CLOUD COMPUTING LAB
KUBERNETES

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TASKS:

Task-1: After installation of both kubectl and minikube.

```
Last login: Tue Feb 13 11:38:08 on ttys001
(base) sirigowrih@PES1UG21CS599 ~ % minikube start
😄  minikube v1.32.0 on Darwin 11.5.1 (arm64)
✨  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
(base) sirigowrih@PES1UG21CS599 ~ %
```

Task-2: Creating pods and deployments, editing them and observing Rollback.

✓ **SCREENSHOT 2a: Get nodes, pods, services.**

```
(base) sirigowrih@PES1UG21CS599 ~ % kubectl get nodes
NAME       STATUS   ROLES           AGE     VERSION
minikube   Ready    control-plane   3m53s   v1.28.3
(base) sirigowrih@PES1UG21CS599 ~ % kubectl get pod.
No resources found in default namespace.
(base) sirigowrih@PES1UG21CS599 ~ % kubectl get services
NAME         TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
kubernetes   ClusterIP   10.96.0.1    <none>        443/TCP   4m7s
(base) sirigowrih@PES1UG21CS599 ~ %
```

✓ **SCREENSHOT 2b: Deployment Created (with SRN)**

```
(base) sirigowrih@PES1UG21CS599 ~ % kubectl create deployment pes1ug21cs599 --image=nginx
deployment.apps/pes1ug21cs599 created
(base) sirigowrih@PES1UG21CS599 ~ %
```

✓ **SCREENSHOT 2c: Get deployment and pod.**

```
(base) sirigowrih@PES1UG21CS599 ~ % kubectl create deployment pes1ug21cs599 --image=nginx
deployment.apps/pes1ug21cs599 created
(base) sirigowrih@PES1UG21CS599 ~ % kubectl get deployment
NAME            READY   UP-TO-DATE   AVAILABLE   AGE
pes1ug21cs599   0/1     1            0           34s
(base) sirigowrih@PES1UG21CS599 ~ % kubectl get pod
NAME                             READY   STATUS             RESTARTS   AGE
pes1ug21cs599-568d4466d6-55qgk   0/1     ImagePullBackOff   0          43s
(base) sirigowrih@PES1UG21CS599 ~ %
```

✓ SCREENSHOT 2d: Editing '-image:nginx'

```
      containers:
      - image: nginx:1.16
        imagePullPolicy: Always
        name: nginx
        resources: {}
        terminationMessagePath: /dev/termination-log
        terminationMessagePolicy: File
      dnsPolicy: ClusterFirst
      restartPolicy: Always
      schedulerName: default-scheduler
      securityContext: {}
      terminationGracePeriodSeconds: 30
```

✓ SCREENSHOT 2e: Showing edited deployment.

```
(base) sirigowrih@PES1UG21CS599 ~ % kubectl edit deployment pes1ug21cs599
deployment.apps/pes1ug21cs599 edited
```

✓ SCREENSHOT 2g: Changes after rolling back to original.

```
(base) sirigowrih@PES1UG21CS599 ~ % kubectl rollout undo deployment pes1ug21cs599
deployment.apps/pes1ug21cs599 rolled back
(base) sirigowrih@PES1UG21CS599 ~ %
```

```
      containers:
      - image: nginx
        imagePullPolicy: Always
        name: nginx
        resources: {}
        terminationMessagePath: /dev/termination-log
        terminationMessagePolicy: File
      dnsPolicy: ClusterFirst
      restartPolicy: Always
      schedulerName: default-scheduler
      securityContext: {}
      terminationGracePeriodSeconds: 30
```

Task-3: Debugging Pods.

✓SCREENSHOT 3a: Kubectl logs displayed

```
(base) sirigowrih@PES1UG21CS599 ~ % kubectl get pod
NAME                                READY   STATUS    RESTARTS   AGE
pes1ug21cs599-568d4466d6-ftdf7   1/1     Running   0          3m31s
(base) sirigowrih@PES1UG21CS599 ~ % kubectl logs pes1ug21cs599-568d4466d6-ftdf7
/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: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh
/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
2024/02/13 06:38:58 [notice] 1#1: using the "epoll" event method
2024/02/13 06:38:58 [notice] 1#1: nginx/1.25.3
2024/02/13 06:38:58 [notice] 1#1: built by gcc 12.2.0 (Debian 12.2.0-14)
2024/02/13 06:38:58 [notice] 1#1: OS: Linux 5.15.49-linuxkit-pr
2024/02/13 06:38:58 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2024/02/13 06:38:58 [notice] 1#1: start worker processes
2024/02/13 06:38:58 [notice] 1#1: start worker process 29
2024/02/13 06:38:58 [notice] 1#1: start worker process 30
2024/02/13 06:38:58 [notice] 1#1: start worker process 31
2024/02/13 06:38:58 [notice] 1#1: start worker process 32
(base) sirigowrih@PES1UG21CS599 ~ %
```

