LAB1

A.1 Prerequisites for working with Kubernetes

The following tools and utilities are needed to work with Kubernetes.
In addition to Kubernetes itself, we need to install kubectl. The kubectl is a command line utility which allows interacting with Kubernetes control plane and allows doing virtually anything with Kubernetes.

CONFIGURE KUBECTL
To get started go ahead and install Minikube as described at https://kubernetes.io/docs/tasks/tools/install-kubectl/. If you are macOS or Linux user you can complete the installation process in one step using homebrew package manager using the following command:

A.2 Install minikube and create a cluster

Minikube is an application that allows you to run a single-node Kubernetes cluster on your desktop or laptop machine. Installation instructions are available at https://minikube.sigs.k8s.io/docs/start/

https://kubernetes.io/docs/tasks/tools/install-minikube/

LAB2

Working with pod

CREATING A NAMESPACE FROM A YAML FILE
First, create a **custom-namespace.yaml** file with the following listing's contents (you'll find the file in the book's code archive).

```
apiVersion: v1
kind: Namespace
metadata:
  name: custom-namespace
```

Creating a simple YAML descriptor for a pod nxinig-pod.yaml

```
kind: Pod
apiVersion: v1
metadata:
  name: nginx
spec:
  containers:
  - name: nginx
    image: nginx:1.11
    ports:
    - containerPort: 80
      protocol: TCP
```

Using kubectl create to create the pod

To create the pod from your YAML file, use the kubectl create command:

```
$ kubectl create -f nginix-pod.yaml -n custom-namespace
```

Use the following command to see the full descriptor of the pod and take a little time to inspect the output

```
$ kubectl get po nginx -o yaml -n custom-namespace
```

Let's list pods to see their statuses:

```
$ kubectl get po -n custom-namespace
NAME                     READY   STATUS    RESTARTS   AGE
nginx                    1/1     Running   0          2m14s
```

Set up the following alias:

```
$ alias kcd='kubectl config set-context $(kubectl config
current-context) --namespace '
```

Set the custom-namespace as default

```
$  kcd custom-namespace
Context "minikube" modified.
$ kubectl get po
NAME    READY   STATUS    RESTARTS   AGE
nginx   1/1     Running   0          84s
```

FORWARDING A LOCAL NETWORK PORT TO A PORT IN THE POD

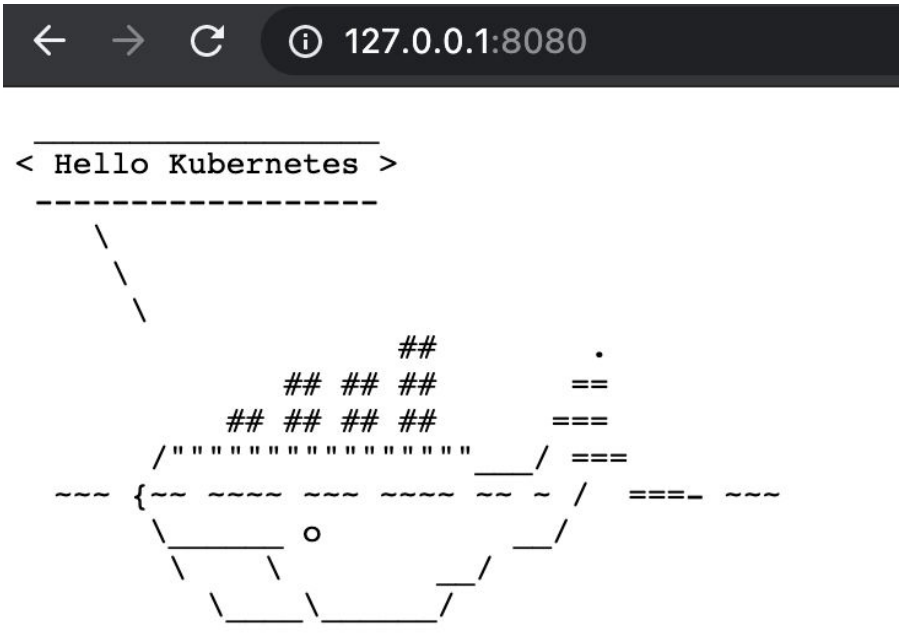
The following command will forward your machine's local port 8080 to port 80 of your nginix pod:

```
$ kubectl get po
NAME                        READY   STATUS    RESTARTS   AGE
nginx                       1/1     Running   0          171m
$ kubectl port-forward nginx 8080:80
Forwarding from 127.0.0.1:8080 -> 80
Forwarding from [::1]:8080 -> 80
```

Open a new shell to get the log

```
$ kubectl logs po/nginx -f
```

The port forwarder is running and you can now connect to your pod through the local port.



