

# Report for SCD Lab Exam

21i-1111

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SE-P

**The YAML Files are for Kubernetes, Jenkinsfile for Jenkins and Dockerfile and docker-compose.yml file for docker parts**

ISSUE:

Aoa Maam, I mailed you and also talked to you about the issue regarding the port forwarding and engress due to which it does not allow me to access any of my deployed services. Whenever I do try its time out and the following picture proves it that I cant do port forwarding on anything.

```
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl get services -n exam
NAME                TYPE        CLUSTER-IP      EXTERNAL-IP      PORT(S)          AGE
auth-service        NodePort    10.107.179.224   <none>            3112:32501/TCP   3m28s
classrooms-service  NodePort    10.107.111.134   <none>            3113:31266/TCP   3m28s
client-service      NodePort    10.107.249.67    <none>            4111:30535/TCP   3m28s
event-bus-service   NodePort    10.106.171.64    <none>            3111:31162/TCP   3m28s
mongo               NodePort    10.106.65.112    <none>            27017:31900/TCP  3m28s
post-service        NodePort    10.108.142.27    <none>            3114:31773/TCP   3m28s
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl port-forward service/client-service 4111:4111 -n exam
error: timed out waiting for the condition
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl port-forward service/event-bus-service 3111:3111 -n exam
error: timed out waiting for the condition
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl port-forward service/auth-service 3112:3112 -n exam
error: timed out waiting for the condition
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl port-forward service/classrooms-service 3113:3113 -n exam
error: timed out waiting for the condition
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl port-forward service/post-service 3114:3114 -n exam
error: timed out waiting for the condition
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl get pods -n exam
NAME                READY   STATUS    RESTARTS   AGE
my-app-deployment-7d9777cfff-nn4kp  6/6     Running   0           30m
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> |
```

This issue started when I did the SCD assignment 3 where I did some things to make the assignment work but when I deleted it and reinstalled Minikube for paper its started having issue and I wasn't able to resolve it from a day before paper and even within paper and playground was out of the questions since I had limited time and playground would have taken a major portion of it.

SO because of the I wasn't able to do the testing part in Kubernetes but you can cross verify the yaml files with other people because its defined correctly.

Step:3 Creating Docker Containers:

**Assumptions:**

**Since my roll number is 1111**

**I added 2000 to the roll number for the backend ports and added 1 to make them separate.**

**For Frontend I couldn't use 1111 since Window detects anything running as trojan on it for some reason so I added 3000 since 2111 is already used and 3111 is being used for backend. So my frontend port is 4111**

**These were modifications were made directly to the code given to us.**

Frontend Docker files:

```
# Use an official Node runtime as the base image
FROM node:14 as build

# Set the working directory in the container to /app
WORKDIR /app

# Copy package.json and package-lock.json to the working directory
COPY package*.json ./

# Install any needed packages specified in package.json
RUN npm install

# Copy the current directory contents into the container at /app
COPY . .

# Build the app
RUN npm run build

# Start a new stage from scratch
FROM node:14

# Install serve
RUN npm install -g serve

# Set the working directory in the container to /app
WORKDIR /app

# Copy the build directory from the previous stage
COPY --from=build /app/build .

# Make port 5000 available to the world outside this container
EXPOSE 4111

# Run the app when the container launches
CMD ["serve", "-s", ".", "-l", "4111"]
```

This is the frontend docker file for the client folder react app.

Backend Docker files:

```

FROM node:14

# Set the working directory in the container
WORKDIR /app

# Copy package.json and package-lock.json
COPY package*.json ./

# Install any needed packages specified in package.json
RUN npm install

# Bundle the app source inside the Docker image
# (Make sure you have a .dockerignore file)
COPY . .

# Make port 4009 available to the world outside this container
EXPOSE 3112

# Define the command to run the app
CMD [ "node", "index.js" ]

```

File for Auth folder.

```

FROM node:14

# Set the working directory in the container
WORKDIR /app

# Copy package.json and package-lock.json
COPY package*.json ./

# Install any needed packages specified in package.json
RUN npm install

# Bundle the app source inside the Docker image
# (Make sure you have a .dockerignore file)
COPY . .

# Make port 4009 available to the world outside this container
EXPOSE 3113

# Define the command to run the app
CMD [ "node", "index.js" ]

