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Department of Computer Science and Engineering

Cloud Computing Assignment – 2b

Kubernetes

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Assignment 2b - KUBERNETES

deliverables:

- Screenshot 1a - Minikube running successfully

```
(base) adityakhot@Adityas-MacBook-Air ~ % minikube start
😊 minikube v1.29.0 on Darwin 13.1 (arm64)
💡 Automatically selected the docker driver
🚀 Using Docker Desktop driver with root privileges
👍 Starting control plane node minikube in cluster minikube
👉 Pulling base image ...
⬇️ Downloading Kubernetes v1.26.1 preload ...
  > preloaded-images-k8s-v18-v1...: 330.51 MiB / 330.51 MiB 100.00% 18.62 M
  > index.docker.io/kicbase/sta...: 368.75 MiB / 368.75 MiB 100.00% 11.77 M
❗ minikube was unable to download gcr.io/k8s-minikube/kicbase:v0.0.37, but successfully downloaded docker.io/kicbase/stable:v0.0.37 as a fallback image
🔥 Creating docker container (CPUs=2, Memory=2200MB) ...
🌐 Preparing Kubernetes v1.26.1 on Docker 20.10.23 ...
  ■ Generating certificates and keys ...
  ■ Booting up control plane ...
  ■ Configuring RBAC rules ...
🔗 Configuring bridge CNI (Container Networking Interface) ...
  ■ Using image gcr.io/k8s-minikube/storage-provisioner:v5
🌐 Verifying Kubernetes components...
🌟 Enabled addons: default-storageclass, storage-provisioner
🎉 Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
(base) adityakhot@Adityas-MacBook-Air ~ %
```

- Screenshot 2a - get nodes, pod and services command.

```
(base) adityakhot@Adityas-MacBook-Air ~ % kubectl get nodes
NAME      STATUS    ROLES      AGE      VERSION
minikube  Ready     control-plane  53s     v1.26.1
(base) adityakhot@Adityas-MacBook-Air ~ % kubectl get pod
No resources found in default namespace.
(base) adityakhot@Adityas-MacBook-Air ~ % kubectl get services
NAME      TYPE      CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
kubernetes  ClusterIP  10.96.0.1   <none>        443/TCP   80s
(base) adityakhot@Adityas-MacBook-Air ~ %
```

- Screenshot 2b- Deployment created.

```
(base) adityakhot@Adityas-MacBook-Air ~ % kubectl create deployment pes2ug20cs414 --image=nginx
deployment.apps/pes2ug20cs414 created
```

- Screenshot 2c- get deployment and pod command .

```
[(base) adityakhot@Adityas-MacBook-Air ~ % kubectl get deployment  
NAME READY UP-TO-DATE AVAILABLE AGE  
pes2ug20cs414 1/1 1 1 59s  
[(base) adityakhot@Adityas-MacBook-Air ~ % kubectl get pod  
NAME READY STATUS RESTARTS AGE  
pes2ug20cs414-76f886b78d-qdh7f 1/1 Running 0 66s  
(base) adityakhot@Adityas-MacBook-Air ~ %
```

- Screenshot 2d- editing ‘-image:nginx.’

```
spec:  
  containers:  
    - image: nginx:1.16  
      imagePullPolicy: Always  
      name: nginx  
      resources: {}  
      terminationMessagePath: /dev/termination-log  
      terminationMessagePolicy: File
```

- Screenshot 2e- showing edited deployment.

```
(base) adityakhot@Adityas-MacBook-Air ~ % kubectl edit deployment pes2ug20cs414  
deployment.apps/pes2ug20cs414 edited
```

- Screenshot 2f- deployment is rolled back.

```
(base) adityakhot@Adityas-MacBook-Air ~ % kubectl rollout undo deployment/pes2ug20cs414  
deployment.apps/pes2ug20cs414 rolled back  
(base) adityakhot@Adityas-MacBook-Air ~ %
```

- Screenshot 2g- showing original nginx image.

```

app: pes2ug20cs414
spec:
  containers:
    - image: nginx
      imagePullPolicy: Always
      name: nginx

