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Assignment-5

Docker and Kubernetes:The container masterclass

(url: https://hub.docker.com/repository/docker/tanc2002/simple-webapp/general)

Problem Statement:

Deploy Containers Using Kubectl, use Kubectl to create and launch Deployments, Replication Controllers and expose them via Services without writing yaml definitions. Deploy A Containerized Web Application On Kubernetes.

1) Package your app into a Docker image

2) Run the container locally on your machine (optional)

3) Upload the image to a registry

4) Create a container cluster

5) Deploy your app to the cluster

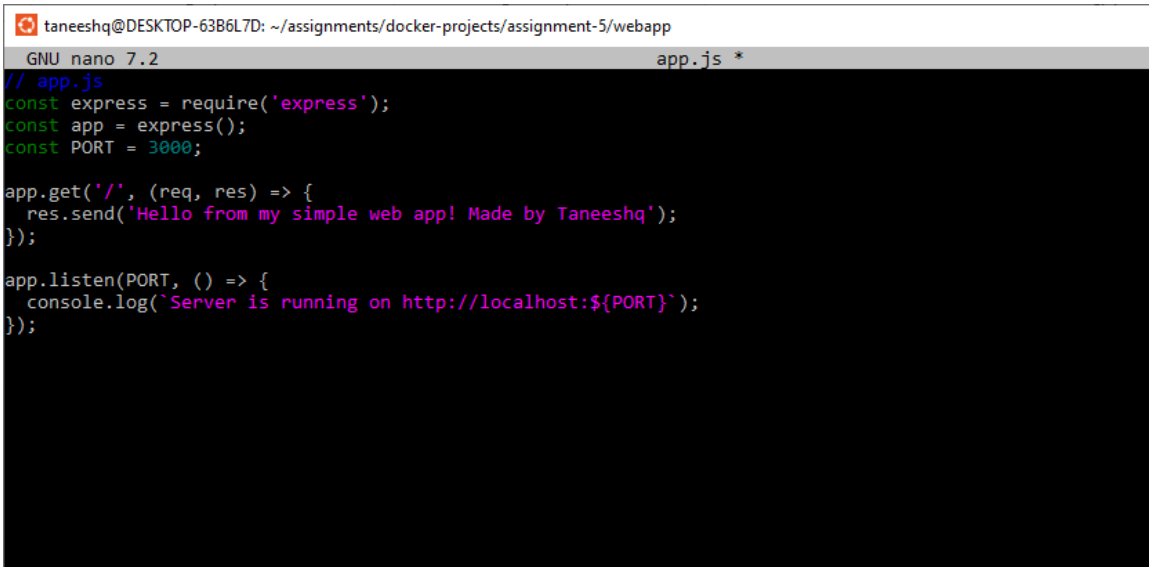
6) Expose your app to the Internet

7) Scale up your deployment

8) Deploy a new version of your app

Methodology:

Step 1: Created a simple webapp using node and express js to be deployed and ran it locally.



```
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects$ mkdir assignment-4
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects$ cd assignment-4
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4$ mkdir webapp
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4$ cd webapp
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ touch app.js
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ npm -v
^C
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ code .
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ npm install express

added 69 packages, and audited 70 packages in 57s

14 packages are looking for funding
  run `npm fund` for details

found 0 vulnerabilities
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ node app.js
Server is running on http://localhost:3000
^C
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ cd ..
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4$ touch Dockerfile
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4$ nano Dockerfile
```

Hello from my simple web app! Made by Taneeshq

Step 2: Create a dockerfile to package the app.

```
taneeshq@DESKTOP-63B6L7D: ~/assignments/docker-projects/assignment-5/webapp
  GNU nano 7.2                                                Dockerfile
FROM node:18

WORKDIR /usr/src/app

COPY package*.json ./

RUN npm install
COPY . .

EXPOSE 3000
CMD ["node", "app.js"]
```