✓ SCREENSHOT 3b: Kubectl ‘describe pod’ command – Screenshot of “events” section

```
Events:
  Type    Reason     Age    From               Message
  ----    ------     ----   ----               -------
  Normal  Scheduled  4m58s  default-scheduler  Successfully assigned default/pes1ug21cs599-568d4466d6-ftdf7 to minikube
  Normal  Pulling    4m58s  kubelet            Pulling image "nginx"
  Normal  Pulled     4m46s  kubelet            Successfully pulled image "nginx" in 12.618s (12.618s including waiting)
  Normal  Created    4m46s  kubelet            Created container nginx
  Normal  Started    4m46s  kubelet            Started container nginx
(base) sirigowrih@PES1UG21CS599 ~ %
```

✓SCREENSHOT 3c: Creating mongo deployment

```
(base) sirigowrih@PES1UG21CS599 ~ % kubectl create deployment pes1ug21cs599-mongo --image=mongo
deployment.apps/pes1ug21cs599-mongo created
(base) sirigowrih@PES1UG21CS599 ~ %
```

✓SCREENSHOT 3d: Deleting both requirements.

```
(base) sirigowrih@PES1UG21CS599 ~ % kubectl delete deployment pes1ug21cs599
deployment.apps "pes1ug21cs599" deleted
(base) sirigowrih@PES1UG21CS599 ~ % kubectl delete deployment pes1ug21cs599-mongo
deployment.apps "pes1ug21cs599-mongo" deleted
(base) sirigowrih@PES1UG21CS599 ~ %
```

Task-4: Applying configuration files.

✓SCREENSHOT 4a: Kubectl apply command on yaml file.

```
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl apply -f nginx-deployment.yaml
deployment.apps/nginx-deployment-pes1ug21cs599 created
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl get pod
NAME                                              READY   STATUS              RESTARTS   AGE
nginx-deployment-pes1ug21cs599-67856bc4f5-fs6fb   0/1     ContainerCreating   0          13s
nginx-deployment-pes1ug21cs599-67856bc4f5-k2fmq   0/1     ContainerCreating   0          13s
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl get deployment
NAME                            READY   UP-TO-DATE   AVAILABLE   AGE
nginx-deployment-pes1ug21cs599   0/2     2            0           20s
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl get replicaset
NAME                                        DESIRED   CURRENT   READY   AGE
nginx-deployment-pes1ug21cs599-67856bc4f5   2         2         0       29s
(base) sirigowrih@PES1UG21CS599 Desktop %
```

✓SCREENSHOT 4b: Kubectl get on yaml file.

```
status:
  availableReplicas: 2
  conditions:
  - lastTransitionTime: "2024-02-13T06:49:23Z"
    lastUpdateTime: "2024-02-13T06:49:23Z"
    message: Deployment has minimum availability.
    reason: MinimumReplicasAvailable
    status: "True"
    type: Available
  - lastTransitionTime: "2024-02-13T06:48:46Z"
    lastUpdateTime: "2024-02-13T06:49:23Z"
    message: ReplicaSet "nginx-deployment-pes1ug21cs599-67856bc4f5" has successfully
      progressed.
    reason: NewReplicaSetAvailable
    status: "True"
    type: Progressing
  observedGeneration: 1
  readyReplicas: 2
  replicas: 2
  updatedReplicas: 2
(base) sirigowrih@PES1UG21CS599 Desktop %
```

Task-5: Delete a pod to observe the self-healing feature.