```

- Screenshot 3a - Kubectl logs displayed.

```

(base) adityakhot@Adityas-MacBook-Air ~ % kubectl logs pes2ug20cs414-76f886b78d-929bd
/docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to perform configuration
/docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/
/docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-default.sh
10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/conf.d/default.conf
10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/conf.d/default.conf
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2023/02/24 14:27:42 [notice] 1#1: using the "epoll" event method
2023/02/24 14:27:42 [notice] 1#1: nginx/1.23.3
2023/02/24 14:27:42 [notice] 1#1: built by gcc 10.2.1 20210110 (Debian 10.2.1-6)
2023/02/24 14:27:42 [notice] 1#1: OS: Linux 5.15.49-linuxkit
2023/02/24 14:27:42 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2023/02/24 14:27:42 [notice] 1#1: start worker processes
2023/02/24 14:27:42 [notice] 1#1: start worker process 29
2023/02/24 14:27:42 [notice] 1#1: start worker process 30
2023/02/24 14:27:42 [notice] 1#1: start worker process 31
2023/02/24 14:27:42 [notice] 1#1: start worker process 32
(base) adityakhot@Adityas-MacBook-Air ~ %

```

- Screenshot 3b- Kubectl ‘describe pod ‘ command.

Events:				
Type	Reason	Age	From	Message
Normal	Scheduled	3m41s	default-scheduler	Successfully assigned default/pes2ug20cs414-76f886b78d-929bd to minikube
Normal	Pulling	3m41s	kubelet	Pulling image "nginx"
Normal	Pulled	3m38s	kubelet	Successfully pulled image "nginx" in 2.162094501s (2.16210596s including waiting)
Normal	Created	3m38s	kubelet	Created container nginx
Normal	Started	3m38s	kubelet	Started container nginx

- Screenshot 3c - Create mongo deployment.

```

(base) adityakhot@Adityas-MacBook-Air ~ % kubectl exec -it pes2ug20cs414-76f886b78d-929bd -- bin/bash
root@pes2ug20cs414-76f886b78d-929bd:/# ls
bin boot dev docker-entrypoint.d docker-entrypoint.sh etc home lib media mnt opt proc root run sbin srv sys tmp usr v
root@pes2ug20cs414-76f886b78d-929bd:/# exit
exit

```

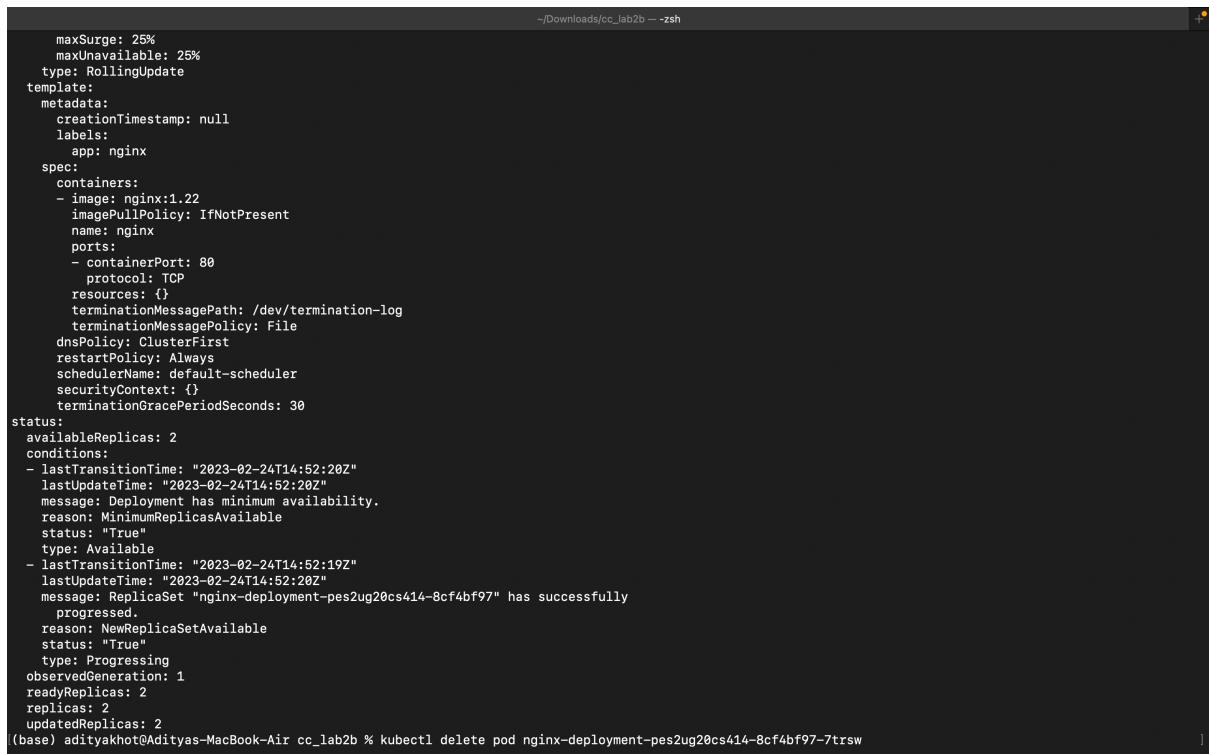
- Screenshot 3d - Delete both requirements.

```
(base) adityakhot@Adityas-MacBook-Air ~ % kubectl delete deployment pes2ug20cs414
deployment.apps "pes2ug20cs414" deleted
(base) adityakhot@Adityas-MacBook-Air ~ % kubectl delete deployment pes2ug20cs414-mongo
deployment.apps "pes2ug20cs414-mongo" deleted
(base) adityakhot@Adityas-MacBook-Air ~ %
```

