1. Where is the default kubeconfig file located in the current environment

or you can use \$KUBECONFIG environment variable if it's set.

2. How many clusters are defined in the default kubeconfig

```
• shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$ kubectl config get-clusters
NAME
minikube
• shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$
```

3. What is the user configured in the current context

```
    shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$ kubectl config get-contexts
        CURRENT NAME CLUSTER AUTHINFO NAMESPACE
        * minikube minikube minikube default
            shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$
```

- 4. Create a Persistent Volume with the given specification.
- → Volume Name: pv-log
- → Storage: 100Mi
- → Access Modes: ReadWriteMany
- → Host Path: /pv/log

5. Create a Persistent Volume Claim with the given specification.

→ Volume Name: claim-log-1→ Storage Request: 50Mi

→ Access Modes: ReadWriteMany

```
**shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$ kubectl get pvc

NAME STATUS VOLUME CAPACITY ACCESS MODES STORAGECLASS VOLUMEATTRIBUTESCLASS AGE

claim-log-1 Bound pvc-c75cb132-7286-4ab6-b526-df61c6fe2c05 50Mi RWX standard <unset> 28m

shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$
```

- 6. Create a webapp pod to use the persistent volume claim as its storage.
- → Name: webapp
- → Image Name: nginx
- → Volume: PersistentVolumeClaim=claim-log-1
- → Volume Mount: /var/log/nginx

```
lab5 > ! webapp-pod.yml > {} spec > [ ] volumes > {} 0 > {} ;
       io.k8s.api.core.v1.Pod (v1@pod.json)
       apiVersion: v1
       kind: Pod
       metadata:
         name: webapp
       spec:
         containers:
           - name: nginx
              image: nginx
              volumeMounts:
                mountPath: "/var/log/nginx"
 11
                  name: log-volume
         volumes:
 12
 13
            - name: log-volume
              persistentVolumeClaim:
 15
                claimName: claim-log-1
```

```
• shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$ kubectl describe pod webapp | grep ClaimName ClaimName: claim-log-1
o shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$
```

```
shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$ kubectl exec -it webapp -- /bin/sh
# ls -l var/log/nginx
total 4
-rw-r--r-- 1 root root    0 Feb 15 12:57 access.log
-rw-r--r-- 1 root root 488 Feb 15 12:57 error.log
# []
```

## 7. Create a pod named volume-share-datacenter.

For first container, use image centos:latest, container should be named as volume-container-datacenter-1, and run a command '/bin/bash', '-c' and 'sleep 10000'. Volume volume-share should be mounted at path /tmp/news.

For second container, use image centos:latest, container should be named as volume-container-datacenter-2, and run a command '/bin/bash', '-c' and 'sleep 10000'. Volume volume-share should be mounted at path /tmp/cluster.

Volumes to be named as volume-share and use emptyDir: { }.

After creating the pod, exec into the first container volume-container-datacenter-1, and create a file news.txt with content Welcome from datacenter-1! under the mount path of first container /tmp/news.

The file news.txt should be present under the mounted path /tmp/cluster of second container volume-container-datacenter-2 as they are using shared Volumes.

```
lab5 > ! volume-share-datacenter.yml > {} spec > [ ] containers > {} 1 > [ ] command
      io.k8s.api.core.v1.Pod (v1@pod.json)
      apiVersion: v1
      kind: Pod
      metadata:
      name: volume-share-datacenter
       spec:
         containers:

    name: volume-container-datacenter-1

             image: centos:latest
             command: ["/bin/bash", "-c", "sleep 10000"]
             volumeMounts:
                - mountPath: "/tmp/news"
 11
 12
                  name: volume-share
 13

    name: volume-container-datacenter-2

 14
             image: centos:latest
 15
             command: ["/bin/bash", "-c", "sleep 10000"]
             volumeMounts:
 17
               mountPath: "/tmp/cluster"
                  name: volume-share
         volumes:
           - name: volume-share
             emptyDir: {}
 21
```

```
• shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$ kubectl exec -it volume-share-datacenter -c volume-container-datacenter-1 -- /bin/bash [root@volume-share-datacenter /]# echo "Welcome from datacenter-1!" > /tmp/news/news.txt [root@volume-share-datacenter /]# exit exit

shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$
```

8. Create a pod named webserver.

Create an emptyDir volume name: shared-logs.