```

File for classrooms backend

```

1 # Use an official Node.js runtime as a parent image
2 FROM node:14
3
4 # Set the working directory in the container
5 WORKDIR /app
6
7 # Copy package.json and package-lock.json
8 COPY package*.json ./
9
10 # Install any needed packages specified in package.json
11 RUN npm install
12
13 # Bundle the app source inside the Docker image
14 # (Make sure you have a .dockerignore file)
15 COPY . .
16
17 # Make port 4009 available to the world outside this container
18 EXPOSE 3111
19
20 # Define the command to run the app
21 CMD [ "node", "index.js" ]

```

File for event bus backend

```

1 # Use an official Node.js runtime
2 FROM node:14
3
4 # Set the working directory in the
5 WORKDIR /app
6
7 # Copy package.json and package-lock.json
8 COPY package*.json ./
9
10 # Install any needed packages specified in package.json
11 RUN npm install
12
13 # Bundle the app source inside the container
14 # (Make sure you have a .dockerignore file)
15 COPY . .
16
17 # Make port 4009 available to the host
18 EXPOSE 3114
19
20 # Define the command to run the application
21 CMD [ "node", "index.js" ]

```

Posts folder docker file

## Docker Compose File:

```

version: '3'
services:
  auth:
    build:
      context: ./Auth
      dockerfile: Dockerfile
    ports:
      - 3112:3112

  classrooms:
    build:
      context: ./Classrooms
      dockerfile: Dockerfile
    ports:
      - 3113:3113

  post:
    build:
      context: ./Post
      dockerfile: Dockerfile
    ports:
      - 3114:3114

  event-bus:
    build:
      context: ./event-bus
      dockerfile: Dockerfile
    ports:
      - 3111:3111

  client:
    build:
      context: ./client
      dockerfile: Dockerfile
    ports:
      - 4111:4111

  mongo:
    image: mongo
    ports:
      - 27017:27017

```








Docker compose file for the whole application to containerize it.

```

PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> docker compose up
[*] Running 9/9
✓ mongo 8 layers [██████████] 0B/0B Pulled
25.5s
✓ 7646c8da3324 Pull complete 2.4s
✓ 11f24a004130 Pull complete 0.8s
✓ 1dfe8821fc6 Pull complete 1.0s
✓ bd2b135d9110 Pull complete 1.7s
✓ 76154bf34598 Pull complete 6.9s
✓ a91134489020 Pull complete 2.5s
✓ f41fa78f4cf9 Pull complete 14.3s
✓ d91b3273507c Pull complete 3.2s
[*] Building 0.0s (0/0) docker:default
2024/06/05 13:29:39 http2: server: error reading preface from client //./pipe/docker_engine: file has already been closed
2024/06/05 13:29:39 http2: server: error reading preface from client //./pipe/docker_engine: file has already been closed
[*] Building 0.0s (0/0) docker:default
[*] Building 0.0s (0/0) docker:default reading preface from client //./pipe/docker_engine: file has already been closed
[*] Building 0.0s (0/0) docker:default reading preface from client //./pipe/docker_engine: file has already been closed
[*] Building 0.0s (0/0) docker:default reading preface from client //./pipe/docker_engine: file has already been closed
[*] Building 99.8s (43/43) FINISHED
docker:default
=> [post internal] load build definition from Dockerfile 0.0s
=> => transferring dockerfile: 626B 0.0s
=> [post internal] load metadata for docker.io/library/node:14 1.9s
=> [classrooms internal] load build definition from Dockerfile 0.0s
=> => transferring dockerfile: 626B 0.0s
=> [client internal] load build definition from Dockerfile 0.0s
=> => transferring dockerfile: 882B 0.0s
=> [auth internal] load build definition from Dockerfile 0.0s
=> => transferring dockerfile: 606B 0.0s
=> [event-bus internal] load build definition from Dockerfile 0.0s

