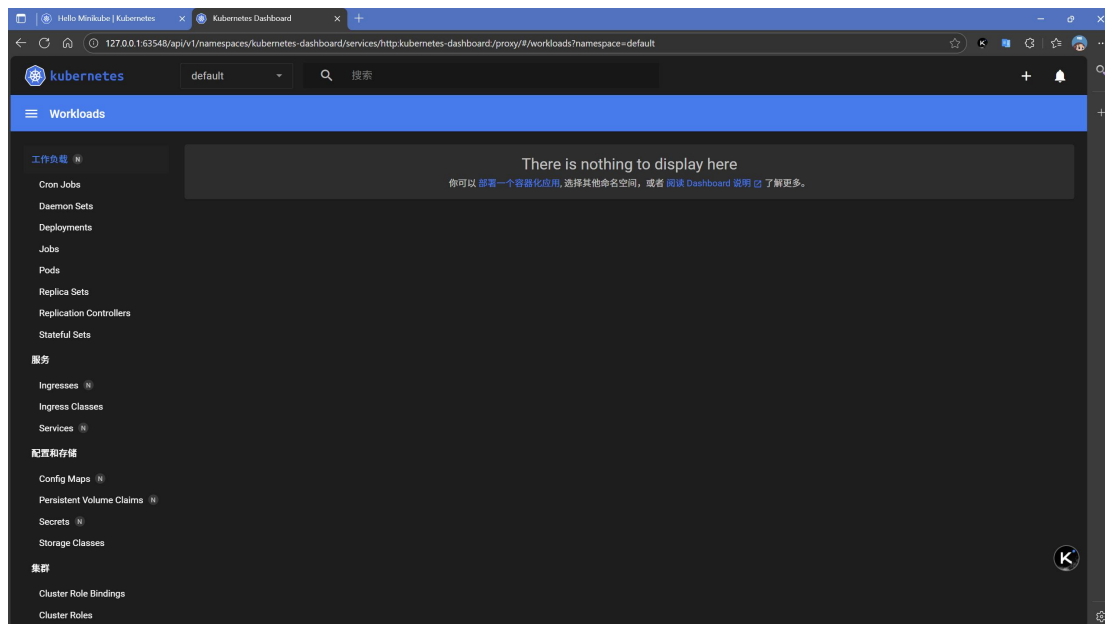
```
minikube start
Minikube dashboard
kubectl version
kubectl get nodes
```

Screenshots:



```
PS C:\Windows\system32> minikube start
* Microsoft Windows 11 Home China 10.0.22631.5624 Build 22631.5624 上的 minikube v1.37.0
* 根据现有的配置文件使用 docker 驱动程序
* 在集群中 "minikube" 启动节点 "minikube" primary control-plane
* 正在拉取基础镜像 v0.0.48 ...
* 正在更新运行中的 docker "minikube" container ...-
! 从 Minikube 的 container 内部连接到 https://registry.cn-hangzhou.aliyuncs.com/google_containers/ 失败
* 要获取新的外部镜像, 可能需要配置代理: https://minikube.sigs.k8s.io/docs/reference/networking/proxy/
* 正在 Docker 28.4.0 中准备 Kubernetes v1.34.0.../
* 正在验证 Kubernetes 组件...
- 正在使用镜像 registry.cn-hangzhou.aliyuncs.com/google_containers/storage-provisioner:v5
* 启用插件: storage-provisioner, default-storageclass

! C:\Program Files\Docker\Docker\resources\bin\kubectl.exe 的版本为 1.32.2, 可能与 Kubernetes 1.34.0 不兼容。
- 想要使用 kubectl v1.34.0 吗? 尝试使用 'minikube kubectl -- get pods -A' 命令
* 完成! kubectl 现在已配置, 默认使用 "minikube" 集群和 "default" 命名空间
```



```
PS C:\Windows\system32> minikube dashboard
* 正在验证 dashboard 运行情况 ...
* 正在启动代理...
* 正在验证 proxy 运行情况 ...
* 正在使用默认浏览器打开 http://127.0.0.1:63973/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboar
d:/proxy/ ...
```

Observations:

Cluster started successfully

Dashboard started successfully

3.2 Deploy Application

Commands:

```
kubectl create deployment hello-minikube
--image=kicbase/echo-server:1.0
kubectl get deployments
kubectl get pods
```

Screenshots:

```
PS C:\Windows\system32> kubectl create deployment hello-node --image=registry.k8s.io/e2e-test-images/agnhost:2.53 -- /ag
nhost netexec --http-port=8080
deployment.apps/hello-node created
PS C:\Windows\system32> kubectl get pods
```

NAME	READY	STATUS	RESTARTS	AGE
hello-node-6c9b5f4b59-jfgbg	1/1	Running	0	60s

Observations:

Deployment created and pod(s) are running.