Create two containers from nginx and ubuntu images with latest tag only and remember to mention tag i.e nginx:latest, nginx container name should be Nginx-container and ubuntu container name should be sidecar-container on webserver pod.Add command on sidecar-container "sh","-c","while true; do cat /var/log/nginx/access.log /var/log/nginx/error.log; sleep 30; done"

Mount volume /var/log/nginx on both containers, all containers should be up and Running.

```
io.kBs.api.core.v1.Pod (v1@pod.json)
apiVersion: v1
kind: Pod
metadata:
name: webserver
spec:
containers:
-name: nginx-container
image: nginx:latest
volumeMounts:
-name: shared-logs
-name: sidecar-container
image: ubuntu:latest
command: ["sh", "c", "while true; do cat /var/log/nginx/access.log /var/log/nginx/error.log; sleep 30; done"]
volumeMounts:
-mountPath: "/var/log/nginx"
-name: shared-logs
volumeMounts:
-mountPath: "/var/log/nginx"
-mame: shared-logs
-name: shared-logs
```

```
• shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$ kubectl get pods | grep webserver webserver 2/2 Running 0 77s

• shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$
```

```
• shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$ kubectl logs webserver -c sidecar-container 2025/02/15 13:43:48 [notice] l#1: using the "epoll" event method 2025/02/15 13:43:48 [notice] l#1: using the "epoll" event method 2025/02/15 13:43:48 [notice] l#1: built by gcc 12.2.0 (Debian 12.2.0-14) 2025/02/15 13:43:48 [notice] l#1: 0S: Linux 5.10.207 2025/02/15 13:43:48 [notice] l#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576 2025/02/15 13:43:48 [notice] l#1: start worker processes 2025/02/15 13:43:48 [notice] l#1: start worker processes 29 2025/02/15 13:43:48 [notice] l#1: start worker process 30 2025/02/15 13:43:48 [notice] l#1: using the "epoll" event method 2025/02/15 13:43:48 [notice] l#1: nginx/1.27.4 2025/02/15 13:43:48 [notice] l#1: built by gcc 12.2.0 (Debian 12.2.0-14) 2025/02/15 13:43:48 [notice] l#1: 0S: Linux 5.10.207
```

9. Create a new service account with the name pvviewer. Grant this Service account access to list all PersistentVolumes in the cluster by creating an appropriate cluster role called pvviewer-role and ClusterRoleBinding called pvviewer-role-binding.

```
lab5 > ! pvviewer-role-bind.yml > [ ] subjects > {} 0 > ■ apiGroup
       io.k8s.api.rbac.v1.ClusterRoleBinding (v1@clusterrolebinding.json)
       apiVersion: rbac.authorization.k8s.io/vl
       kind: ClusterRoleBinding
       metadata:
       name: pvviewer-role-bind
       roleRef:
        kind: ClusterRole
        name: pvviewer-role
        apiGroup: rbac.authorization.k8s.io
       subjects:
        - kind: ServiceAccount
 11
          name: pvviewer
 12
          namespace: default
 13
          apiGroup: ""
```

```
shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$ kubectl exec -it my-pd -- sh
# kubectl get pv
NAME
                                              CAPACITY
                                                          ACCESS MODES
                                                                          RECLAIM POLICY
                                                                                                                                 STORAGE
                                                                                            STATUS
pvc-c75cb132-7286-4ab6-b526-df61c6fe2c05
                                              100Mi
                                                          RWX
                                                                          Retain
                                                                                             Available
                                                          RWX
                                                                          Delete
                                                                                             Bound
                                                                                                          default/claim-log-1
                                                                                                                                 standa
```

10.Create a ConfigMap named nginx-config with the following Nginx configuration: nginx.conf:

**Create a Pod named nginx-pod that:** 

- o Uses the Nginx image, & mounts the ConfigMap as a volume.
- Ensures that the nginx.conf file from the ConfigMap is available at /etc/nginx/nginx.conf.