```

## Docker compose up

<input type="checkbox"/>		<b>scd-final-lab-exam-talalhabib123</b>	
<input type="checkbox"/>		<b>classrooms-1</b>	<a href="#">scd-final-lab-exam-talalhabib123-classrooms</a>
<input type="checkbox"/>		<b>client-1</b>	<a href="#">scd-final-lab-exam-talalhabib123-client</a>
<input type="checkbox"/>		<b>auth-1</b>	<a href="#">scd-final-lab-exam-talalhabib123-auth</a>
<input type="checkbox"/>		<b>post-1</b>	<a href="#">scd-final-lab-exam-talalhabib123-post</a>
<input type="checkbox"/>		<b>event-bus-1</b>	<a href="#">scd-final-lab-exam-talalhabib123-event-bus</a>
<input type="checkbox"/>		<b>mongo-1</b>	<a href="#">mongo</a>

Running Docker Container with an mongo container for the local database.

## Step 4: Jenkins Pipeline

```

pipeline {
  stages {
    stage('Build Docker Images') {
      steps {
        script {
          def services = ['auth', 'classrooms', 'post', 'event-bus', 'client']
          for (service in services) {
            // Start of step for 21I-1111
            bat "docker build -t ${service} ./${service}"
            // End of step for 21I-1111
          }
        }
      }
    }
    stage('Push Docker Images') {
      steps {
        withCredentials([usernamePassword(credentialsId: 'badd24f7-ad18-40df-8508-73eff65a3b05', usernameVariable: 'User', passwordVariable: 'Pass'))] {
          script {
            def services = ['auth', 'classrooms', 'post', 'event-bus', 'client']
            for (service in services) {
              // Start of step for 21I-1111
              bat "docker login -u %User% -p %Pass%"
              bat "docker tag ${service} %User%/${service}"
              bat "docker push %User%/${service}"
              // End of step for 21I-1111
            }
          }
        }
      }
    }
  }
}

```

This pipeline loops through all the folder of my repo and makes the images and tags them with my docker hub username and pushes it to the Docker Hub.

Each step has my roll number at the start and at the end

Build #1

[Rebuild](#)
[Console](#)
[Configure](#)

Pipeline

Details
 

- Manually run by Talal Habib Malik
- Started 2 min 45 sec ago
- Queued 19 ms
- Took 1 min 55 sec

```

latest: digest: sha256:b53a33ed8085e8cd54d71e4abd1
[Pipeline] }
[Pipeline] // script
[Pipeline] }
[Pipeline] // withCredentials
[Pipeline] }
[Pipeline] // stage
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // node
[Pipeline] End of Pipeline
Finished: SUCCESS

```

My pipeline was successfully built and all my images were pushed to my docker hub.

<b>talalhabib123 / client</b> Contains: Image • Last pushed: 7 minutes ago	☆ 0	↓ 9	Public	Scout inactive
<b>talalhabib123 / event-bus</b> Contains: Image • Last pushed: 7 minutes ago	☆ 0	↓ 6	Public	Scout inactive
<b>talalhabib123 / post</b> Contains: Image • Last pushed: 7 minutes ago	☆ 0	↓ 7	Public	Scout inactive
<b>talalhabib123 / classrooms</b> Contains: Image • Last pushed: 8 minutes ago	☆ 0	↓ 6	Public	Scout inactive
<b>talalhabib123 / auth</b> Contains: Image • Last pushed: 8 minutes ago	☆ 0	↓ 9	Public	Scout inactive

My docker images on docker hub.

Step 5 Deployment and Services

```

apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: mongo-pvc
  namespace: exam
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 1Gi
---
apiVersion: apps/v1
kind: Deployment
metadata:
  name: my-app-deployment
  namespace: exam
spec:
  replicas: 1
  selector:
    matchLabels:
      app: my-app
  template:
    metadata:
      labels:
        app: my-app
    spec:
      containers:
        - name: auth
          image: talalhabib123/auth
          ports:
            - containerPort: 3112
        - name: classrooms
          image: talalhabib123/classrooms
          ports:
            - containerPort: 3113
        - name: client
          image: talalhabib123/client
          ports:
            - containerPort: 4111
        - name: event-bus
          image: talalhabib123/event-bus
          ports:
            - containerPort: 3111
        - name: post
          image: talalhabib123/post
          ports:
            - containerPort: 3114
        - name: mongodb
          image: mongo
          ports:
            - containerPort: 27017
          volumeMounts:
            - name: mongo-storage
              mountPath: /data/db
          volumes:
            - name: mongo-storage
              persistentVolumeClaim:
                claimName: mongo-pvc

