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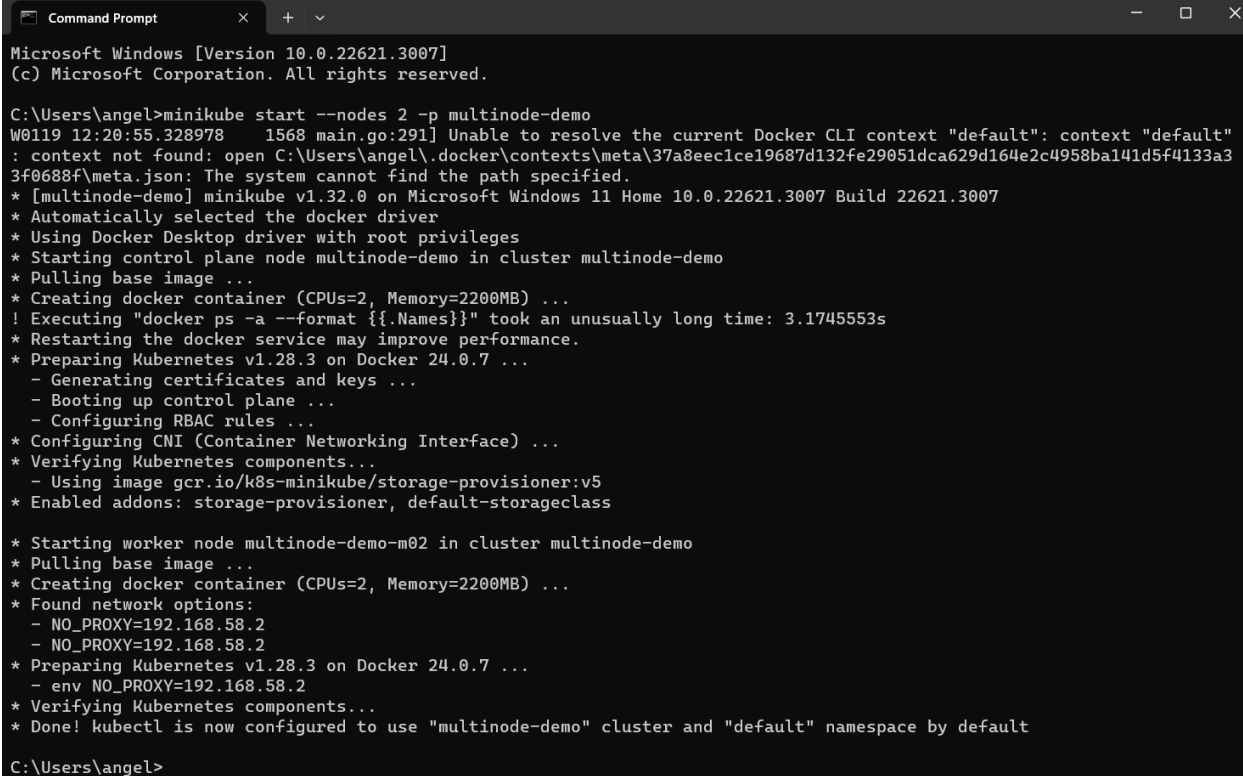
ID Number: 101483544

BCDV 4032 Building Scalable Blockchain Apps

Lab 3

Run a multi-node cluster using the commands above. Submission should include screenshots for each command.