Verify the Pod by:

- Checking the pod logs.
- Executing a command inside the pod to test the custom configuration.

```
io.k8s.api.core.v1.Pod (v1@pod.json)
    apiVersion: v1
    kind: Pod
    metadata:
    name: nginx-pod
    spec:
      containers:
      - name: nginx
         image: nginx:latest
          volumeMounts:
          - name: config-volume
              mountPath: /etc/nginx/
      volumes:
3
        - name: config-volume
          configMap:
            name: nginx-config
```

```
shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$ kubectl exec -it nginx-pod -- sh
# cat /etc/nginx/nginx.conf
events {}

http {
    server {
        listen 80;
        location / {
            return 200 'Custom Nginx Config Loaded!';
        }
    }
}
```

```
• shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$ kubectl logs nginx-pod /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: /etc/nginx/conf.d/default.conf is not a file or does not exist /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
```

## **Deploy HaProxy**

1. Create a namespace haproxy-controller-devops.

```
io.k8s.api.core.v1.Namespace (v1@namespace.json)

1 apiVersion: v1

2 kind: Namespace

3 v metadata:

4 name: haproxy-controller-devops
```

```
    shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$ kubectl get ns

 NAME
                              STATUS
                                       AGE
 default
                              Active
                                       2d2h
 haproxy-controller-devops
                              Active
                                       895
 iti
                              Active
                                       84m
 kube-node-lease
                              Active
                                       2d2h
 kube-public
                              Active
                                       2d2h
                              Active
                                       2d2h
 kube-system
 shehab-gamal@shehab-gamal-Lenovo-ideapad-520-15IKB:~/Kubernetes-labs/lab5$
```

2. Create a ServiceAccount haproxy-service-account-devops under the same namespace.

```
io.k8s.api.core.v1.ServiceAccount (v1@serviceaccount.json)
1    apiVersion: v1
2    kind: ServiceAccount
3    metadata:
4    name: haproxy-service-account-devops
5    namespace: haproxy-controller-devops
```

3. Create a ClusterRole which should be named as haproxy-cluster-role-devops, to grant permissions "get", "list", "watch", "create", "patch", "update" to "Configmaps", "secrets", "endpoints", "nodes", "pods", "services "namespaces", "events", "serviceaccounts".

```
apiVersion: rbac.authorization.k8s.io/v1
    kind: ClusterRole
    metadata:
     name: haproxy-cluster-role-devops
    rules:
      - apiGroups: ["", "networking.k8s.io", "apiextensions.k8s.io", "discovery.k8s.io"]
          - configmaps
          - secrets
          - endpoints
          - nodes
          - pods
          - services
          - namespaces
          - serviceaccounts
          - ingresses
          - ingressclasses

    endpointslices

          - customresourcedefinitions
          - get
          - watch
            patch
27
          - update
```

4. Create a ClusterRoleBinding which should be named as haproxy-cluster-role-binding-devops under the same namespace. Define roleRef apiGro should be rbac.authorization.k8s.io, kind should be ClusterRole, name should be haproxy-cluster-role-devops and subjects kind should be ServiceAccount, name should be haproxy-service-account-devops and namespace should be haproxy-controller-devops.

```
lab5 > ! haproxy-clusterrole-bind.yml > {} roleRef
      io.k8s.api.rbac.v1.ClusterRoleBinding (v1@clusterrolebinding.json)
       apiVersion: rbac.authorization.k8s.io/v1
      kind: ClusterRoleBinding
      metadata:
       name: haproxy-cluster-role-binding-devops
       subjects:

    kind: ServiceAccount

           name: haproxy-service-account-devops
           namespace: haproxy-controller-devops
       roleRef:
         kind: ClusterRole
         name: haproxy-cluster-role-devops
 11
         apiGroup: rbac.authorization.k8s.io
 12
```

- 5. Create a backend deployment which should be named as backend-deployment-devops under the same namespace,
- → labels "run=ingress-default-backend",
- → replicas=1,
- → container name=backend-container-devops,
- $\rightarrow$  image gcr.io/google\_containers/defaultbackend:1.0  $\rightarrow$  containerPort=8080.

```
io.k8s.api.apps.v1.Deployment (v1@deployment.json)
     apiVersion: apps/v1
     kind: Deployment
    metadata:
       name: backend-deployment-devops
       namespace: haproxy-controller-devops
       labels:
         run: ingress-default-backend
     spec:
       replicas: 1
       selector:
11
         matchLabels:
12
           run: ingress-default-backend
13
       template:
14
         metadata:
           labels:
             run: ingress-default-backend
17
         spec:
           containers:

    name: backend-container

                image: gcr.io/google containers/defaultbackend:1.0
21
                ports:
22
                 - containerPort: 8080
```