```

Created a Kubernetes deployment file which specifies all the container of the application to run inside one pod and also to create a mongo container as well which

```

Administrator: Windows PowerShell
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl apply -f 21I_1111_deployment_21I_1111.yaml
persistentvolumeclaim/mongo-pvc created
deployment.apps/my-app-deployment created

```

Deployment Created.



```

PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl get deployments -n exam
NAME                                READY    UP-TO-DATE    AVAILABLE    AGE
my-app-deployment                  1/1      1              1             5m4s
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl get pods -n exam
NAME                                READY    STATUS    RESTARTS    AGE
my-app-deployment-7d9777cff-nn4kp  6/6      Running   0            5m15s
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> |

```

This verifies that our deployment was done successfully and we have 6 deployments inside one pod, which include Frontend (client), Backend (auth, event-bus, posts, classrooms), and MongoDB as well.

All of this is being performed inside a Namespace to isolate it in the cluster and namespace being used is exam

```

PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl get
NAME            STATUS    AGE
default         Active    159m
exam            Active    11m
kube-node-lease Active    159m
kube-public     Active    159m
kube-system     Active    159m
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> |

```

Creating Services:

```

---
apiVersion: v1
kind: Service
metadata:
  name: auth-service
  namespace: exam
spec:
  selector:
    app: my-app
    name: auth
  ports:
    - protocol: TCP
      port: 3112
      targetPort: 3112
  type: NodePort
---
apiVersion: v1
kind: Service
metadata:
  name: classrooms-service
  namespace: exam
spec:
  selector:
    app: my-app
    name: classrooms
  ports:
    - protocol: TCP
      port: 3113
      targetPort: 3113
  type: NodePort
---

```

These are not all of our services but this yaml file specifies the services of our deployments.

```

PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl apply -f 21I_1111_service_21I_1111.yaml
service/auth-service created
service/classrooms-service created
service/client-service created
service/event-bus-service created
service/post-service created
service/mongo created
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl get services -n exam

```

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
auth-service	NodePort	10.107.179.224	<none>	3112:32501/TCP	21s
classrooms-service	NodePort	10.107.111.134	<none>	3113:31266/TCP	21s
client-service	NodePort	10.107.249.67	<none>	4111:30535/TCP	21s
event-bus-service	NodePort	10.106.171.64	<none>	3111:31162/TCP	21s
mongo	NodePort	10.106.65.112	<none>	27017:31900/TCP	21s
post-service	NodePort	10.108.142.27	<none>	3114:31773/TCP	21s

```

PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123>

```

The above command in the screenshot is used to create the services for all of our deployments from the yaml file above.

```
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl get deployments -n exam
NAME                READY   UP-TO-DATE   AVAILABLE   AGE
my-app-deployment   1/1     1             1           31m
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl scale deployment my-app-deployment --replicas=3 -n exam
deployment.apps/my-app-deployment scaled
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> |
```

Here we are scaling the application and all of its components within the pod.

Observing how the cluster has redistributed the workload

```
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl get pods -n exam -o wide
NAME                                READY   STATUS              RESTARTS   AGE   IP            NODE     NOMINATED NODE   READINESS GATES
my-app-deployment-7d9777cff-6cbr4   5/6     CrashLoopBackOff    5 (107s ago)  5m24s  10.244.0.7    minikube <none>           <none>
my-app-deployment-7d9777cff-nn4kp    6/6     Running              0           37m   10.244.0.6    minikube <none>           <none>
my-app-deployment-7d9777cff-nsbbs   5/6     CrashLoopBackOff    5 (111s ago)  5m24s  10.244.0.8    minikube <none>           <none>
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> |
```

mongodb:

Container ID:

docker://3da015facbd938cf36c66f0ccf1d3ba1a75716ea6b1e124f3f94e2846955ecf3

Image: mongo

Image ID: docker-

pullable://mongo@sha256:108cd0d7867ba32559a3a2c4b353183f7076042369a85c67aab3f7c52d  
fc2783

Port: 27017/TCP

Host Port: 0/TCP

State: Waiting

Reason: CrashLoopBackOff

Last State: Terminated

Reason: Error

Exit Code: 100

Started: Wed, 05 Jun 2024 14:49:00 +0500

Finished: Wed, 05 Jun 2024 14:49:00 +0500

Ready: False

Restart Count: 4

Environment: <none>

Mounts:

/data/db from mongo-storage (rw)

/var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-xkdz (ro)

During scaling it is observed that the cluster is waiting for the MongoDB to scale since it crashed.

The testing part wasn't able to do because of the issue I mentioned before. And in the email as well so kindly consider and cross verify.

## Kubernetes Dashboard:

Using Kubernetes dashboard to monitor deployed applications and cluster health.

Setting it up

```
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl apply -f https://raw.githubusercontent.com/kubernetes/dashboard/v2.0.0-beta8/aio/deploy/recommended.yaml
namespace/kubernetes-dashboard created
serviceaccount/kubernetes-dashboard created
service/kubernetes-dashboard created
secret/kubernetes-dashboard-certs created
secret/kubernetes-dashboard-csrf created
secret/kubernetes-dashboard-key-holder created
configmap/kubernetes-dashboard-settings created
role.rbac.authorization.k8s.io/kubernetes-dashboard created
clusterrole.rbac.authorization.k8s.io/kubernetes-dashboard created
rolebinding.rbac.authorization.k8s.io/kubernetes-dashboard created
clusterrolebinding.rbac.authorization.k8s.io/kubernetes-dashboard created
Warning: spec.template.spec.nodeSelector[beta.kubernetes.io/os]: deprecated since v1.14; use "kubernetes.io/os" instead
deployment.apps/kubernetes-dashboard created
service/dashboard-metrics-scraper created
Warning: spec.template.metadata.annotations[seccomp.security.alpha.kubernetes.io/pod]: non-functional in v1.27+; use the "seccompProfile" field instead
deployment.apps/dashboard-metrics-scraper created
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> |
```

Pulling yaml files from github

```
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> kubectl apply -f 21I_1111_dashboard-admin_21I_1111.yaml
serviceaccount/dashboard-admin-sa created
clusterrolebinding.rbac.authorization.k8s.io/dashboard-admin-sa created
PS C:\Users\talal\Downloads\scd-final-lab-exam-TalalHabib123> |
```

