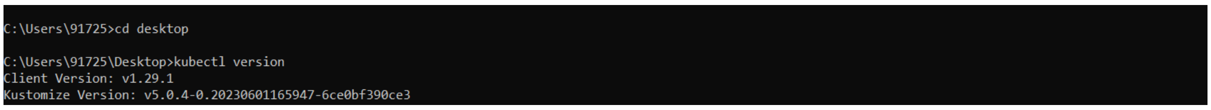
1. You are tasked with creating a simple pod in your Kubernetes cluster. The pod should run a container using the busybox image.



```
C:\Users\91725>cd desktop

C:\Users\91725\Desktop>kubectl version
Client Version: v1.29.1
Kustomize Version: v5.0.4-0.20230601165947-6ce0bf390ce3
```

Create a YAML Manifest:

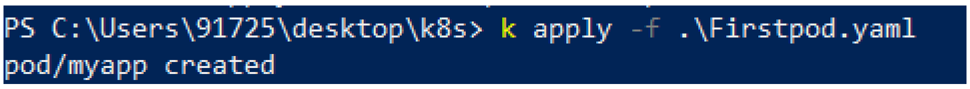
Create a YAML manifest file **(Firstpod.yaml)** with the following content:

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: myapp
  labels:
    name: myapp
spec:
  containers:
  - name: myapp
    image: busybox
    args:
    - "/bin/sh"
    - "-c"
    - "sleep 3600"
    resources:
      limits:
        memory: "128Mi"
        cpu: "500m"
    ports:
      - containerPort: 8080
```

Apply the Manifest:

Apply the YAML manifest using the command:

K apply -f .\Firstpod.yaml

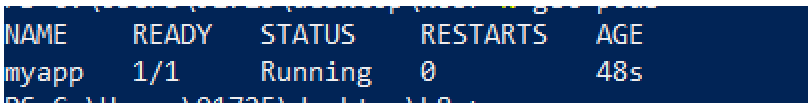


```
PS C:\Users\91725\desktop\k8s> k apply -f .\Firstpod.yaml
pod/myapp created
```

Verify the Pod:

Verify that the Pod has been created successfully by running:

k get pods



```
NAME    READY   STATUS    RESTARTS   AGE
myapp   1/1     Running   0          48s
```

2. Change the image name from busybox to nginx, also check that pod is running well.

Edit the YAML Manifest:

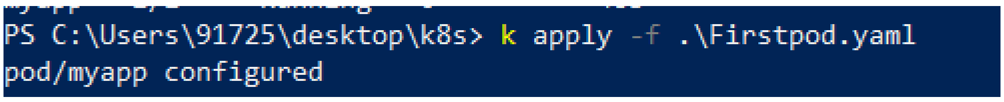
Edit the YAML manifest file **(Firstpod.yaml)** to change the image name from busybox to nginx. Here's the modified manifest:

```
apiVersion: v1
kind: Pod
metadata:
  name: myapp
  labels:
    name: myapp
spec:
  containers:
  - name: myapp
    image: nginx
    args:
    - "/bin/sh"
    - "-c"
    - "sleep 3600"
    resources:
      limits:
        memory: "128Mi"
        cpu: "500m"
    ports:
      - containerPort: 8080
```

Apply the Manifest Changes:

Apply the updated YAML manifest to the Kubernetes cluster using the kubectl apply command:

k apply -f .\Firstpod.yaml

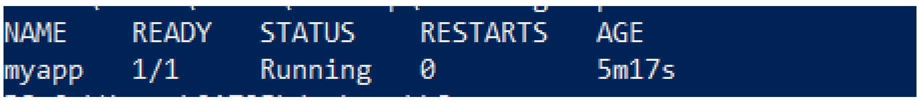


```
PS C:\Users\91725\desktop\k8s> k apply -f .\Firstpod.yaml
pod/myapp configured
```

Verify the Pod Status:

Check the status of the Pod to ensure it's running and the new container using the nginx image is created:

k get pods



