KUBERNETES EXERCISES:

1. Create a pod called web-server with nginx:1.19.10 image

   ANS:
   kubectl run web-server --image=nginx:1.19.10

   SCREENSHOT:

```
root@controlplane:~# kubectl run web-server --image=nginx:1.19.10
pod/web-server created
root@controlplane:~# kubectl get pods
NAME         READY   STATUS              RESTARTS   AGE
web-server   0/1     ContainerCreating   0          7s
root@controlplane:~# kubectl get pods
NAME         READY   STATUS              RESTARTS   AGE
web-server   0/1     ContainerCreating   0          13s
root@controlplane:~# kubectl get pods
NAME         READY   STATUS    RESTARTS   AGE
web-server   1/1     Running   0          48s
root@controlplane:~#
```

2. Expose port 80 of the web-server pod to be reachable within cluster

   ANS:
   kubectl expose pod web-server --type=ClusterIP --port=80 –name=ex2-service

   SCREENSHOT:

```
root@controlplane:~# kubectl expose pod web-server --type=ClusterIP --port=80 --name=ex2-service
service/ex2-service exposed
root@controlplane:~# kubectl get services
NAME          TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)   AGE
ex2-service   ClusterIP   10.107.216.193   <none>        80/TCP    3s
kubernetes    ClusterIP   10.96.0.1        <none>        443/TCP   17m
```

3. Create a single pod with below images:

i) nginx:1.19.10

ii) redis:6.2.2

ANS:

pod-definition.yml

```
apiVersion: v1
kind: Pod
metadata:
  name: ex3
spec:
  containers:
  - name: nginx
    image: nginx:1.19.10
  - name: redis
    image: redis: 6.2.2
```

kubectl create -f pod-definition.yml

SCREENSHOTS:

```
root@controlplane:~# vi pod-definition.yml
root@controlplane:~# kubectl create -f pod-definition.yml
pod/ex3 created
root@controlplane:~# kubectl get pods
NAME         READY   STATUS              RESTARTS   AGE
ex3          0/2     ContainerCreating   0          15s
mypod        1/1     Running             0          7m42s
web-server   1/1     Running             0          15m
root@controlplane:~# kubectl get pods
NAME         READY   STATUS    RESTARTS   AGE
ex3          2/2     Running   0          24s
mypod        1/1     Running   0          7m51s
web-server   1/1     Running   0          15m
root@controlplane:~# more pod-definition.yml
apiVersion: v1
kind: Pod
metadata:
  name: ex3
spec:
  containers:
  - name: nginx
    image: nginx:1.19.10
  - name: redis
```

4. Expose port 80 and 6379 of the above created pod such that the application can be connected from the outside world using node's IP address

ANS:

ex4-service.yml

```
apiVersion: v1
kind: Service
metadata:
  name: ex4-service
spec:
  selector:
    app: ex4-pod
  type: NodePort
  ports:
  - name: nginx-service
    port: 80
    targetPort: 80
    nodePort: 30080
- name: redis-service
    port: 6379
    targetPort: 6379
    nodePort: 30081
```

pod-definition.yml

```
apiVersion: v1
kind: Pod
metadata:
  name: ex3
  labels:
    app: ex4-pod
spec:
  containers:
  - name: nginx
    image: nginx:1.19.10
    ports:
```

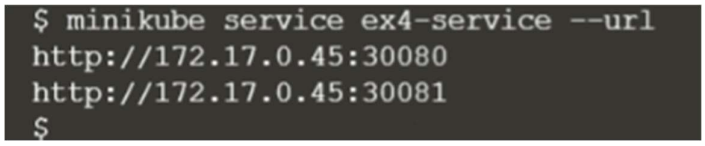
```
  - containerPort: 80
- name: redis
  image: redis: 6.2.2
  ports:
  - containerPort: 6379
```