Creating an admin dashboard service

Started kubectl proxy to access the dashboard and was given this

```
127.0.0.1:8001
Pretty print
{
  "paths": [
    "/well-known/openid-configuration",
    "/api",
    "/api/v1",
    "/api",
    "/api",
    "/api/admissionregistration.k8s.io",
    "/api/admissionregistration.k8s.io/v1",
    "/api/apixextensions.k8s.io",
    "/api/apixextensions.k8s.io/v1",
    "/api/apiregistration.k8s.io",
    "/api/apiregistration.k8s.io/v1",
    "/api/apps",
    "/api/apps/v1",
    "/api/authentication.k8s.io",
    "/api/authentication.k8s.io/v1",
    "/api/authorization.k8s.io",
    "/api/authorization.k8s.io/v1",
    "/api/autoscaling",
    "/api/autoscaling/v1",
    "/api/autoscaling/v2",
    "/api/batch",
    "/api/batch/v1",
    "/api/certificates.k8s.io",
    "/api/certificates.k8s.io/v1",
    "/api/coordination.k8s.io",
    "/api/coordination.k8s.io/v1",
    "/api/discovery.k8s.io",
    "/api/discovery.k8s.io/v1",
    "/api/events.k8s.io",
    "/api/events.k8s.io/v1",
    "/api/fluentd.k8s.io",
    "/api/fluentd.k8s.io/v1",
    "/api/fluentd.k8s.io/v1beta3",
    "/api/networking.k8s.io",
    "/api/networking.k8s.io/v1",
    "/api/node.k8s.io",
    "/api/node.k8s.io/v1",
    "/api/policy",
    "/api/policy/v1",
    "/api/rbac.authorization.k8s.io",
    "/api/rbac.authorization.k8s.io/v1",
    "/api/scheduling.k8s.io",
    "/api/scheduling.k8s.io/v1",
    "/api/storage.k8s.io",
    "/api/storage.k8s.io/v1",
    "/health",
    "/health/autoregister-completion",
    "/health/etcd",
    "/health/ping",
    "/health/poststarthook/aggretor-reload-proxy-client-cert",
    "/health/poststarthook/apiservice-discovery-controller",
    "/health/poststarthook/apiservice-openapi-controller",
    "/health/poststarthook/apiservice-openapi-controller",
    "/health/poststarthook/apiservice-registration-controller",
    "/health/poststarthook/apiservice-status-available-controller",
    "/health/poststarthook/auditlog-controller",
    "/health/poststarthook/crd-informer-sync",
    "/health/poststarthook/generic-apiserver-start-informers",
    "/health/poststarthook/kube-apiserver-autoregistration",
    "/health/poststarthook/priority-and-fairness-config-consumer",
    "/health/poststarthook/priority-and-fairness-config-producer"
  ]
}
```