- Screenshot 4a - Kubectl apply command on yaml file.

```
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl apply -f nginx-deployment.yaml
deployment.apps/nginx-deployment-pes1ug20csxxx created
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl apply -f nginx-deployment.yaml
deployment.apps/nginx-deployment-pes1ug20cs414 created
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl apply -f nginx-deployment.yaml
deployment.apps/nginx-deployment-pes2ug20cs414 created
```

- Screenshot 4b- Kubectl get on yaml file



```
~/Downloads/cc_lab2b --zsh
maxSurge: 25%
maxUnavailable: 25%
type: RollingUpdate
template:
  metadata:
    creationTimestamp: null
  labels:
    app: nginx
spec:
  containers:
  - image: nginx:1.22
    imagePullPolicy: IfNotPresent
    name: nginx
  ports:
  - containerPort: 80
    protocol: TCP
  resources: {}
  terminationMessagePath: /dev/termination-log
  terminationMessagePolicy: File
  dnsPolicy: ClusterFirst
  restartPolicy: Always
  schedulerName: default-scheduler
  securityContext: {}
  terminationGracePeriodSeconds: 30
status:
  availableReplicas: 2
  conditions:
  - lastTransitionTime: "2023-02-24T14:52:02Z"
    lastUpdateTime: "2023-02-24T14:52:02Z"
    message: Deployment has minimum availability.
    reason: MinimumReplicasAvailable
    status: "True"
    type: Available
  - lastTransitionTime: "2023-02-24T14:52:19Z"
    lastUpdateTime: "2023-02-24T14:52:02Z"
    message: ReplicaSet "nginx-deployment-pes2ug20cs414-8cf4bf97" has successfully
      progressed.
    reason: NewReplicaSetAvailable
    status: "True"
    type: Progressing
  observedGeneration: 1
  readyReplicas: 2
  replicas: 2
  updatedReplicas: 2
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl delete pod nginx-deployment-pes2ug20cs414-8cf4bf97-7trsw
```

```

~/Downloads/cc_lab2b --zsh
nginx-deployment-pes2ug20cs414-8cf4bf97  2      2      2      58s
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl get deployment nginx-deployment-pes2ug20cs414 -o yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  annotations:
    deployment.kubernetes.io/revision: "1"
    kubectl.kubernetes.io/last-applied-configuration: |
      {"apiVersion": "apps/v1", "kind": "Deployment", "metadata": {"annotations": {}, "labels": {"app": "nginx"}, "name": "nginx-deployment-pes2ug20cs414", "namespace": "d
      efault"}, "spec": {"replicas": 2, "selector": {"matchLabels": {"app": "nginx"}}, "template": {"metadata": {"labels": {"app": "nginx"}}, "spec": {"containers": [{"image": "nginx:1.22", "name": "nginx", "ports": [{"containerPort": 80}]}]}}}
    creationTimestamp: "2023-02-24T14:52:19Z"
  generation: 1
  labels:
    app: nginx
  name: nginx-deployment-pes2ug20cs414
  namespace: default
  resourceVersion: "2355"
  uid: 2a5e2394-461e-46c8-b5c5-5ab08f82e82e
spec:
  progressDeadlineSeconds: 600
  replicas: 2
  revisionHistoryLimit: 10
  selector:
    matchLabels:
      app: nginx
  strategy:
    rollingUpdate:
      maxSurge: 25%
      maxUnavailable: 25%
      type: RollingUpdate
  template:
    metadata:
      creationTimestamp: null
      labels:
        app: nginx
    spec:
      containers:
        - image: nginx:1.22
          imagePullPolicy: IfNotPresent
          name: nginx
          ports:
            - containerPort: 80
              protocol: TCP
          resources: {}