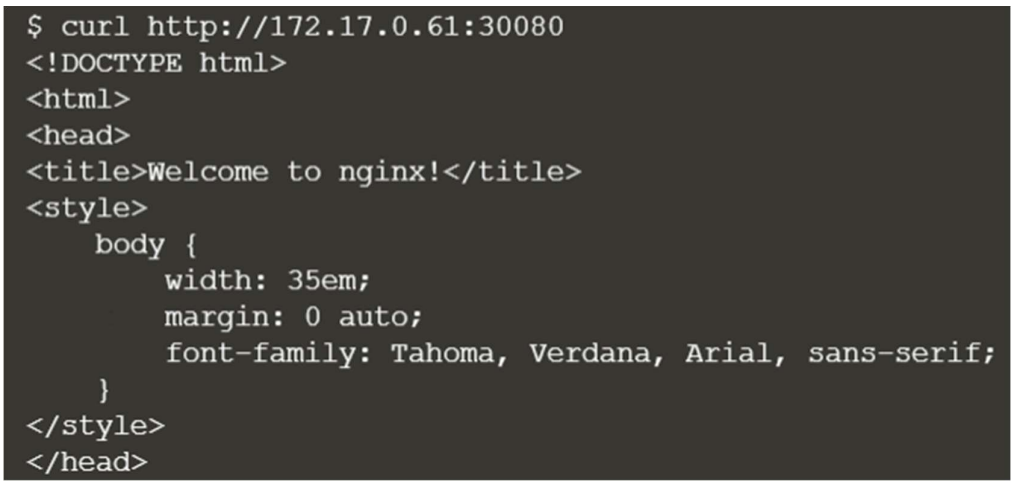
kubectl create -f pod-definition.yml

kubectl create -f ex4-service.yml

minikube service ex4-service --url

SCREENSHOTS:





5. Create a deployment web-deploy with nginx:1.19.10 image of 2 replica

ANS:

dep-def.yml

```
apiVersion: apps/v1
kind: Deployment
metadata:
 name: web-deploy
spec:
 replicas: 2
 selector:
  matchLabels:
   app: ex5
 template:
  metadata:
   name: ex5-pod
   labels:
    app: ex5
  spec:
   containers:
   - name: nginx
    image: nginx:1.19.10
```

kubectl create -f dep-def.yml
kubectl get deployment web-deploy -o wide

SCREENSHOT:

```
$ kubectl create -f dep-def.yml
deployment.apps/web-deploy created
$ kubectl get deployment web-deploy -o wide
NAME         READY   UP-TO-DATE   AVAILABLE   AGE   CONTAINERS   IMAGES          SELECTOR
web-deploy   2/2     2            2           30s   nginx        nginx:1.19.10   app=ex5
```

6. Change the image of web-deploy to nginx:1.20.0 and record the change

ANS:

kubectl set image deployment.apps/web-deploy nginx=nginx:1.20.0 –record

kubectl rollout history deployment.apps/web-deploy

SCREENSHOT:

```
$ kubectl set image deployment.apps/web-deploy nginx=nginx:1.20.0 --record
deployment.apps/web-deploy image updated
$ kubectl rollout history deployment.apps/web-deploy
deployment.apps/web-deploy
REVISION  CHANGE-CAUSE
1         <none>
2         kubectl set image deployment.apps/web-deploy nginx=nginx:1.20.0 --record=true

$
```

7. Scale web-deploy to 5 replica

ANS:

kubectl scale deployment web-deploy --replicas=5

SCREENSHOT:

```
$ kubectl scale deployment web-deploy --replicas=5
deployment.apps/web-deploy scaled
$ kubectl get deployment web-deploy
NAME         READY   UP-TO-DATE   AVAILABLE   AGE
web-deploy   5/5     5            5           14m
$
```