minikube start --nodes 2 -p multinode-demo



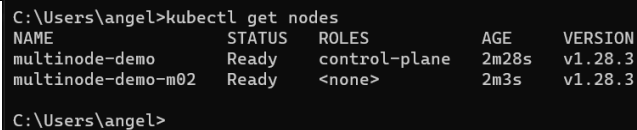
```
Microsoft Windows [Version 10.0.22621.3007]
(c) Microsoft Corporation. All rights reserved.

C:\Users\angel>minikube start --nodes 2 -p multinode-demo
W0119 12:20:55.328978      1568 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\angel\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a3
3f0688f\meta.json: The system cannot find the path specified.
* [multinode-demo] minikube v1.32.0 on Microsoft Windows 11 Home 10.0.22621.3007 Build 22621.3007
* Automatically selected the docker driver
* Using Docker Desktop driver with root privileges
* Starting control plane node multinode-demo in cluster multinode-demo
* Pulling base image ...
* Creating docker container (CPUs=2, Memory=2200MB) ...
! Executing "docker ps -a --format {{.Names}}" took an unusually long time: 3.1745553s
* Restarting the docker service may improve performance.
* Preparing Kubernetes v1.28.3 on Docker 24.0.7 ...
  - Generating certificates and keys ...
  - Booting up control plane ...
  - Configuring RBAC rules ...
* Configuring CNI (Container Networking Interface) ...
* Verifying Kubernetes components...
  - Using image gcr.io/k8s-minikube/storage-provisioner:v5
* Enabled addons: storage-provisioner, default-storageclass

* Starting worker node multinode-demo-m02 in cluster multinode-demo
* Pulling base image ...
* Creating docker container (CPUs=2, Memory=2200MB) ...
* Found network options:
  - NO_PROXY=192.168.58.2
  - NO_PROXY=192.168.58.2
* Preparing Kubernetes v1.28.3 on Docker 24.0.7 ...
  - env NO_PROXY=192.168.58.2
* Verifying Kubernetes components...
* Done! kubectl is now configured to use "multinode-demo" cluster and "default" namespace by default

C:\Users\angel>
```

kubectl get nodes



```
C:\Users\angel>kubectl get nodes
NAME                STATUS    ROLES    AGE   VERSION
multinode-demo      Ready    control-plane   2m28s   v1.28.3
multinode-demo-m02  Ready    <none>        2m3s    v1.28.3

C:\Users\angel>
```

minikube status -p multinode-demo

```
C:\Users\angel>minikube status -p multinode-demo
W0119 12:24:36.135663 30728 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\angel\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a3
3f0688f\meta.json: The system cannot find the path specified.
multinode-demo
type: Control Plane
host: Running
kubelet: Running
apiserver: Running
kubeconfig: Configured

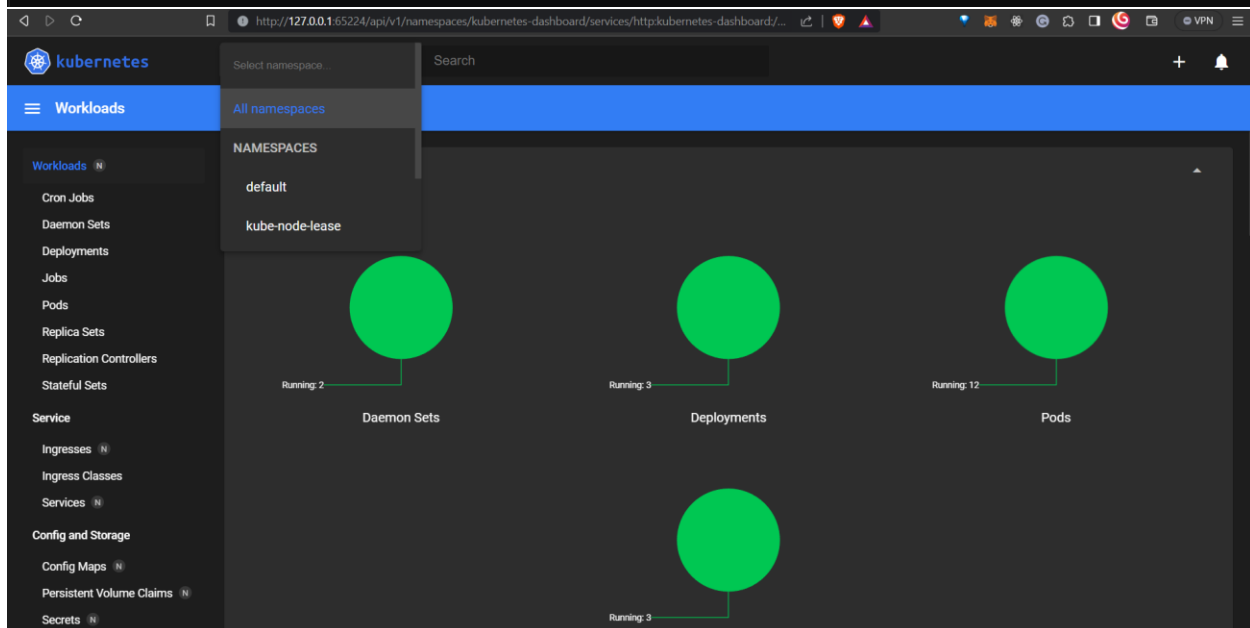
multinode-demo-m02
type: Worker
host: Running
kubelet: Running
```