```

- Screenshot 5a - Deleted pod:-

```

(base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl delete pod nginx-deployment-pes2ug20cs414-8cf4bf97-7trsww
pod "nginx-deployment-pes2ug20cs414-8cf4bf97-7trsww" deleted
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl get pod
NAME                               READY   STATUS    RESTARTS   AGE
nginx-deployment-pes1ug20cs414-8cf4bf97-7752d  1/1     Running   0          6m16s
nginx-deployment-pes1ug20cs414-8cf4bf97-xxskf  1/1     Running   0          6m16s
nginx-deployment-pes1ug20csxxx-8cf4bf97-bpzlv  1/1     Running   0          6m37s
nginx-deployment-pes1ug20csxxx-8cf4bf97-g9v25  1/1     Running   0          6m37s
nginx-deployment-pes2ug20cs414-8cf4bf97-jqk2d  1/1     Running   0          31s
nginx-deployment-pes2ug20cs414-8cf4bf97-k2s9f  1/1     Running   0          5m35s
(base) adityakhot@Adityas-MacBook-Air cc_lab2b %

```

- Screenshot 6a- Kubectl apply and get command.

```
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl apply -f nginx-service.yaml
service/nginx-service-pes2ug20cs414 created
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl get services
NAME           TYPE      CLUSTER-IP   EXTERNAL-IP  PORT(S)    AGE
kubernetes     ClusterIP  10.96.0.1   <none>       443/TCP   45m
nginx-service-pes2ug20cs414  ClusterIP  10.103.215.86  <none>     8080/TCP  20s
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl describe service nginx-service
Name:            nginx-service-pes2ug20cs414
Namespace:       default
Labels:          <none>
Annotations:    <none>
Selector:        app=nginx
Type:            ClusterIP
IP Family Policy: SingleStack
IP Families:    IPv4
IP:              10.103.215.86
IPs:             10.103.215.86
Port:            <unset>  8080/TCP
TargetPort:      80/TCP
Endpoints:       10.244.0.10:80,10.244.0.11:80,10.244.0.13:80 + 3 more...
Session Affinity: None
Events:          <none>
```

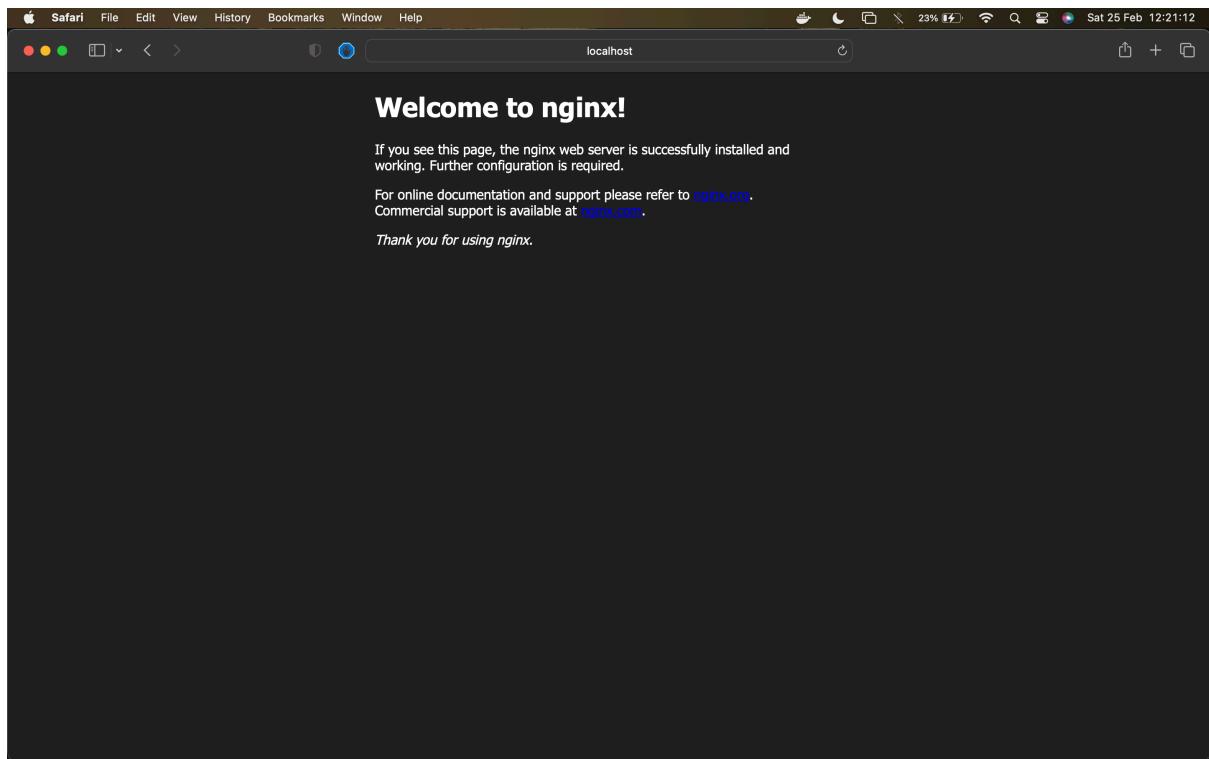
- Screenshot 6b-kubectl get pod -o wide command

```
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl get pod -o wide
NAME          READY   STATUS    RESTARTS   AGE     IP          NODE   NOMINATED-NODE   READINESS   GATES
nginx-deployment-pes1ug20cs414-8cf4bf97-7752d  1/1    Running   0          15m    10.244.0.9  minikube  <none>        <none>
nginx-deployment-pes1ug20cs414-8cf4bf97-xxskf  1/1    Running   0          15m    10.244.0.10  minikube  <none>        <none>
nginx-deployment-pes1ug20csxxx-8cf4bf97-bpz1v  1/1    Running   0          15m    10.244.0.7  minikube  <none>        <none>
nginx-deployment-pes1ug20csxxx-8cf4bf97-g9v25  1/1    Running   0          15m    10.244.0.8  minikube  <none>        <none>
nginx-deployment-pes2ug20cs414-8cf4bf97-jqk2d  1/1    Running   0          9m44s  10.244.0.13  minikube  <none>        <none>
nginx-deployment-pes2ug20cs414-8cf4bf97-k2s9f  1/1    Running   0          14m    10.244.0.11  minikube  <none>        <none>
(base) adityakhot@Adityas-MacBook-Air cc_lab2b %
```