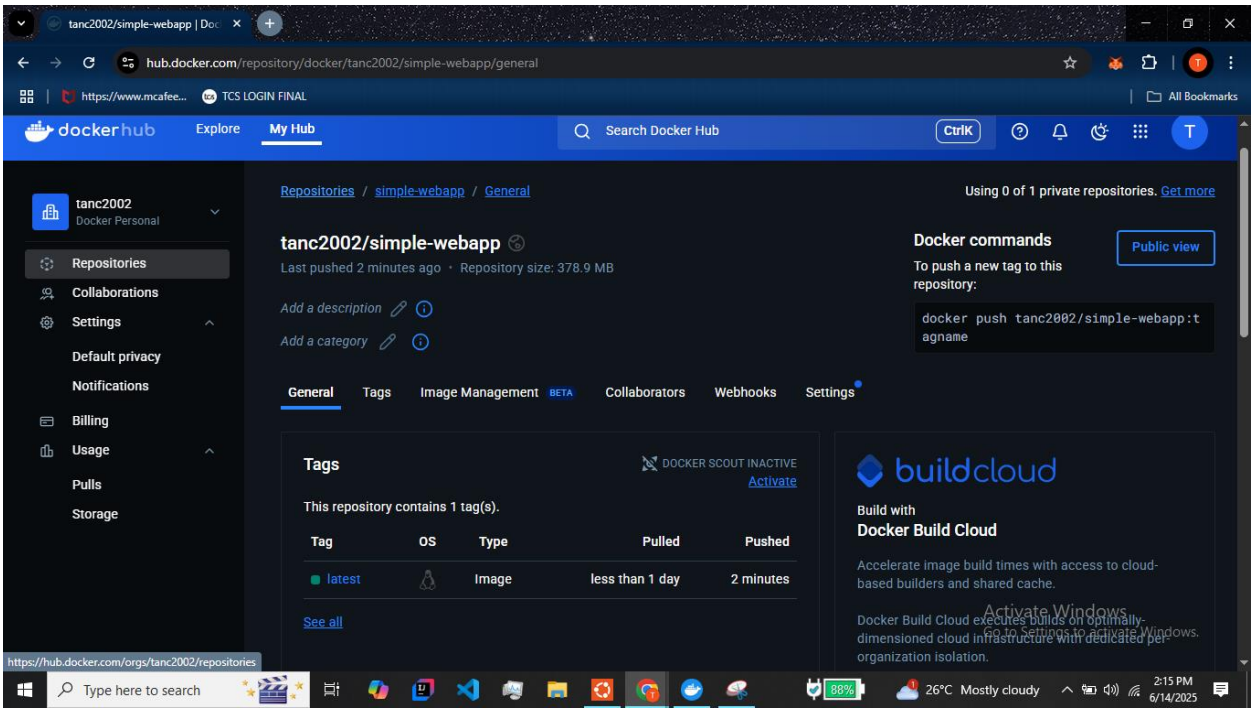
Step 3: Build the image and run the container to verify the image

```
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ docker build -t tanc2002/simple-webapp .
[+] Building 253.6s (11/11) FINISHED                                                                    docker:default
 => [internal] load build definition from Dockerfile                                                           27.9s
 => => transferring dockerfile: 157B                                                                            0.0s
 => [internal] load metadata for docker.io/library/node:18                                                     25.1s
 => [auth] library/node:pull token for registry-1.docker.io                                                     0.0s
 => [internal] load .dockerignore                                                                              18.9s
 => => transferring context: 2B                                                                                 0.0s
 => [1/5] FROM docker.io/library/node:18@sha256:c6ae79e38498325db67193d391e6ec1d224d96c693a8a4d943498556716d3783  15.2s
 => => resolve docker.io/library/node:18@sha256:c6ae79e38498325db67193d391e6ec1d224d96c693a8a4d943498556716d3783  12.6s
 => [internal] load build context                                                                              33.6s
 => => transferring context: 2.31MB                                                                            16.6s
 => CACHED [2/5] WORKDIR /usr/src/app                                                                           0.0s
 => [3/5] COPY package*.json ./                                                                                11.4s
 => [4/5] RUN npm install                                                                                      56.5s
 => [5/5] COPY . .                                                                                             13.2s
 => exporting to image                                                                                         40.3s
 => => exporting layers                                                                                        20.1s
 => => exporting manifest sha256:a9540788f5bf489da07473a3cdda169571f99307d0c7ea7c252a686a7bca9863               4.0s
 => => exporting config sha256:0c1006a16b55d32a24505ce852edeb02271f7e4cab428be82b7951149f3a2b17                 0.9s
 => => exporting attestation manifest sha256:e5ce6b81f45f3d03d2fe020d17f64f5b90d610df00134f4b04c70d1019c57769   3.9s
 => => exporting manifest list sha256:807d10cbe8620de5048554d2acd274189a6cfc412d3b67e38fbbb40bf6ad5d9a         0.7s
 => => naming to docker.io/tanc2002/simple-webapp:latest                                                       0.2s
 => => unpacking to docker.io/tanc2002/simple-webapp:latest                                                    7.3s
```

```
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ docker images
REPOSITORY                    TAG       IMAGE ID       CREATED         SIZE
tanc2002/simple-webapp        latest    807d10cbe862   2 minutes ago   1.58GB
tanc2002/sample-image         latest    ac37338cd04c   5 days ago      214MB
tanc2002/demorep              latest    5bd8e332fec5   5 days ago      214MB
mongo                         latest    15fb53a5160e   10 days ago     1.2GB
gcr.io/k8s-minikube/kicbase   v0.0.47   8311be96a0a8   3 weeks ago     1.86GB
gcr.io/k8s-minikube/kicbase   <none>    6ed579c9292b   3 weeks ago     1.86GB
mongo-express                 latest    1b23d7976f02   15 months ago   286MB
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ docker run -p 3000:3000 tanc2002/simple-weba
pp
Server is running on http://localhost:3000
```