8. Create a persistent volume redis-pv with below specs:

i) hostpath /mnt/redis/data

ii) storage size 2Gi

iii) access mode – ReadWriteOnce

ANS:

pv-def.yml

```
apiVersion: v1
kind: PersistentVolume
metadata:
  name: redis-pv
spec:
  capacity:
    storage: 2Gi
  accessModes:
  - ReadWriteOnce
  hostPath:
    path: "/mnt/redis/data"
```

kubectl create -f pv-def.yml

SCREENSHOT:

```
root@controlplane:~# kubectl get pv
NAME       CAPACITY   ACCESS MODES   RECLAIM POLICY   STATUS   CLAIM               STORAGECLASS   REASON   AGE
redis-pv   2Gi        RWO            Retain           Bound    default/redis-pvc                           5m29s
root@controlplane:~# kubectl describe pv redis-pv
Name:            redis-pv
Labels:          <none>
Annotations:     pv.kubernetes.io/bound-by-controller: yes
Finalizers:      [kubernetes.io/pv-protection]
StorageClass:
Status:          Bound
Claim:           default/redis-pvc
Reclaim Policy:  Retain
Access Modes:    RWO
VolumeMode:      Filesystem
Capacity:        2Gi
Node Affinity:   <none>
Message:
Source:
    Type:          HostPath (bare host directory volume)
    Path:          /mnt/redis/data
    HostPathType:
Events:            <none>
root@controlplane:~#
```

9. Create a persistent volume claim redis-pvc that claims redis-pv persistent volume

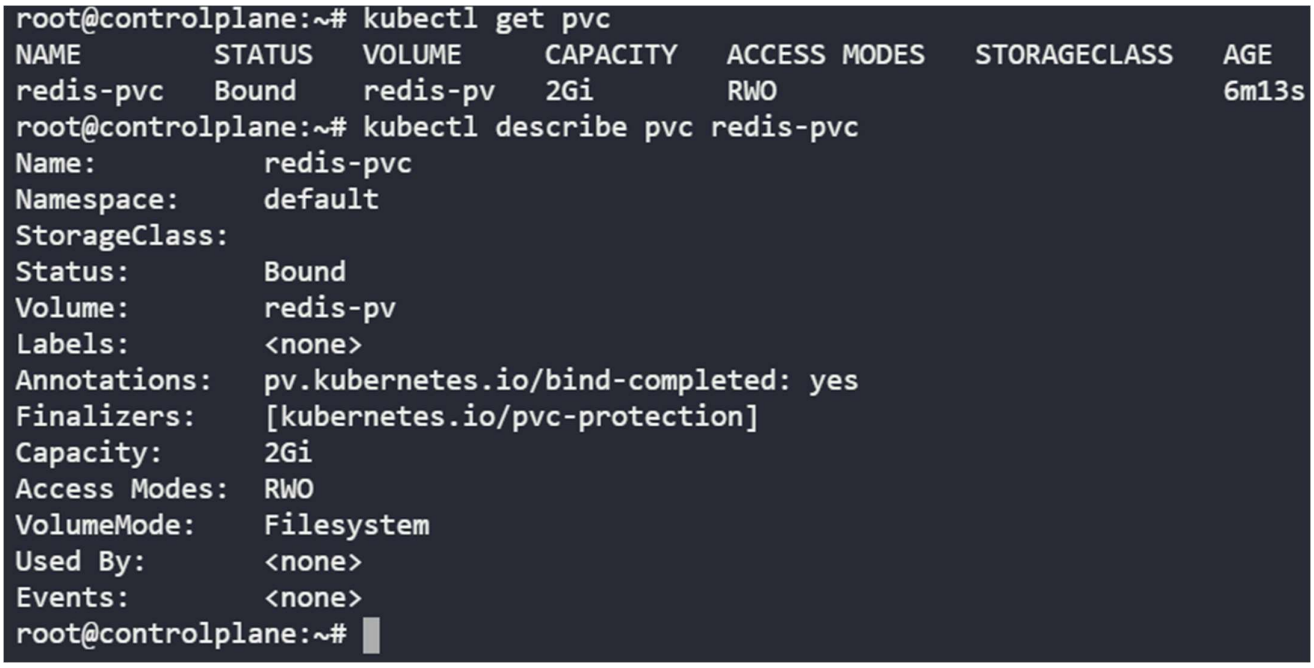
ANS:

pvc-def.yml

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: redis-pvc
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 1Gi
  volumeName: "redis-pv"
```

kubectl create -f pvc-def.yml

SCREENSHOT:



```
root@controlplane:~# kubectl get pvc
NAME        STATUS   VOLUME     CAPACITY   ACCESS MODES   STORAGECLASS   AGE
redis-pvc   Bound    redis-pv   2Gi        RWO                           6m13s
root@controlplane:~# kubectl describe pvc redis-pvc
Name:          redis-pvc
Namespace:     default
StorageClass:
Status:        Bound
Volume:        redis-pv
Labels:        <none>
Annotations:   pv.kubernetes.io/bind-completed: yes
Finalizers:    [kubernetes.io/pvc-protection]
Capacity:      2Gi
Access Modes:  RWO
VolumeMode:    Filesystem
Used By:       <none>
Events:        <none>
root@controlplane:~#
```

10. Create a pod redis which binds the redis-pvc to the path /data with image redis:6.2.2

ANS:

pod-def.yml

```
apiVersion: v1
kind: Pod
metadata:
  name: redis
spec:
  volumes:
  - name: pv-bind
    persistentVolumeClaim:
      claimName: redis-pvc
  containers:
  - name: redis
    image: redis:6.2.2
    volumeMounts:
    - name: pv-bind
      mountPath: "/data"
```

kubectl create -f pod-def.yml

SCREENSHOT:

```
root@controlplane:~# kubectl create -f pod-def.yml
pod/redis created
root@controlplane:~# kubectl get pod
NAME    READY   STATUS              RESTARTS   AGE
redis   0/1     ContainerCreating   0          11s
root@controlplane:~# kubectl get pod
NAME    READY   STATUS              RESTARTS   AGE
redis   0/1     ContainerCreating   0          13s
root@controlplane:~# kubectl get pod
NAME    READY   STATUS    RESTARTS   AGE
redis   1/1     Running   0          18s
root@controlplane:~# kubectl describe pod redis
Name:         redis
Namespace:    default
Priority:     0
Node:         controlplane/10.24.18.9
Start Time:   Fri, 07 May 2021 06:26:39 +0000
Labels:       <none>
Annotations:  <none>
Status:       Running
IP:           10.244.0.4
IPs:
  IP:  10.244.0.4
Containers:
  redis:
    Container ID:   docker://0d202c6214ddd4694fdd23052b7b8aad9f2642cc43b3868d668c705def42b962
```

```
    Mounts:
      /data from pv-bind (rw)
      /var/run/secrets/kubernetes.io/serviceaccount from default-token-j8tmp (ro)
Conditions:
  Type              Status
  Initialized       True
  Ready             True
  ContainersReady   True
  PodScheduled      True
Volumes:
  pv-bind:
    Type:       PersistentVolumeClaim (a reference to a PersistentVolumeClaim in the same namespace)
    ClaimName:  redis-pvc
    ReadOnly:   false
  default-token-j8tmp:
    Type:        Secret (a volume populated by a Secret)
    SecretName:  default-token-j8tmp
    Optional:    false
QoS Class:       BestEffort
Node-Selectors:  <none>
Tolerations:     node.kubernetes.io/not-ready:NoExecute op=Exists for 300s
                 node.kubernetes.io/unreachable:NoExecute op=Exists for 300s
Events:
  Type    Reason     Age   From               Message
  ----    ------     ----  ----               -------
  Normal  Scheduled  30s   default-scheduler  Successfully assigned default/redis to controlplane
```

11. Update the storage size of the redis persistent volume to 3Gi and record the change

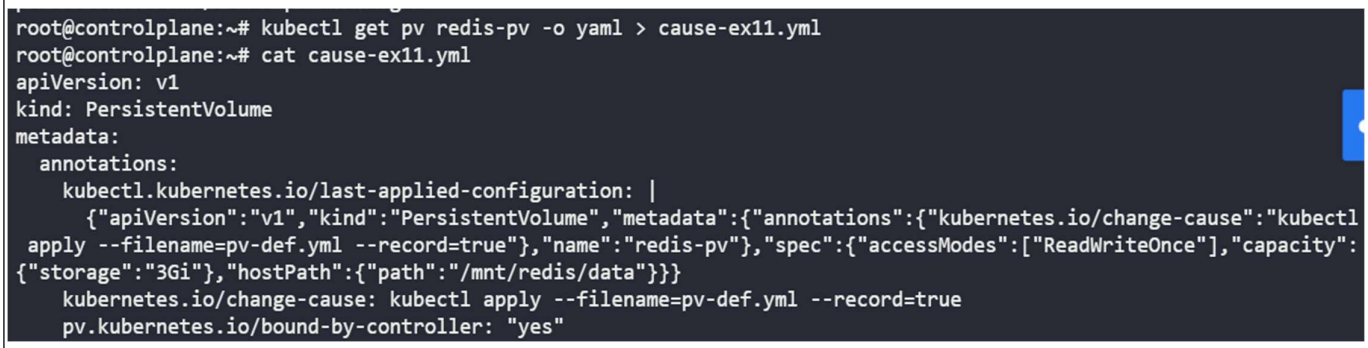
ANS:

vi pv-def.yml