These are paths where I check and see specific things of the cluster

```
# HELP aggregator_discovery_aggregation_count_total [ALPHA] Counter of number of times discovery was aggregated
# TYPE aggregator_discovery_aggregation_count_total counter
aggregator_discovery_aggregation_count_total 2
# HELP aggregator_unavailable_apiservice [ALPHA] Gauge of APIServices which are marked as unavailable broken down by APIService name.
# TYPE aggregator_unavailable_apiservice gauge
aggregator_unavailable_apiservice{name="v1."} 0
aggregator_unavailable_apiservice{name="v1.admissionregistration.k8s.io"} 0
aggregator_unavailable_apiservice{name="v1.apixtensions.k8s.io"} 0
aggregator_unavailable_apiservice{name="v1.apps"} 0
aggregator_unavailable_apiservice{name="v1.authentication.k8s.io"} 0
aggregator_unavailable_apiservice{name="v1.authorization.k8s.io"} 0
aggregator_unavailable_apiservice{name="v1.autoscaling"} 0
aggregator_unavailable_apiservice{name="v1.batch"} 0
aggregator_unavailable_apiservice{name="v1.certificates.k8s.io"} 0
aggregator_unavailable_apiservice{name="v1.coordination.k8s.io"} 0
aggregator_unavailable_apiservice{name="v1.discovery.k8s.io"} 0
aggregator_unavailable_apiservice{name="v1.events.k8s.io"} 0
aggregator_unavailable_apiservice{name="v1.flowcontrol.apiserver.k8s.io"} 0
aggregator_unavailable_apiservice{name="v1.networking.k8s.io"} 0
aggregator_unavailable_apiservice{name="v1.node.k8s.io"} 0
aggregator_unavailable_apiservice{name="v1.policy"} 0
aggregator_unavailable_apiservice{name="v1.rbac.authorization.k8s.io"} 0
aggregator_unavailable_apiservice{name="v1.scheduling.k8s.io"} 0
aggregator_unavailable_apiservice{name="v1.storage.k8s.io"} 0
aggregator_unavailable_apiservice{name="v1beta3.flowcontrol.apiserver.k8s.io"} 0
aggregator_unavailable_apiservice{name="v2.autoscaling"} 0
# HELP apixtensions_apiserver_validation_ratcheting_seconds [ALPHA] Time for comparison of old to new for the purposes of CRDValidationRatcheting during an UPDATE in s
# TYPE apixtensions_apiserver_validation_ratcheting_seconds histogram
apixtensions_apiserver_validation_ratcheting_seconds_bucket{le="1e-05"} 0
apixtensions_apiserver_validation_ratcheting_seconds_bucket{le="4e-05"} 0
apixtensions_apiserver_validation_ratcheting_seconds_bucket{le="0.00016"} 0
apixtensions_apiserver_validation_ratcheting_seconds_bucket{le="0.00064"} 0
apixtensions_apiserver_validation_ratcheting_seconds_bucket{le="0.00256"} 0
apixtensions_apiserver_validation_ratcheting_seconds_bucket{le="0.01024"} 0
apixtensions_apiserver_validation_ratcheting_seconds_bucket{le="0.04096"} 0
apixtensions_apiserver_validation_ratcheting_seconds_bucket{le="0.16384"} 0
apixtensions_apiserver_validation_ratcheting_seconds_bucket{le="0.65536"} 0
apixtensions_apiserver_validation_ratcheting_seconds_bucket{le="2.62144"} 0
apixtensions_apiserver_validation_ratcheting_seconds_bucket{le="+Inf"} 0
apixtensions_apiserver_validation_ratcheting_seconds_sum 0
apixtensions_apiserver_validation_ratcheting_seconds_count 0
# HELP apiserver_admission_controller_admission_duration_seconds [STABLE] Admission controller latency histogram in seconds, identified by name and broken out for each
# TYPE apiserver_admission_controller_admission_duration_seconds histogram
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateApproval",operation="UPDATE",rejected="false",type="validate",le="0.005"} 7046
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateApproval",operation="UPDATE",rejected="false",type="validate",le="0.025"} 7046
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateApproval",operation="UPDATE",rejected="false",type="validate",le="0.1"} 7046
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateApproval",operation="UPDATE",rejected="false",type="validate",le="0.5"} 7046
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateApproval",operation="UPDATE",rejected="false",type="validate",le="1"} 7046
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateApproval",operation="UPDATE",rejected="false",type="validate",le="2.5"} 7046
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateApproval",operation="UPDATE",rejected="false",type="validate",le="+Inf"} 7046
apiserver_admission_controller_admission_duration_seconds_sum{name="CertificateApproval",operation="UPDATE",rejected="false",type="validate"} 0.00137142300000000122
apiserver_admission_controller_admission_duration_seconds_count{name="CertificateApproval",operation="UPDATE",rejected="false",type="validate"} 7046
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateSigning",operation="UPDATE",rejected="false",type="validate",le="0.005"} 7046
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateSigning",operation="UPDATE",rejected="false",type="validate",le="0.025"} 7046
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateSigning",operation="UPDATE",rejected="false",type="validate",le="0.1"} 7046
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateSigning",operation="UPDATE",rejected="false",type="validate",le="0.5"} 7046
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateSigning",operation="UPDATE",rejected="false",type="validate",le="1"} 7046
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateSigning",operation="UPDATE",rejected="false",type="validate",le="2.5"} 7046
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateSigning",operation="UPDATE",rejected="false",type="validate",le="+Inf"} 7046
apiserver_admission_controller_admission_duration_seconds_sum{name="CertificateSigning",operation="UPDATE",rejected="false",type="validate"} 0.00120340300000000083
apiserver_admission_controller_admission_duration_seconds_count{name="CertificateSigning",operation="UPDATE",rejected="false",type="validate"} 7046
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateSubjectRestriction",operation="CREATE",rejected="false",type="validate",le="0.005"} 27
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateSubjectRestriction",operation="CREATE",rejected="false",type="validate",le="0.025"} 27
apiserver_admission_controller_admission_duration_seconds_bucket{name="CertificateSubjectRestriction",operation="CREATE",rejected="false",type="validate",le="0.1"} 278
```

These are the metrics of the cluster

We can also use minikube dashboard to monitor which is a more simplified version of this