Step 4: Push the image to dockerhub repository so it can be later used in minikube.

```
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ docker push tanc2002/simple-webapp
Using default tag: latest
The push refers to repository [docker.io/tanc2002/simple-webapp]
2132988a132d: Pushed
cda7f44f2bdd: Pushed
f9612ea73c25: Pushed
90dbe95ded0c: Pushed
3697be50c98b: Pushed
37927ed901b1: Pushed
79b2f47ad444: Pushed
e23f099911d6: Pushed
461077a72fb7: Pushed
9ea2970d137a: Pushed
c6b30c3f1696: Pushed
3e6b9d1a9511: Pushed
f9de25446572: Pushed
latest: digest: sha256:807d10cbe8620de5048554d2acd274189a6cfc412d3b67e38fbbb40bf6ad5d9a size: 856
```



Step 5: Start the minikube cluster and create a deployment using the previously pushed image.

```
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ kubectl create deployment webapp --image=tanc2002/simple-webapp

deployment.apps/webapp created
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ kubectl get deployments
NAME         READY   UP-TO-DATE   AVAILABLE   AGE
hello-node   1/1     1            1           104m
webapp       0/1     1            0           45s
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ kubectl get pods
NAME                         READY   STATUS              RESTARTS   AGE
hello-node-69c6fdb9d6-dp2fx  1/1     Running             0          106m
webapp-cdbc47ff5-zm4qp       0/1     ContainerCreating   0          2m8s
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$
```

Step 6: Create a service from the deployment by exposing it on port 3000.

```
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ kubectl expose deployment webapp --type=Node
Port --port=3000
service/webapp exposed
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ kubectl get svc
NAME         TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)          AGE
hello-node   NodePort    10.111.215.62    <none>        8080:32650/TCP   108m
kubernetes   ClusterIP   10.96.0.1        <none>        443/TCP          131m
webapp       NodePort    10.103.100.218   <none>        3000:31219/TCP   48s
```

Step 7: Access the service using minikube. Check the url provided by minikube by pasting it in browser.

```
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ minikube service webapp
❗  Executing "docker container inspect minikube --format={{.State.Status}}" took an unusually long time: 7.349151649s
❗  Restarting the docker service may improve performance.
|-----------|--------|-------------|--------------------------|
| NAMESPACE |  NAME  | TARGET PORT |           URL            |
|-----------|--------|-------------|--------------------------|
| default   | webapp |        3000 | http://192.168.58.2:32430 |
|-----------|--------|-------------|--------------------------|
❗  Starting tunnel for service webapp.
|-----------|--------|-------------|------------------------|
| NAMESPACE |  NAME  | TARGET PORT |          URL           |
|-----------|--------|-------------|------------------------|
| default   | webapp |             | http://127.0.0.1:41701 |
|-----------|--------|-------------|------------------------|
```

Step 8: Scale up the deployment by adding pods. Here I scaled it up to 3 pods.

kubectl scale deployment webapp --replicas=3

```
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ kubectl get pods
NAME                              READY   STATUS              RESTARTS   AGE
hello-node-69c6fdb9d6-dp2fx       1/1     Running             0          144m
webapp-cdbc47ff5-c8t64            1/1     Running             0          20m
webapp-cdbc47ff5-dtvct            0/1     ContainerCreating   0          72s
webapp-cdbc47ff5-hcz2w            0/1     ContainerCreating   0          71s
```

Step 9: Make minute changes in the webapp and push a new image to dockerhub. I just added a tag “v2”. Use the new image to create deployment.