```
NAME    READY   STATUS    RESTARTS   AGE
myapp   1/1     Running   0          5m17s
```

3. Create a ReplicaSet named " app-replicaset " managing three replicas of an application pod using the nginx image.

Create a YAML Manifest:

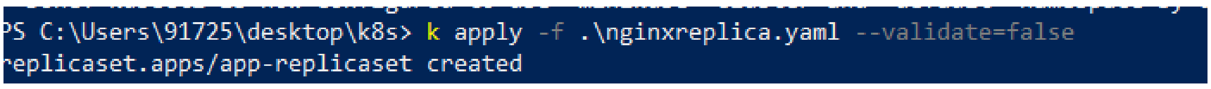
Create a YAML manifest file (nginxreplica.yaml) with the following content:

```yaml
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: app-replicaset
  labels:
    app: app-replicaset
spec:
  replicas: 3
  selector:
    matchLabels:
      app: app-replicaset
  template:
    metadata:
      labels:
        app: app-replicaset
    spec:
      containers:
      - name: app-replicaset
        image: nginx
        ports:
        - name: web
          containerPort:  80
          protocol: TCP
        env:
        - name: NGX_VERSION
          value: 1.16.1
```

Apply the Manifest:

Apply the YAML manifest to the Kubernetes cluster using the command:

k apply -f .\nginxreplica.yaml –validate=false

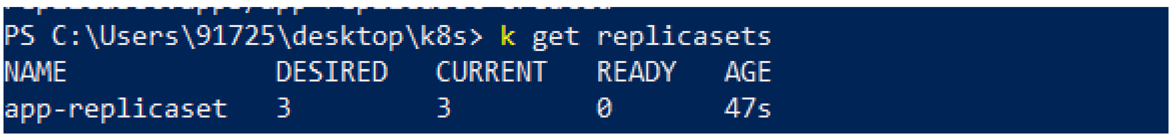


```
PS C:\Users\91725\desktop\k8s> k apply -f .\nginxreplica.yaml --validate=false
replicaset.apps/app-replicaset created
```

Verify the ReplicaSet:

Check the status of the ReplicaSet to ensure it's created successfully:

k get replicasets



```
PS C:\Users\91725\desktop\k8s> k get replicasets
NAME             DESIRED   CURRENT   READY   AGE
app-replicaset   3         3         0       47s
```

4. Create a Deployment named "app-deployment" managing four replicas of an application pod using the nginx:alpine image.

Create a YAML Manifest:

Create a YAML manifest file (nginx-alpine.yaml) with the following content:

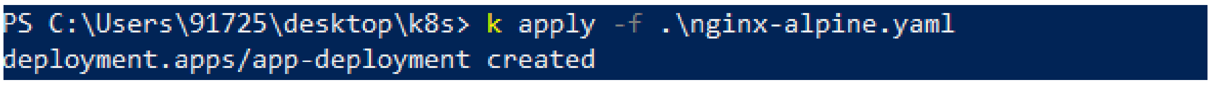
```
apiVersion: apps/v1
kind: Deployment
metadata:
  name:  app-deployment
  namespace: default
  labels:
    app:  app-deployment
spec:
  selector:
    matchLabels:
      app: app-deployment
  replicas: 4
  strategy:
    rollingUpdate:
      maxSurge: 25%
      maxUnavailable: 25%
    type: RollingUpdate
  template:
    metadata:
      labels:
        app:  app-deployment
    spec:
      # initContainers:
        # Init containers are exactly like regular containers, except:
          # - Init containers always run to completion.
          # - Each init container must complete successfully before the next one
starts.
      containers:
      - name:  app-deployment
        image:  nginx:alpine
        resources:
          requests:
            cpu: 100m
            memory: 100Mi
          limits:
            cpu: 100m
            memory: 100Mi
        livenessProbe:
```