minikube dashboard -p multinode-demo

```
C:\Users\angel>minikube dashboard -p multinode-demo
W0119 12:25:34.581914 23888 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\angel\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a3
3f0688f\meta.json: The system cannot find the path specified.
* Enabling dashboard ...
  - Using image docker.io/kubernetesui/metrics-scraper:v1.0.8
  - Using image docker.io/kubernetesui/dashboard:v2.7.0
* Some dashboard features require the metrics-server addon. To enable all features please run:

    minikube -p multinode-demo addons enable metrics-server

* Verifying dashboard health ...
* Launching proxy ...
* Verifying proxy health ...
* Opening http://127.0.0.1:65224/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/ in yo
ur default browser...
```



minikube stop -p multinode-demo

```
C:\Users\angel>minikube stop -p multinode-demo
W0119 12:29:47.246310 24416 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\angel\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a3
3f0688f\meta.json: The system cannot find the path specified.
* Stopping node "multinode-demo" ...
* Powering off "multinode-demo" via SSH ...
* Stopping node "multinode-demo-m02" ...
* Powering off "multinode-demo-m02" via SSH ...
* 2 nodes stopped.

C:\Users\angel>
```

minikube delete --all

```
C:\Users\angel>minikube delete --all
W0119 12:30:38.680529 17476 main.go:291] Unable to resolve the current Docker CLI context "default": context "default"
: context not found: open C:\Users\angel\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a3
3f0688f\meta.json: The system cannot find the path specified.
* Deleting "minikube" in docker ...
* Removing C:\Users\angel\.minikube\machines\minikube ...
* Removed all traces of the "minikube" cluster.
* Deleting "multinode-demo" in docker ...
* Removing C:\Users\angel\.minikube\machines\multinode-demo ...
* Removing C:\Users\angel\.minikube\machines\multinode-demo-m02 ...
* Removed all traces of the "multinode-demo" cluster.
* Successfully deleted all profiles

C:\Users\angel>
```

Run all types of deployment YAML commands separately. Submission should include screenshots for each command.

Replica Set YAML and apply.

```
replicaset.yaml
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: nginx
  labels:
    app: nginx
    tier: lb
spec:
  replicas: 3
  selector:
    matchLabels:
      tier: lb
  template:
    metadata:
      labels:
        tier: lb
    spec:
      containers:
        - name: nginx-replicaset
          image: nginx
```

```
kubectl apply -f replicaset.yaml
```

```
Windows PowerShell
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl apply -f replicaset.yaml
replicaset.apps/nginx created
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |
```

```
kubectl get pods
```

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
nginx-dlj5n    1/1     Running   0           109s
nginx-h6hbt    1/1     Running   0           109s
nginx-pwl4b    1/1     Running   0           109s
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |
```

Delete a pod in the ReplicaSet

```
kubectl delete pod nginx-pwl4b
```

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl delete pod nginx-pwl4b
pod "nginx-pwl4b" deleted
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |
```

```
kubectl get pods
```

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
nginx-6x9dr    1/1     Running   0           52s
nginx-dlj5n    1/1     Running   0           6m44s
nginx-h6hbt    1/1     Running   0           6m44s
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |
```

```
kubectl get replicaset
```

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl get replicaset
NAME      DESIRED   CURRENT   READY   AGE
nginx     3         3         3       7m30s
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |
```