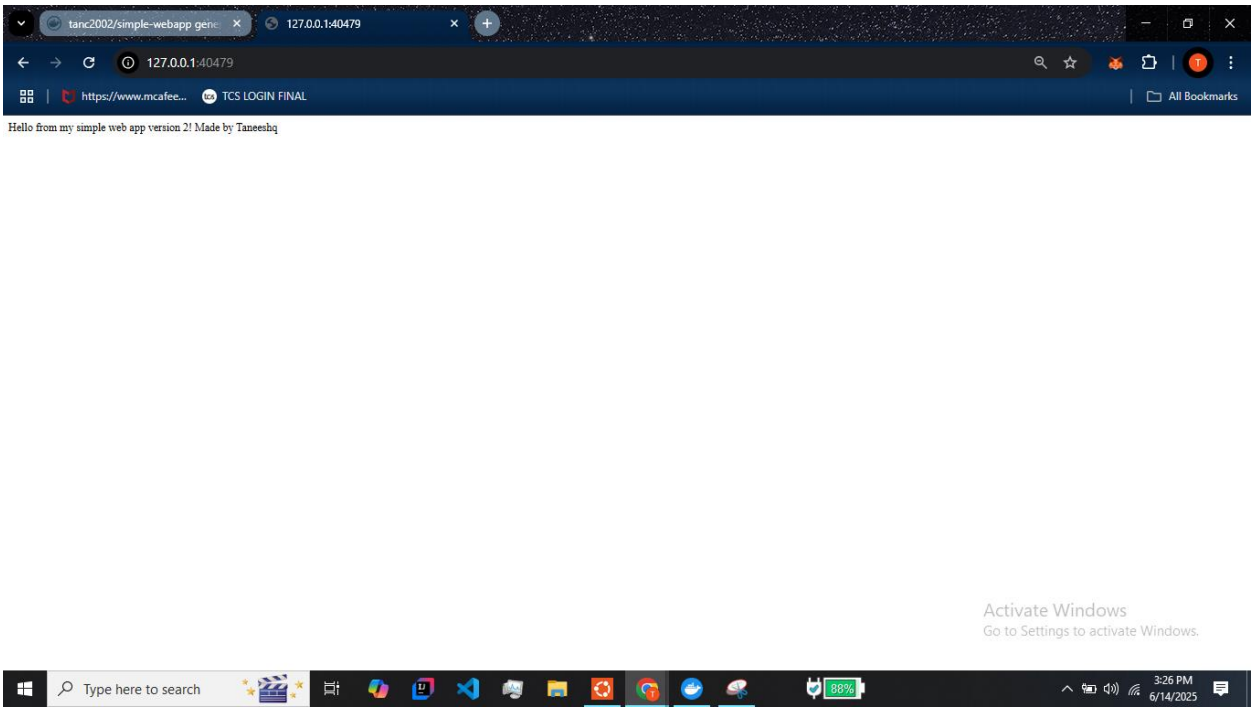
taneeshq@DESKTOP-63B6L7D: ~/assignments/docker-projects/assignment-5/webapp

```
  GNU nano 7.2                                                  app.js
// app.js
const express = require('express');
const app = express();
const PORT = 3000;

app.get('/', (req, res) => {
  res.send('Hello from my simple web app version 2! Made by Taneeshq');
});

app.listen(PORT, () => {
  console.log(`Server is running on http://localhost:${PORT}`);
});
```

```
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ kubectl set image deployment/webapp simple-webapp=tanc2002/simple-webapp:v2
deployment.apps/webapp image updated
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ kubectl get pods
NAME                              READY   STATUS              RESTARTS   AGE
hello-node-69c6fdb9d6-dp2fx       1/1     Running             0          163m
webapp-7b854958d9-gtpd8           0/1     ContainerCreating   0          58s
webapp-cdbc47ff5-c8t64            1/1     Running             0          38m
webapp-cdbc47ff5-dtvct            1/1     Running             0          19m
webapp-cdbc47ff5-hcz2w            1/1     Running             0          19m
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ kubectl get pods
NAME                              READY   STATUS    RESTARTS   AGE
hello-node-69c6fdb9d6-dp2fx       1/1     Running   0          166m
webapp-7b854958d9-9khb4           1/1     Running   0          116s
webapp-7b854958d9-gtpd8           1/1     Running   0          4m29s
webapp-7b854958d9-l7q2v           1/1     Running   0          3m4s
taneeshq@DESKTOP-63B6L7D:~/assignments/docker-projects/assignment-4/webapp$ minikube service webapp
|-----------|--------|-------------|-------------------------|
| NAMESPACE |  NAME  | TARGET PORT |           URL           |
|-----------|--------|-------------|-------------------------|
| default   | webapp |        3000 | http://192.168.58.2:32430 |
|-----------|--------|-------------|-------------------------|
|-----------|--------|-------------|-------------------------|
| NAMESPACE |  NAME  | TARGET PORT |          URL            |
|-----------|--------|-------------|-------------------------|
| default   | webapp |             | http://127.0.0.1:40479  |
|-----------|--------|-------------|-------------------------|
```


tanc2002/simple-webapp gene
127.0.0.1:40479
127.0.0.1:40479
https://www.mcafee...
TCS LOGIN FINAL
All Bookmarks
Hello from my simple web app version 2! Made by Taneeshq
Activate Windows
Go to Settings to activate Windows.
Type here to search
88%
3:26 PM
6/14/2025