```
  tcpSocket:
    port: 80



env:
- name: DB_HOST
  valueFrom:
    configMapKeyRef:
      name: app-deployment
      key: DB_HOST
ports:
- containerPort:  80
  name:  app-deployment
```

Apply the Manifest:

Apply the YAML manifest to the Kubernetes cluster using the command:

k apply -f .\nginx-alpine.yaml

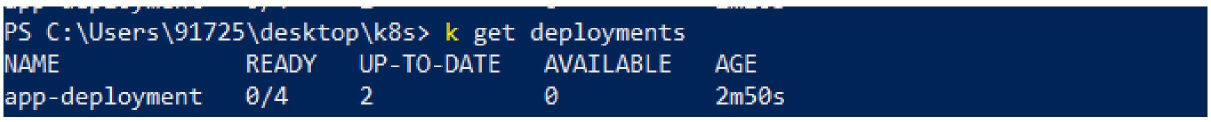


```
PS C:\Users\91725\desktop\k8s> k apply -f .\nginx-alpine.yaml
deployment.apps/app-deployment created
```

Verify the Deployment:

Check the status of the Deployment to ensure it's created successfully:

k get deployments



```
PS C:\Users\91725\desktop\k8s> k get deployments
NAME             READY   UP-TO-DATE   AVAILABLE   AGE
app-deployment   0/4     2            0           2m50s
```

5. Explain how to automatically roll back to the previous version using the "app-deployment."

Automatically rolling back to the previous version using a Kubernetes Deployment can be achieved by taking advantage of the Deployment's rollout feature. Kubernetes Deployment allows you to manage updates to your application by controlling the rollout process.

Here's how you can configure automatic rollback to the previous version using a Deployment:

Define the Deployment: First, define your Deployment manifest (app-deployment.yaml), including the desired image version, replicas, and other specifications.

Update the Deployment: When you need to update the application to a new version, apply the new Deployment manifest using kubectl apply -f app-deployment.yaml.

Rollback Conditions: Kubernetes provides various conditions under which a rollback can occur automatically. Some common rollback conditions include:

--rollback-to: You can manually trigger a rollback by specifying the previous revision to rollback to.

--max-surge and --max-unavailable: These options control the rate of change during a rollout. If the rollout fails, Kubernetes can use these parameters to determine whether to proceed with the rollout or initiate a rollback.

Monitor Rollout Status: Monitor the rollout status using kubectl rollout status deployment/app-deployment.

Trigger Rollback: If the rollout encounters issues or fails, Kubernetes will automatically trigger a rollback based on the configured conditions. If you need to manually trigger a rollback, you can use the kubectl rollout undo command, specifying the deployment name.

```
kubectl rollout undo deployment/app-deployment
```

Verify Rollback: After triggering the rollback, monitor the rollout status again to ensure that Kubernetes successfully rolls back to the previous version.

6. Describe the differences between a ClusterIP service and a LoadBalancer service, providing a use case for each

ClusterIP Service:

Description: A ClusterIP service exposes the application internally within the cluster using a virtual IP address. It is only accessible from within the cluster and is not exposed to the external network.

Use Case: A common use case for a ClusterIP service is when you have microservices architecture and want to enable communication between different services within the cluster. For example, if you have a frontend service that needs to communicate with a backend API service, you can create a ClusterIP service for the backend API to allow the frontend service to access it.

LoadBalancer Service:

Description: A LoadBalancer service exposes the application externally to the cluster by provisioning a load balancer from the cloud provider's infrastructure. It distributes incoming traffic across multiple backend pods and provides high availability and scalability.

Use Case: A typical use case for a LoadBalancer service is when you want to expose your application to the internet and distribute incoming traffic across multiple backend pods for scalability and fault tolerance. For example, if you have a web application that needs to be accessible from the internet, you can create a LoadBalancer service to expose it, allowing users to access the application from their browsers.

In summary, ClusterIP services are suitable for internal communication between services within the cluster, while LoadBalancer services are ideal for exposing applications to the external network, providing scalability and high availability.