Deployment YAML with ReplicaSet

```
deployment.yaml
```

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
  labels:
    app: nginx
spec:
  replicas: 3
```

```

selector:
  matchLabels:
    app: nginx
template:
  metadata:
    labels:
      app: nginx
  spec:
    containers:
      - name: nginx
        image: nginx:1.14.2
        ports:
          - containerPort: 80

```

kubectl apply -f deployment.yaml

```

PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl apply -f deployment.yaml
deployment.apps/nginx-deployment created
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |

```

kubectl get deployments

```

PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl get deployments
NAME                READY   UP-TO-DATE   AVAILABLE   AGE
nginx-deployment    3/3     3             3           29s
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |

```

kubectl rollout status deployment nginx-deployment

```

PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl rollout status deployment nginx-deployment
deployment "nginx-deployment" successfully rolled out
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |

```

StatefulSet YAML

statefulset.yaml

```

apiVersion: v1
kind: Service
metadata:
  name: nginx
  labels:
    app: nginx
spec:
  ports:
    - port: 80
      name: web
  clusterIP: None
  selector:

```

```

    app: nginx
---
apiVersion: apps/v1
kind: StatefulSet
metadata:
  name: web
spec:
  selector:
    matchLabels:
      app: nginx # has to match .spec.template.metadata.labels
  serviceName: "nginx"
  replicas: 3 # by default is 1
  template:
    metadata:
      labels:
        app: nginx # has to match .spec.selector.matchLabels
    spec:
      terminationGracePeriodSeconds: 10
      containers:
        - name: nginx
          image: k8s.gcr.io/nginx-slim:0.8
          ports:
            - containerPort: 80
              name: web
          volumeMounts:
            - name: www
              mountPath: /usr/share/nginx/html
  volumeClaimTemplates:
    - metadata:
        name: www
      spec:
        accessModes: ["ReadWriteOnce"]
        storageClassName: "my-storage-class"
        resources:
          requests:
            storage: 1Gi

```

```
kubectl apply -f statefulset.yaml
```

```

PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl apply -f statefulset.yaml
service/nginx created
statefulset.apps/web created
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |

```

```
kubectl get statefulsets
```

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl get statefulsets
NAME    READY    AGE
web     0/3      33s
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |
```

DaemonSet YAML

Daemonset.yaml

```
apiVersion: apps/v1
kind: DaemonSet
metadata:
  name: nginx
spec:
  selector:
    matchLabels:
      name: nginx-lb
  template:
    metadata:
      labels:
        name: nginx-lb
    spec:
      containers:
        - name: nginx
          image: nginx
```

kubectl apply -f daemonset.yaml

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl apply -f daemonset.yaml
daemonset.apps/nginx created
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |
```

kubectl get daemonset

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl get daemonset
NAME    DESIRED    CURRENT    READY    UP-TO-DATE    AVAILABLE    NODE SELECTOR    AGE
nginx   1           1           1         1              1            <none>           41s
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |
```

Deployment example with resource limits.

deployment-resource-limit.yaml

```
apiVersion: apps/v1
kind: Deployment
metadata:
```

```

name: nginx-deployment
labels:
  app: nginx
spec:
  replicas: 3
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
        - name: nginx
          image: nginx:1.14.2
          ports:
            - containerPort: 80
          resources:
            limits:
              memory: "256Mi"
              cpu: "200m"
            requests:
              memory: "128Mi"
              cpu: "100m"

```

kubectl apply -f deployment-resource-limit.yaml

```

Windows PowerShell
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl apply -f deployment-resource-limit.yaml
deployment.apps/nginx-deployment configured
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |

```

kubectl get deployments

```

PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl get deployments
NAME                READY   UP-TO-DATE   AVAILABLE   AGE
nginx-deployment    3/3     3             3           47m
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |

```

Deployment with health checks.

deployment-healthcheck.yaml

```

apiVersion: apps/v1
kind: Deployment
metadata:

```



```
name: nginx-deployment
labels:
  app: nginx
spec:
  replicas: 3
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
      - name: nginx
        image: nginx:1.14.2
        ports:
        - containerPort: 80
        livenessProbe:
          httpGet:
            path: /
            port: 80
          initialDelaySeconds: 15
          periodSeconds: 10
        readinessProbe:
          httpGet:
            path: /
            port: 80
          initialDelaySeconds: 5
          periodSeconds: 5
```

kubectl apply -f deployment-healthcheck.yaml

```
Windows PowerShell
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl apply -f deployment-healthcheck.yaml
deployment.apps/nginx-deployment configured
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |
```

kubectl get deployments

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> kubectl get deployments
NAME                READY    UP-TO-DATE    AVAILABLE    AGE
nginx-deployment    3/3      3              3            54m
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3> |
```

Run the full-stack application deployment as provided in the attached instructions.

- Submission should include screenshots for each command.

```
kubectl apply -f secrets/mongodb-secret.yml
```

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> kubectl apply -f secrets/mongodb-secret.yml
secret/mongodb-secret created
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> |
```

```
kubectl apply -f stateful-sets/mongodb-stateful-set.yml
```

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> kubectl apply -f stateful-sets/mongodb-stateful-set.yml
statefulset.apps/mongodb-stateful-set created
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> |
```

```
kubectl apply -f services/mongodb-service.yml
```

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> kubectl apply -f services/mongodb-service.yml
service/mongodb-service created
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> |
```

```
kubectl apply -f deployments/note-server-depl.yml
```

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> kubectl apply -f deployments/note-server-depl.yml
deployment.apps/note-server-deployment created
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> |
```

If everything is working properly you would be able to see the message connected to DB in the server pod logs.

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> kubectl apply -f deployments/note-server-depl.yml
deployment.apps/note-server-deployment created
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
mongodb-stateful-set-0              1/1     Running   0           4m53s
mongodb-stateful-set-1              1/1     Running   0           4m38s
note-server-deployment-6fb5fcb67f-txm2f  1/1     Running   0           3m18s
note-server-deployment-6fb5fcb67f-z8kvp  1/1     Running   0           3m18s
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> kubectl logs note-server-deployment-6fb5fcb67f-z8kvp
> note-server@1.0.0 start
> node index.js

(node:25) [MONGODB] DeprecationWarning: Mongoose: the 'strictQuery' option will be switched back to 'false' by default in Mongoose 7. Use 'mongoose.set('strictQuery', false);' if you want to prepare for this change. Or use 'mongoose.set('strictQuery', true);' to suppress this warning.
(Use 'node --trace-deprecation ...' to show where the warning was created)
Server is listening...
Connected to DB
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes>
```

```
kubectl apply -f services/note-server-service.yml
```

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> kubectl apply -f services/note-server-service.yml
service/note-server-service created
```

```
kubectl apply -f deployments/note-depl.yml
```

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> kubectl apply -f deployments/note-depl.yml
deployment.apps/note-deployment created
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes>
```

```
kubectl apply -f services/note-service.yml
```

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> kubectl apply -f services/note-service.yml
service/note-service created
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes>
```

minikube service note-service

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> minikube service note-service
W0120 14:51:38.116020 21052 main.go:291] Unable to resolve the current Docker CLI context "default": context "default":
context not found: open C:\Users\angel\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a33f06
88f\meta.json: The system cannot find the path specified.
```

NAMESPACE	NAME	TARGET PORT	URL
default	note-service	3000	http://192.168.49.2:31223

★ Starting tunnel for service note-service.

NAMESPACE	NAME	TARGET PORT	URL
default	note-service		http://127.0.0.1:60517

🌐 Opening service default/note-service in default browser...

! Because you are using a Docker driver on windows, the terminal needs to be open to run it.