See the log:

```
$ kubectl logs po/nginx -f
127.0.0.1 - - [29/Nov/2020:21:46:19 +0000] "GET / HTTP/1.1" 200
425 "-" "Mozilla/5.0 (Macintosh; Intel Mac OS X 11_0_0)
```

```
AppleWebKit/537.36 (KHTML, like Gecko) Chrome/86.0.4240.198
Safari/537.36" "-"
127.0.0.1 - -
[...]
```

Deleting pods by deleting the whole namespace

```
$ kcd default
Context "minikube" modified.
```

Stop the port forwarder typing Ctrl+c

Delete your namespace "custom-namespace"

```
$ kubectl delete ns custom-namespace
namespace "custom-namespace" deleted


$ kubectl get ns
NAME              STATUS   AGE
default           Active   57d
kube-node-lease   Active   57d
kube-public       Active   57d
kube-system       Active   57d
```

LAB3

Creating a ReplicationController

create a YAML file called **kubia-rc.yam**l for your ReplicationController

```
apiVersion: v1
kind: ReplicationController
metadata:
  name: kubia
spec:
  replicas: 3
  selector:
    app: kubia
  template:
    metadata:
      labels:
        app: kubia
    spec:
      containers:
      - name: kubia
        image: luksa/kubia
        ports:
        - containerPort: 8080
```

Use the kubectl create command to create your ReplicationController

```
$ kubectl create -f kubia-rc.yaml
replicationcontroller/kubia created
$ kubectl get po
NAME          READY   STATUS    RESTARTS   AGE
kubia-9cbh4   1/1     Running   0          116s
kubia-d7c8m   1/1     Running   0          116s
kubia-hwmt8   1/1     Running   0          116s
```

Try to delete a pod to see how the ReplicationController spins up a new one immediately

```
$ kubectl delete pod kubia-9cbh4
pod "kubia-9cbh4" deleted

$ kubectl get pod
NAME          READY   STATUS        RESTARTS   AGE
kubia-9cbh4   1/1     Terminating   0          13m
kubia-9gjdj   1/1     Running       0          27s
kubia-d7c8m   1/1     Running       0          13m
kubia-hwmt8   1/1     Running       0          13m
```

Now, let's see what information the kubectl get command shows for ReplicationControllers

```
$ kubectl get rc
NAME    DESIRED   CURRENT   READY   AGE
kubia   3         3         3       15m
```

You can see additional information about your ReplicationController with the kubectl describe command, as shown in the following listing.

```
$ kubectl describe rc kubia
Name:         kubia
Namespace:    default
Selector:     app=kubia
Labels:       app=kubia
Annotations:  <none>
Replicas:     3 current / 3 desired
Pods Status:  3 Running / 0 Waiting / 0 Succeeded / 0 Failed
Pod Template:
  Labels:  app=kubia
  Containers:
   kubia:
    Image:        luksa/kubia
    Port:         8080/TCP
    Host Port:    0/TCP
    Environment:  <none>
    Mounts:       <none>
  Volumes:        <none>
Events:
  Type    Reason            Age   From                    Message
  ----    ------            ----  ----                    -------
  Normal  SuccessfulCreate  17m   replication-controller  Created
pod: kubia-hwmt8
  Normal  SuccessfulCreate  17m   replication-controller  Created
pod: kubia-9cbh4
  Normal  SuccessfulCreate  17m   replication-controller  Created
pod: kubia-d7c8m
  Normal  SuccessfulCreate  5m1s  replication-controller  Created
pod: kubia-9gjdj
```

Your ReplicationController has been keeping three instances of your pod running. Try to scale that number up to 10 now manually.

```
$ kubectl scale rc kubia --replicas=10
```

```
$ kubectl get po
NAME          READY   STATUS              RESTARTS   AGE
kubia-9gjdj   1/1     Running             0          8m45s
kubia-bdt9h   0/1     ContainerCreating   0          7s
```

```
kubia-bmz6g   0/1     ContainerCreating   0          7s
kubia-d7c8m   1/1     Running             0          21m
kubia-hwmt8   1/1     Running             0          21m
kubia-pbm7g   1/1     Running             0          7s
kubia-pp2lc   0/1     ContainerCreating   0          7s
kubia-tvt92   1/1     Running             0          7s
kubia-wzxnq   0/1     ContainerCreating   0          7s
kubia-zgh9r   0/1     ContainerCreating   0          7s
```

Scaling your ReplicationController by editing it's definition

```
$ kubectl edit rc kubia
replicationcontroller/kubia edited
```