```
apiVersion: v1
kind: PersistentVolume
metadata:
  name: redis-pv
spec:
  capacity:
    storage: 3Gi
  accessModes:
  - ReadWriteOnce
  hostPath:
    path: "/mnt/redis/data"
```

kubectl apply -f pv-def.yml --record

SCREENSHOTS:



12. Create an Ingress for web-deploy deployment with wildcard hostname

ANS:

kubectl expose deployment web-deploy --port=80 --type=NodePort

ingress-def.yml

```
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  name: ex5-ingress
spec:
  rules:
  - host: ""
    http:
      paths:
      - path: /
        pathType: Prefix
        backend:
          service:
            name: web-deploy
            port:
              number: 80
```

kubectl create -f ingress-def.yml

SCREENSHOTS:

```
root@controlplane:~# vi dep-def.yml
root@controlplane:~# kubectl create -f dep-def.yml
deployment.apps/web-deploy created
root@controlplane:~# kubectl expose deployment web-deploy --port=80 --type=NodePort
service/web-deploy exposed
root@controlplane:~# vi ingress-def.yml
root@controlplane:~# vi ingress-def.yml
root@controlplane:~# kubectl create -f ingress-def.yml
ingress.networking.k8s.io/ex5-ingress created
```

```
root@controlplane:/etc# kubectl get svc web-deploy
NAME         TYPE       CLUSTER-IP      EXTERNAL-IP   PORT(S)        AGE
web-deploy   NodePort   10.102.78.106   <none>        80:30701/TCP   6m24s
root@controlplane:/etc#
```

```
root@controlplane:~# kubectl describe service web-deploy
Name:                     web-deploy
Namespace:                default
Labels:                   <none>
Annotations:              <none>
Selector:                 app=ex5
Type:                     NodePort
IP Families:              <none>
IP:                       10.102.78.106
IPs:                      10.102.78.106
Port:                     <unset>  80/TCP
TargetPort:               80/TCP
NodePort:                 <unset>  30701/TCP
Endpoints:                10.244.0.4:80,10.244.0.5:80
Session Affinity:         None
External Traffic Policy:  Cluster
Events:                   <none>
root@controlplane:~# cd /
root@controlplane:/# cd etc
root@controlplane:/etc# vi hosts
```

```
root@controlplane:/etc# curl http://10.102.78.106
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
    body {
        width: 35em;
        margin: 0 auto;
        font-family: Tahoma, Verdana, Arial, sans-serif;
    }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>
```

```
root@controlplane:~# kubectl get ingress
NAME          CLASS    HOSTS   ADDRESS   PORTS   AGE
ex5-ingress   <none>   *                 80      37m
root@controlplane:~# kubectl describe ingress ex5-ingress
Name:             ex5-ingress
Namespace:        default
Address:
Default backend:  default-http-backend:80 (<error: endpoints "default-http-backend" not found>)
Rules:
  Host        Path  Backends
  ----        ----  --------
  *
              /   web-deploy:80 (10.244.0.4:80,10.244.0.5:80)
Annotations:  <none>
Events:       <none>
root@controlplane:~#
```

Result:

The exercises in kubernetes are successfully executed