Important Assignments 📄



kubectl apply -f deployments/mongo-express-depl.yml

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> kubectl apply -f deployments/mongo-express-depl.y
ml
deployment.apps/mongo-express-deployment created
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes>
```

kubectl apply -f services/mongo-express-service.yml

minikube service mongo-express-service

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> kubectl apply -f services/mongo-express-service.y
ml
service/mongo-express-service created
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes>
```

minikube service mongo-express-service

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> minikube service mongo-express-service
W0120 15:34:40.413279 29080 main.go:291] Unable to resolve the current Docker CLI context "default": context "default":
context not found: open C:\Users\angel\.docker\contexts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a33f06
88f\meta.json: The system cannot find the path specified.

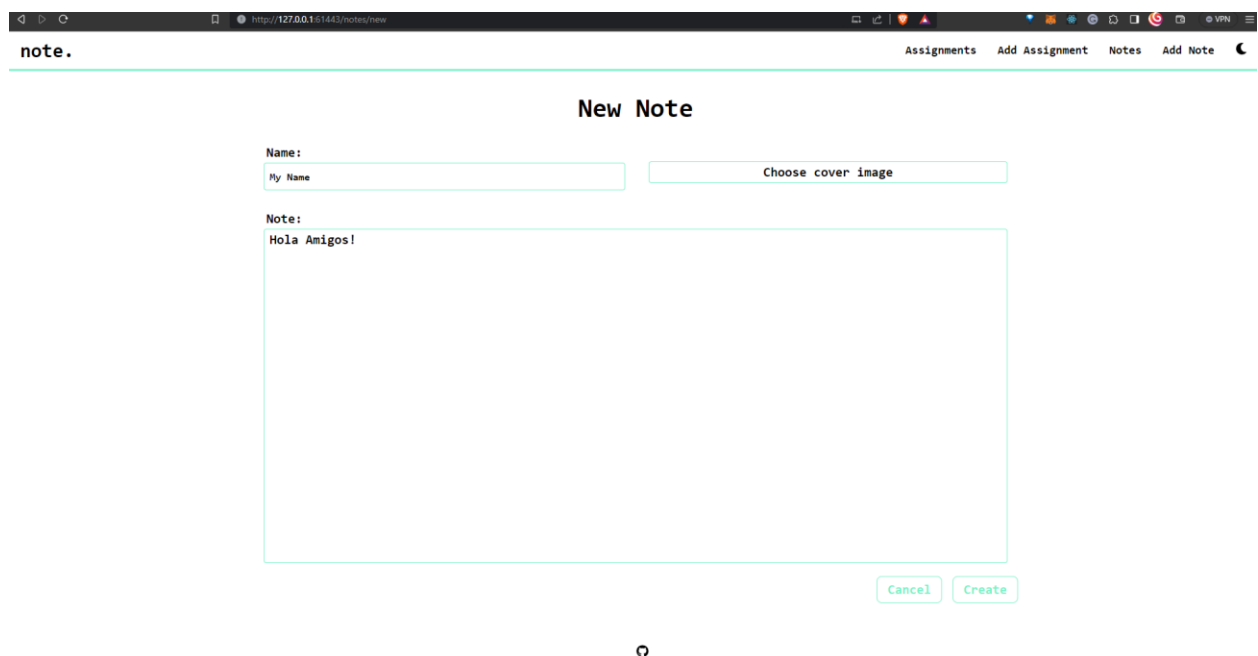
-----
| NAMESPACE | NAME           | TARGET PORT | URL                |
|-----|-----|-----|-----|
| default | mongo-express-service | 8081 | http://192.168.49.2:30518 |
|-----|-----|-----|-----|