✓SCREENSHOT 5a: Delete pod.

```
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl get pod
NAME                                              READY   STATUS    RESTARTS   AGE
nginx-deployment-pes1ug21cs599-67856bc4f5-fs6fb   1/1     Running   0          2m25s
nginx-deployment-pes1ug21cs599-67856bc4f5-k2fmq   1/1     Running   0          2m25s
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl delete pod nginx-deployment-pes1ug21cs599-67856bc4f5-fs6fb
pod "nginx-deployment-pes1ug21cs599-67856bc4f5-fs6fb" deleted
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl get pod
NAME                                              READY   STATUS    RESTARTS   AGE
nginx-deployment-pes1ug21cs599-67856bc4f5-k2fmq   1/1     Running   0          3m35s
nginx-deployment-pes1ug21cs599-67856bc4f5-lrhlg   1/1     Running   0          7s
(base) sirigowrih@PES1UG21CS599 Desktop %
```

Task-6: Connecting Services to Deployments.

✓SCREENSHOT 6a: Kubectl apply and get command.

```
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl apply -f nginx-service.yaml
service/nginx-service-pes1ug21cs599 created
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl get service
NAME                          TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)    AGE
kubernetes                    ClusterIP   10.96.0.1       <none>        443/TCP    33m
nginx-service-pes1ug21cs599   ClusterIP   10.97.196.241   <none>        8080/TCP   11s
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl describe service nginx-service
Name:              nginx-service-pes1ug21cs599
Namespace:         default
Labels:            <none>
Annotations:       <none>
Selector:          app=nginx
Type:              ClusterIP
IP Family Policy:  SingleStack
IP Families:       IPv4
IP:                10.97.196.241
IPs:               10.97.196.241
Port:              <unset>  8080/TCP
TargetPort:        80/TCP
Endpoints:         10.244.0.10:80,10.244.0.9:80
Session Affinity:  None
Events:            <none>

(base) sirigowrih@PES1UG21CS599 Desktop %
```

✓SCREENSHOT 6b: kubectl get pod -o wide command.

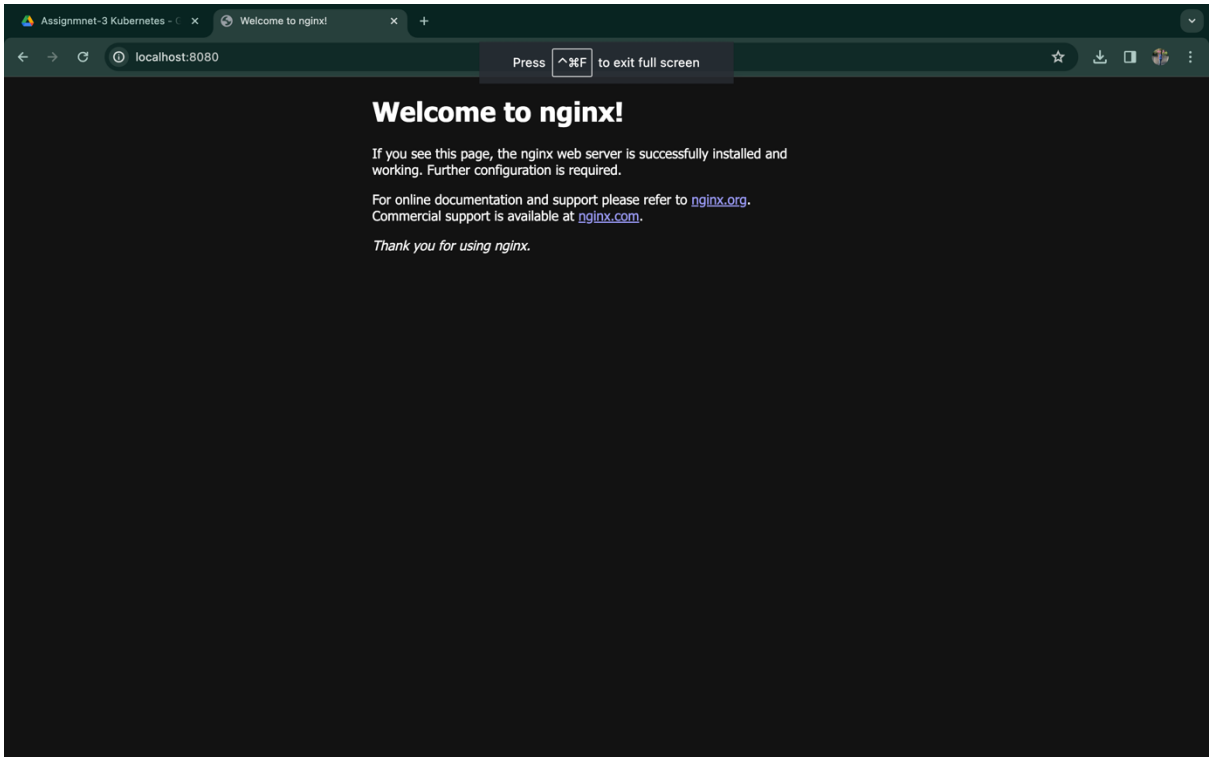
```
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl get pod -o wide
NAME                                          READY   STATUS    RESTARTS   AGE     IP            NODE       NOMINATED NODE   READINESS GATES
nginx-deployment-pes1ug21cs599-67856bc4f5-k2fmq   1/1     Running   0          8m16s   10.244.0.9    minikube   <none>           <none>
nginx-deployment-pes1ug21cs599-67856bc4f5-lrhlg   1/1     Running   0          4m48s   10.244.0.10   minikube   <none>           <none>
(base) sirigowrih@PES1UG21CS599 Desktop %
```