Events								
	Name	Reason	Message	Source	Sub-object	Count	First Seen	Last Seen ↑
●	my-app-deployment-7d9777cff-nsbbs.17d612aed1de141f	BackOff	Back-off restarting failed container mongodb in pod my-app-deployment-7d9777cff-nsbbs_exam(e071e189-3515-43a9-8929-fd3ecb184abc)	kubelet minikube	spec.containers(mongodb)	90	21 minutes ago	2 minutes ago
	my-app-deployment.17d612fd4f900918	ScalingReplicaSet	Scaled down replica set my-app-deployment-7d9777cff to 2 from 3	deployment-controller	-	1	15 minutes ago	15 minutes ago
	my-app-deployment-7d9777cff.17d612fd4fe37778	SuccessfulDelete	Deleted pod: my-app-deployment-7d9777cff-6cbr4	replicaset-controller	-	1	15 minutes ago	15 minutes ago
●	my-app-deployment-7d9777cff-6cbr4.17d612ae5823e8a4	BackOff	Back-off restarting failed container mongodb in pod my-app-deployment-7d9777cff-6cbr4_exam(7c89973d-84db-4f57-8c1f-4c0b2c275e811)	kubelet minikube	spec.containers(mongodb)	22	21 minutes ago	17 minutes ago
	my-app-deployment-7d9777cff-nsbbs.17d612adcad872ae	Started	Started container mongodb	kubelet minikube	spec.containers(mongodb)	1	21 minutes ago	21 minutes ago
	my-app-deployment-7d9777cff-nsbbs.17d612adc816d7bb	Created	Created container mongodb	kubelet minikube	spec.containers(mongodb)	1	21 minutes ago	21 minutes ago
	my-app-deployment-7d9777cff-nsbbs.17d612adc671ce86	Pulled	Successfully pulled image 'mongo' in 2.136s (9.015s including waiting). Image size: 796928306 bytes.	kubelet minikube	spec.containers(mongodb)	1	21 minutes ago	21 minutes ago
	my-app-deployment-7d9777cff-nsbbs.17d612abad17ba3b	Pulling	Pulling image 'mongo'	kubelet minikube	spec.containers(mongodb)	2	21 minutes ago	21 minutes ago
	my-app-deployment-7d9777cff-6cbr4.17d612ab3a6a8160	Pulling	Pulling image 'mongo'	kubelet minikube	spec.containers(mongodb)	2	21 minutes ago	21 minutes ago
	my-app-deployment-7d9777cff-6cbr4.17d612ad4bb6713e	Started	Started container mongodb	kubelet minikube	spec.containers(mongodb)	1	21 minutes ago	21 minutes ago
							1 - 10 of 87	<div><div>&lt;&lt;</div><div>&lt;</div><div>&gt;</div><div>&gt;&gt;</div></div>

Monitoring of my namespace in which my pod is located.

Step 6 Additional Things:

### Resource and Requests Limits:

```
spec:
  containers:
  - name: auth
    image: talalhabib123/auth
    ports:
    - containerPort: 3112
    resources:
      requests:
        memory: "64Mi"
        cpu: "250m"
      limits:
        memory: "128Mi"
        cpu: "500m"
  - name: classrooms
    image: talalhabib123/classrooms
    ports:
    - containerPort: 3113
    resources:
      requests:
        memory: "64Mi"
        cpu: "250m"
      limits:
        memory: "128Mi"
        cpu: "500m"
  - name: client
    image: talalhabib123/client
    ports:
```

For this each container was given instructions to take this much memory and cpu at the start and also specify the maximum resource limits for it

### Annotations and labels:

```

12
13 ---
14 apiVersion: apps/v1
15 kind: Deployment
16 metadata:
17   name: my-app-deployment
18   namespace: exam
19   labels:
20     app: my-app
21     environment: production
22   annotations:
23     description: "This is my application"
24     version: "1.0"
25 spec:
26   replicas: 1
27   selector:
28     matchLabels:
29       app: my-app
30   template:
31     metadata:
32       labels:
33         app: my-app
34         environment: production
35       annotations:
36         description: "This is my application"
37         version: "1.0"
38     spec:
39       containers:
40       - name: auth
41         image: talalhabib123/auth
42         ports:
43         - containerPort: 3112

```

I have added labels specified annotations as well to give it more ease to integrate with other tools.

### Health Checks:

For the health checks we don't specifically need to do anything as cluster is already monitoring our applications and only forward it if they running and also restarts its in the event that there a issue with a container, so its automatically restarts it as well.