3.3 Explore Resources

Commands:

```
kubectl get pods
kubectl describe pod <pod-name>
kubectl logs <pod-name>
```

Screenshot:

```
PS C:\Windows\system32> kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
hello-node-6c9b5f4b59-jfgbg        1/1     Running   0           60s

PS C:\Windows\system32> kubectl expose deployment hello-node --type=LoadBalancer --port=8080
service/hello-node exposed

PS C:\Windows\system32> minikube addons list
```

ADDON NAME	PROFILE	STATUS	MAINTAINER
ambassador	minikube	disabled	3rd party (Ambassador)
amd-gpu-device-plugin	minikube	disabled	3rd party (AMD)
auto-pause	minikube	disabled	minikube
cloud-spanner	minikube	disabled	Google
csi-hostpath-driver	minikube	disabled	Kubernetes
dashboard	minikube	enabled <input checked="" type="checkbox"/>	Kubernetes
default-storageclass	minikube	enabled <input checked="" type="checkbox"/>	Kubernetes
efk	minikube	disabled	3rd party (Elastic)
freshpod	minikube	disabled	Google
gcp-auth	minikube	disabled	Google
gvisor	minikube	disabled	minikube
headlamp	minikube	disabled	3rd party (kinvolk.io)
inaccel	minikube	disabled	3rd party (InAccel [info@inaccel.com])
ingress	minikube	disabled	Kubernetes
ingress-dns	minikube	disabled	minikube
inspektor-gadget	minikube	disabled	3rd party (inspektor-gadget.io)
istio	minikube	disabled	3rd party (Istio)
istio-provisioner	minikube	disabled	3rd party (Istio)
kong	minikube	disabled	3rd party (Kong HQ)
kubeflow	minikube	disabled	3rd party
kubetail	minikube	disabled	3rd party (kubetail.com)
kubevirt	minikube	disabled	3rd party (KubeVirt)
logviewer	minikube	disabled	3rd party (unknown)
metallb	minikube	disabled	3rd party (MetalLB)

```
PS C:\Windows\system32> kubectl get deployments
NAME                                READY   UP-TO-DATE   AVAILABLE   AGE
kubernetes-bootcamp                1/1     1             1           45s
```

```
PS C:\Windows\system32> curl http://localhost:8001/version

StatusCode      : 200
StatusDescription : OK
Content         : {
  "major": "1",
  "minor": "34",
  "emulationMajor": "1",
  "emulationMinor": "34",
  "minCompatibilityMajor": "1",
  "minCompatibilityMinor": "33",
  "gitVersion": "v1.34.0",
  "gitCommit": "f28b4c..."
}
RawContent      : HTTP/1.1 200 OK
                  Audit-Id: b36a02ef-309b-4a28-8fc6-a58e9ff43dc1
                  X-Kubernetes-Pf-Flowschema-Uid: 6fd9e072-ec3d-474a-9d98-84708d4ca98c
                  X-Kubernetes-Pf-Prioritylevel-Uid: 21280c6c-95e6-4470-8813-04e6cc...
Forms           : {}
Headers         : {[Audit-Id, b36a02ef-309b-4a28-8fc6-a58e9ff43dc1], [X-Kubernetes-Pf-Flowschema-Uid, 6fd9e072-ec3d-474a-9d98-84708d4ca98c], [X-Kubernetes-Pf-Prioritylevel-Uid, 21280c6c-95e6-4470-8813-04e6cc65b989], [Content-Length, 379]...}
Images         : {}
InputFields     : {}
Links          : {}
ParsedHtml      : mshtml.HTMLDocumentClass
RawContentLength : 379
```

Observations:

Pod details and logs retrieved successfully.

Notes: Add findings or unexpected log behavior.

3.4 Expose Service

Commands:

```
kubectl expose deployment hello-minikube --type=NodePort --port=8080
kubectl get services
minikube service hello-minikube --url
```

Screenshot:

```
PS C:\Windows\system32> kubectl get services
NAME          TYPE          CLUSTER-IP    EXTERNAL-IP    PORT(S)    AGE
kubernetes    ClusterIP     10.96.0.1     <none>         443/TCP    41m

PS C:\Windows\system32> minikube service kubernetes-bootcamp --url
http://127.0.0.1:51311

PS C:\Windows\system32> kubectl expose deployment/kubernetes-bootcamp --type="NodePort" --port 8080
service/kubernetes-bootcamp exposed

PS C:\Windows\system32> kubectl describe deployment
Name:          kubernetes-bootcamp
Namespace:     default
CreationTimestamp: Mon, 03 Nov 2025 19:18:28 +0800
Labels:        app=kubernetes-bootcamp
Annotations:    deployment.kubernetes.io/revision: 1
Selector:      app=kubernetes-bootcamp
Replicas:      1 desired | 1 updated | 1 total | 1 available | 0 unavailable
StrategyType:  RollingUpdate

PS C:\Windows\system32> kubectl get pods -l app=kubernetes-bootcamp
NAME                                READY   STATUS    RESTARTS   AGE
kubernetes-bootcamp-658f6cbd58-z7wsd 1/1     Running   0          23m

PS C:\Windows\system32> $POD_NAME = kubectl get pods -o go-template --template "{{(range .items)}}{{(metadata.name)}}{{(end)}}\n"
>> Write-Host "Name of the Pod: $POD_NAME"
>>
error: error parsing template {{(range .items)}}{{(metadata.name)}}{{(end)}}\n, template: output:1: unterminated character constant
Name of the Pod:
```

Observations:

Service exposed successfully.