Task-7: Port Forwarding.

✓SCREENSHOT 7a: Kubectl port-forward command .

```
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl port-forward service/nginx-service-pes1ug21cs599 8080:8080
Forwarding from 127.0.0.1:8080 -> 80
Forwarding from [::1]:8080 -> 80
Handling connection for 8080
Handling connection for 8080
```

✓SCREENSHOT 7b: Display welcome to nginx on web page.



Task-8: Deleting service/deployment and Cleanup.

✓SCREENSHOT 8a: Delete nginx deployments.

```
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl delete deployment nginx-deployment-pes1ug21cs599
deployment.apps "nginx-deployment-pes1ug21cs599" deleted
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl delete service nginx-service-pes1ug21cs599
service "nginx-service-pes1ug21cs599" deleted
(base) sirigowrih@PES1UG21CS599 Desktop %
```

✓SCREENSHOT 8b: Minikube stop – Do this after the 9th Task.

```
(base) sirigowrih@PES1UG21CS599 Desktop % minikube stop
✋  Stopping node "minikube"  ...
🛑  Powering off "minikube" via SSH ...
🛑  1 node stopped.
(base) sirigowrih@PES1UG21CS599 Desktop %
```

Task-9: Expose an external IP address to access an Application in a cluster (To be done by the student).

✓SCREENSHOT 9a: The command which exposes specifies the type of service (NodePort/LoadBalancer)

```
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl create deployment nginx-pes1ug21cs599 --image=nginx

deployment.apps/nginx-pes1ug21cs599 created
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl expose deployment nginx-pes1ug21cs599 --type=LoadBalancer --port=80 --target-port=80
service/nginx-pes1ug21cs599 exposed
```

✓SCREENSHOT 9b: kubectl get service command which displays the node port

```
(base) sirigowrih@PES1UG21CS599 Desktop % kubectl get service nginx-pes1ug21cs599

NAME                  TYPE           CLUSTER-IP       EXTERNAL-IP   PORT(S)        AGE
nginx-pes1ug21cs599   LoadBalancer   10.103.219.186   <pending>     80:32638/TCP   18s
```

✓SCREENSHOT 9c: minikube IP address

```
(base) sirigowrih@PES1UG21CS599 Desktop % minikube ip
192.168.49.2
```

```
(base) sirigowrih@PES1UG21CS599 Desktop % minikube tunnel
✅  Tunnel successfully started

📌  NOTE: Please do not close this terminal as this process must stay alive for the tunnel to be accessible ...

❗  The service/ingress nginx-ingress-ingress-nginx-controller requires privileged ports to be exposed: [80 443]
🔑  sudo permission will be asked for it.
🏃  Starting tunnel for service nginx-ingress-ingress-nginx-controller.
❗  The service/ingress nginx-pes1ug21cs599 requires privileged ports to be exposed: [80]
🔑  sudo permission will be asked for it.
🏃  Starting tunnel for service nginx-pes1ug21cs599.
Password:
```

```
Last login: Tue Feb 13 14:37:56 on ttys000
(base) sirigowrih@PES1UG21CS599 ~ % kubectl get service nginx-pes1ug21cs599
NAME                  TYPE           CLUSTER-IP       EXTERNAL-IP   PORT(S)        AGE
nginx-pes1ug21cs599   LoadBalancer   10.103.219.186   127.0.0.1     80:32638/TCP   2m8s
(base) sirigowrih@PES1UG21CS599 ~ %
```

✓ **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)**