- Screenshot 7a -Kubectl port-forward command

```
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl port-forward service/nginx-service-pes2ug20cs414 8080:8080
Forwarding from 127.0.0.1:8080 -> 80
Forwarding from [::1]:8080 -> 80
Handling connection for 8080
```

- Screenshot 7b- Display welcome to nginx on web page Section 8: Deleting service/deployment and Cleanup



- Screenshot 8a - Delete nginx deployments

```
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl delete deployment nginx-deployment-pes2ug20cs414
deployment.apps "nginx-deployment-pes2ug20cs414" deleted
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl delete service nginx-service-pes2ug20cs414
service "nginx-service-pes2ug20cs414" deleted
```

- Screenshot 8b - stop minikube

```
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % minikube stop
✋ Stopping node "minikube" ...
✋ Powering off "minikube" via SSH ...
✋ 1 node stopped.
(base) adityakhot@Adityas-MacBook-Air cc_lab2b %
```

Screenshot 9a- the command which exposes specifies the type of service (NodePort)

```
((base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl create deployment nginx-pes2ug20cs414 --image=nginx
error: failed to create deployment: deployments.apps "nginx-pes2ug20cs414" already exists
((base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl get deployment
NAME                  READY   UP-TO-DATE   AVAILABLE   AGE
nginx-deployment-pes1ug20cs414   2/2     2           2           20h
nginx-pes2ug20cs414   1/1     1           1           4h19m
((base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl create service nodeport nginx-pes2ug20cs414 --tcp=80:80
service/nginx-pes2ug20cs414 created
```

Screenshot 9b - kubectl get service command which displays the node port

```
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % kubectl get service
NAME           TYPE      CLUSTER-IP   EXTERNAL-IP PORT(S) AGE
kubernetes     ClusterIP 10.96.0.1   <none>      443/TCP  16h
nginx-service-pes2ug20cs414 ClusterIP 10.102.80.36 <none>      8080/TCP 9s
(base) adityakhot@Adityas-MacBook-Air cc_lab2b %
```

Screenshot 9c - minikube IP address

```
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % minikube ip
192.168.49.2
(base) adityakhot@Adityas-MacBook-Air cc_lab2b %
```

Screenshot 9d - the webpage with the IP Address visible. (If the IP Address is not visible in the screenshot, you will lose significant portion of marks w.r.t. Section 9)

```
(base) adityakhot@Adityas-MacBook-Air cc_lab2b % minikube service nginx-pes2ug20cs414 --url
http://127.0.0.1:53635
! Because you are using a Docker driver on darwin, the terminal needs to be open to run it.
```