Accessible via NodePort URL.

Notes: Record NodePort number or accessibility issues.

3.5 Scale Application

Commands:

```
kubectl scale deployment hello-minikube --replicas=3
kubectl get pods
```

Screenshot:

```
PS C:\Windows\system32> kubectl get rs
NAME                                DESIRED    CURRENT    READY    AGE
kubernetes-bootcamp-658f6cbd58      1          1          1        27m

PS C:\Windows\system32> kubectl scale deployments/kubernetes-bootcamp --replicas=4
deployment.apps/kubernetes-bootcamp scaled

PS C:\Windows\system32> kubectl get deployments
NAME                                READY    UP-TO-DATE    AVAILABLE    AGE
kubernetes-bootcamp                4/4      4             4            32m

PS C:\Windows\system32> kubectl get pods -o wide
NAME                                READY    STATUS    RESTARTS   AGE    IP             NODE             NOMINATED NODE    READ
kubernetes-bootcamp-658f6cbd58-7qfv4 1/1      Running   0          78s    10.244.0.15    minikube         <none>             <non
kubernetes-bootcamp-658f6cbd58-ncwnc 1/1      Running   0          78s    10.244.0.13    minikube         <none>             <non
kubernetes-bootcamp-658f6cbd58-sbwxd 1/1      Running   0          78s    10.244.0.14    minikube         <none>             <non
kubernetes-bootcamp-658f6cbd58-z7wsd 1/1      Running   0          33m    10.244.0.12    minikube         <none>             <non

PS C:\Windows\system32> kubectl scale deployments/kubernetes-bootcamp --replicas=2
deployment.apps/kubernetes-bootcamp scaled
PS C:\Windows\system32> kubectl get deployments
NAME                                READY    UP-TO-DATE    AVAILABLE    AGE
kubernetes-bootcamp                2/2      2             2            35m
PS C:\Windows\system32> kubectl get pods -o wide
NAME                                READY    STATUS    RESTARTS   AGE    IP             NODE             NOMINATED NODE
kubernetes-bootcamp-658f6cbd58-7qfv4 1/1      Running   0          3m25s   10.244.0.15    minikube         <none>
kubernetes-bootcamp-658f6cbd58-ncwnc 1/1      Terminating 0          3m25s   10.244.0.13    minikube         <none>
kubernetes-bootcamp-658f6cbd58-sbwxd 1/1      Terminating 0          3m25s   10.244.0.14    minikube         <none>
kubernetes-bootcamp-658f6cbd58-z7wsd 1/1      Running   0          35m     10.244.0.12    minikube         <none>
```

Observations:

Deployment scaled up to 4 pods and then scaled down to 2 pods.

Notes: Mention any differences in load balancing or startup times.

3.6 Update Application

Commands:

```
kubectl set image deployment/hello-minikube
hello-minikube=kicbase/echo-server:2.0
kubectl rollout status deployment/hello-minikube
kubectl get pods
```

Screenshot:

```
PS C:\Windows\system32> kubectl set image deployments/kubernetes-bootcamp kubernetes-bootcamp=docker.io/jocatalin/kubern
etes-bootcamp:v2
deployment.apps/kubernetes-bootcamp image updated

PS C:\Windows\system32> kubectl rollout status deployments/kubernetes-bootcamp
deployment "kubernetes-bootcamp" successfully rolled out

Events:
  Type     Reason      Age           From          Message
  ---     -
Normal    Scheduled   <invalid>     default-scheduler Successfully assigned default/kubernetes-bootcam
p-677ff875c4-rcmxxm to minikube
Normal    BackOff     4s (x2 over <invalid>) kubelet        Back-off pulling image "gcr.io/google-samples/ku
ernetes-bootcamp:v10"
Warning   Failed      4s (x2 over <invalid>) kubelet        Error: ImagePullBackOff
Normal    Pulling     <invalid> (x2 over <invalid>) kubelet        Pulling image "gcr.io/google-samples/kubernetes-
bootcamp:v10"
Warning   Failed      <invalid> (x2 over <invalid>) kubelet        Failed to pull image "gcr.io/google-samples/kube
ernetes-bootcamp:v10": Error response from daemon: manifest for gcr.io/google-samples/kubernetes-bootcamp:v10 not found:
manifest unknown: Failed to fetch "v10"
Warning   Failed      <invalid> (x2 over <invalid>) kubelet        Error: ErrImagePull

PS C:\Windows\system32> kubectl rollout undo deployments/kubernetes-bootcamp
deployment.apps/kubernetes-bootcamp rolled back
```

Observations:

Deployment updated or rolled back successfully.

Notes: Record whether the update was smooth or required rollback.

4. Summary & Lessons Learned

What went well: *Smooth deployment, quick Minikube startup.*

Challenges: *Driver or network issues.*

Key Takeaways:

Kubernetes resource hierarchy and relationships.

How deployments manage pods and rollouts.

How scaling and updates maintain app availability.