6. Create a service for backend which should be named as "service-backend-devops" under the same namespace, port should be named as port-backend.

```
io.k8s.api.core.v1.Service (v1@service.json)
     apiVersion: v1
     kind: Service
3 ∨ metadata:
       name: service-backend-devops
       namespace: haproxy-controller-devops
6 v spec:
       selector:
         run: ingress-default-backend
       ports:
10 🗸

    name: port-backend

           port: 8080
11
12
            targetPort: 8080
```

7. Create a deployment for frontend which should be named haproxy-ingress-devops under the same namespace. replicas=1, labels "run=haproxy-ingress". container name=ingress-container-devops service account=haproxy-service-account-devops image=haproxytech/kubernetes-ingress, give args as

--default-backend-service=haproxy-controller-devops/service-backend-devops,

Resources

requests

- → cpu=500m
- → memory=50Mi

livenessProbe

→ httpGet path should be /health its port should be 1024.

The first port name should be http and its containerPort should be 80 the second port name should be https and its containerPort should be 443 third port name should be stat its containerPort should be 1024.

Define environment as TZ=Etc/UT

**POD\_NAME** itsvalueFrom:

fieldRe:

fieldPath: metadata.na POD\_NAMESPACE its

valueFrom: fieldRe:

fieldPath: metadata.namespac

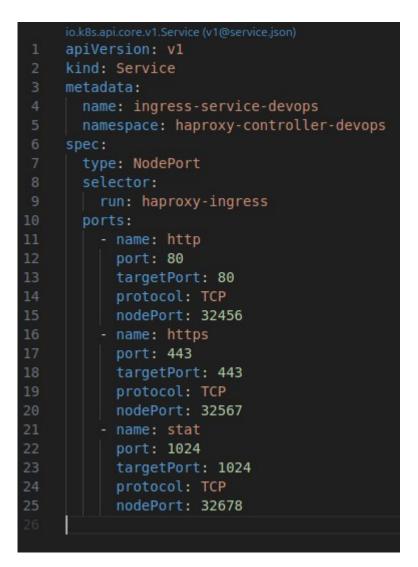
```
lab5 \gt ! haproxy-ingress.yml \gt {} spec \gt {} template \gt {} spec \gt [ ] containers \gt {} 0 \gt [ ] env
      apiVersion: apps/vl
    kind: Deployment
  4 name: haproxy-ingress-devops
       namespace: haproxy-controller-devops
  6 V labels:
      run: haproxy-ingress
      replicas: 1
           run: haproxy-ingress
            labels:
             run: haproxy-ingress
            serviceAccountName: haproxy-service-account-devops
             - name: ingress-container-devops
              image: haproxytech/kubernetes-ingress
             args:
             - "--default-backend-service=haproxy-controller-devops/service-backend-devops
                containerPort: 80
              - name: https
                containerPort: 443
                containerPort: 1024
```

```
lab5 > ! haproxy-ingress.yml > {} spec > {} template > {} spec > [ ] containers > {} 0 > [ ] env
       spec:
 13
         template:
           spec:
             containers:

    name: ingress-container-devops

                resources:
                  requests:
                    cpu: "500m"
 34
                    memory: "50Mi"
                env:
 35
                - name: TZ
                  value: Etc/UTC
                 name: POD NAME
                  valueFrom:
                    fieldRef:
                      fieldPath: metadata.name
                 name: POD NAMESPACE
                  valueFrom:
                    fieldRef:
                      fieldPath: metadata.namespace
                livenessProbe:
                  httpGet:
                    path: /health
                    port: 1024
                  initialDelaySeconds: 3
                  periodSeconds: 3
```

8. Create a service for frontend which should be named as ingress-service-devops under same namespace, type should be NodePort. The first port name should be http, its po should be 80, protocol should be TCP, targetPort should be 80 and nodePort should be 32456. The second port name should be https, its port should be 443, protocol should be TCP, targetPort should be 443 and nodePort should be 32567. The third port name should be stat, its port should be 1024, protocol should be TCP, targetPort should be 1024 and nodePort should be 32678.



9. Access the proxy states on port "1024" via the nodePort service "ingress-service-devops" via the browser