Set the value of
Spec:
  Replicas: 3

```
$ kubectl get po
NAME          READY   STATUS    RESTARTS   AGE
kubia-9gjdj   1/1     Running   0          14m
kubia-d7c8m   1/1     Running   0          27m
kubia-hwmt8   1/1     Running   0          27m
```

Delete your ReplicationControllet without deleting associated pod (--cascade=false)

```
$ kubectl delete rc kubia --cascade=false
replicationcontroller "kubia" deleted

$ kubectl get pod
NAME          READY   STATUS    RESTARTS   AGE
kubia-9gjdj   1/1     Running   0          18m
kubia-d7c8m   1/1     Running   0          30m
kubia-hwmt8   1/1     Running   0          30m
```

You'll rewrite your ReplicationController into a ReplicaSet by creating a new file called **kubia-replicaset.yaml** with the contents in the following listing.

```
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: kubia
spec:
  replicas: 3
  selector:
    matchLabels:
      app: kubia
```

```
  template:
    metadata:
      labels:
        app: kubia
    spec:
      containers:
      - name: kubia
        image: luksa/kubia

$ kubectl create -f kubia-replicaset.yaml
replicaset.apps/kubia created

$ kubectl describe rs kubia
Name:         kubia
Namespace:    default
Selector:     app=kubia
Labels:       <none>
Annotations:  <none>
Replicas:     3 current / 3 desired
Pods Status:  3 Running / 0 Waiting / 0 Succeeded / 0 Failed
Pod Template:
  Labels:  app=kubia
  Containers:
   kubia:
    Image:        luksa/kubia
    Port:         <none>
    Host Port:    <none>
    Environment:  <none>
    Mounts:       <none>
  Volumes:        <none>
Events:           <none>
```

Try to delete an other pod:

```
$ kubectl delete pod kubia-9gjdj
pod "kubia-9gjdj" deleted

$ kubectl get po
NAME          READY   STATUS        RESTARTS   AGE
kubia-9gjdj   1/1     Terminating   0          24m
kubia-d7c8m   1/1     Running       0          37m
kubia-dv7h9   1/1     Running       0          5s
kubia-hwmt8   1/1     Running       0          37m
```

Clean all.

LAB 4

- Create a new ReplicaSet or ReplicationController with a desired number of replicas, based on pod used to check the HTTP-based liveness probe (Creating an HTTP-based liveness probe)

LAB 5

If not already active create a new ReplicaSet

```
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: kubia
spec:
  replicas: 3
  selector:
    matchLabels:
      app: kubia
  template:
    metadata:
      labels:
        app: kubia
    spec:
      containers:
      - name: kubia
        image: luksa/kubia
```

```
$ kubectl create -f kubia-replicaset.yaml
replicaset.apps/kubia created
```

Create a file called **kubia-svc.yaml** with the following listing's contents.

```
apiVersion: v1
kind: Service
metadata:
  name: kubia
spec:
  ports:
  - port: 80
    targetPort: 8080
  selector:
    app: kubia
```

After posting the YAML, you can list all Service resources in your namespace and see that an internal cluster IP has been assigned to your service:

```
$ kubectl get service
NAME         TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)    AGE
kubia        ClusterIP   10.102.158.76   <none>        80/TCP     16s
```

REMOTELY EXECUTING COMMANDS IN RUNNING CONTAINERS

be sure to replace the pod name and the service IP with your own:

```
$ kubectl get pod
NAME          READY   STATUS    RESTARTS   AGE
kubia-b2v5k   1/1     Running   0          57m
kubia-hst84   1/1     Running   0          57m
kubia-l55vf   1/1     Running   0          57m

$ kubectl exec kubia-hst84 -- curl -s http://10.102.158.76
126
You've hit kubia-l55vf
```

Using DNS

You can use the kubectl exec command to run bash (or any other shell) inside a pod's container.

```
$ kubectl get po
NAME          READY   STATUS    RESTARTS   AGE
kubia-b2v5k   1/1     Running   0          74m
kubia-hst84   1/1     Running   0          74m
kubia-l55vf   1/1     Running   0          74m

kubectl exec -it kubia-b2v5k bash
kubectl exec [POD] [COMMAND] is DEPRECATED and will be removed in
a future version. Use kubectl exec [POD] -- [COMMAND] instead.
root@kubia-b2v5k:/# curl http://kubia.default.svc.cluster.local
You've hit kubia-l55vf
root@kubia-b2v5k:/# curl http://kubia.default
You've hit kubia-hst84
```

Look at the /etc/resolv.conf file in the container and you'll understand:

```
root@kubia-b2v5k:/# cat /etc/resolv.conf
nameserver 10.96.0.10
```

LAB6