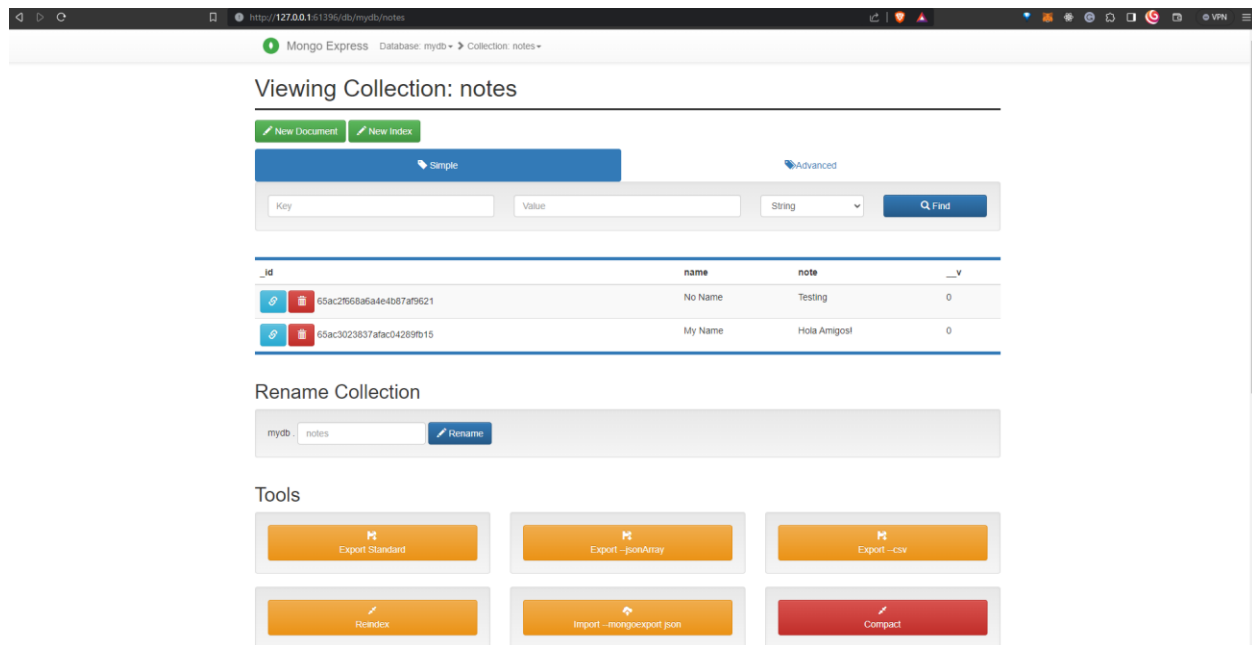
★ Starting tunnel for service mongo-express-service.

-----
| NAMESPACE | NAME           | TARGET PORT | URL                |
|-----|-----|-----|-----|
| default | mongo-express-service |  | http://127.0.0.1:61396 |
|-----|-----|-----|-----|

🌐 Opening service default/mongo-express-service in default browser...
! Because you are using a Docker driver on windows, the terminal needs to be open to run it.
```

- Screenshot with the Front end of the application open.





- **Task: Bring down note-depp pod. Demonstrate using a screenshot if a new pod has started.**

kubectl get pods

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
mongo-express-deployment-b88f6d45f-fnhcb  1/1     Running   0           52m
mongodb-stateful-set-0                 1/1     Running   0           66m
mongodb-stateful-set-1                 1/1     Running   0           66m
note-deployment-74cc946cd8-csxw7        1/1     Running   0           57m
note-deployment-74cc946cd8-z97lq        1/1     Running   0           57m
note-server-deployment-6fb5fcb67f-txm2f  1/1     Running   0           64m
note-server-deployment-6fb5fcb67f-z8kvp  1/1     Running   0           64m
```

kubectl delete pod note-deployment-74cc946cd8-csxw7

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> kubectl delete pod note-deployment-74cc946cd8-csxw7
pod "note-deployment-74cc946cd8-csxw7" deleted
```

kubectl get pods

```
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
mongo-express-deployment-b88f6d45f-fnhcb  1/1     Running   0           56m
mongodb-stateful-set-0                 1/1     Running   0           69m
mongodb-stateful-set-1                 1/1     Running   0           69m
note-deployment-74cc946cd8-fdh65         1/1     Running   0           12s
note-deployment-74cc946cd8-z97lq        1/1     Running   0           61m
note-server-deployment-6fb5fcb67f-txm2f  1/1     Running   0           68m
note-server-deployment-6fb5fcb67f-z8kvp  1/1     Running   0           68m
PS C:\Users\angel\OneDrive\Desktop\BCDV-4032\Lab3\kubernetes\kubernetes> |
```