

DevOps Project CA2

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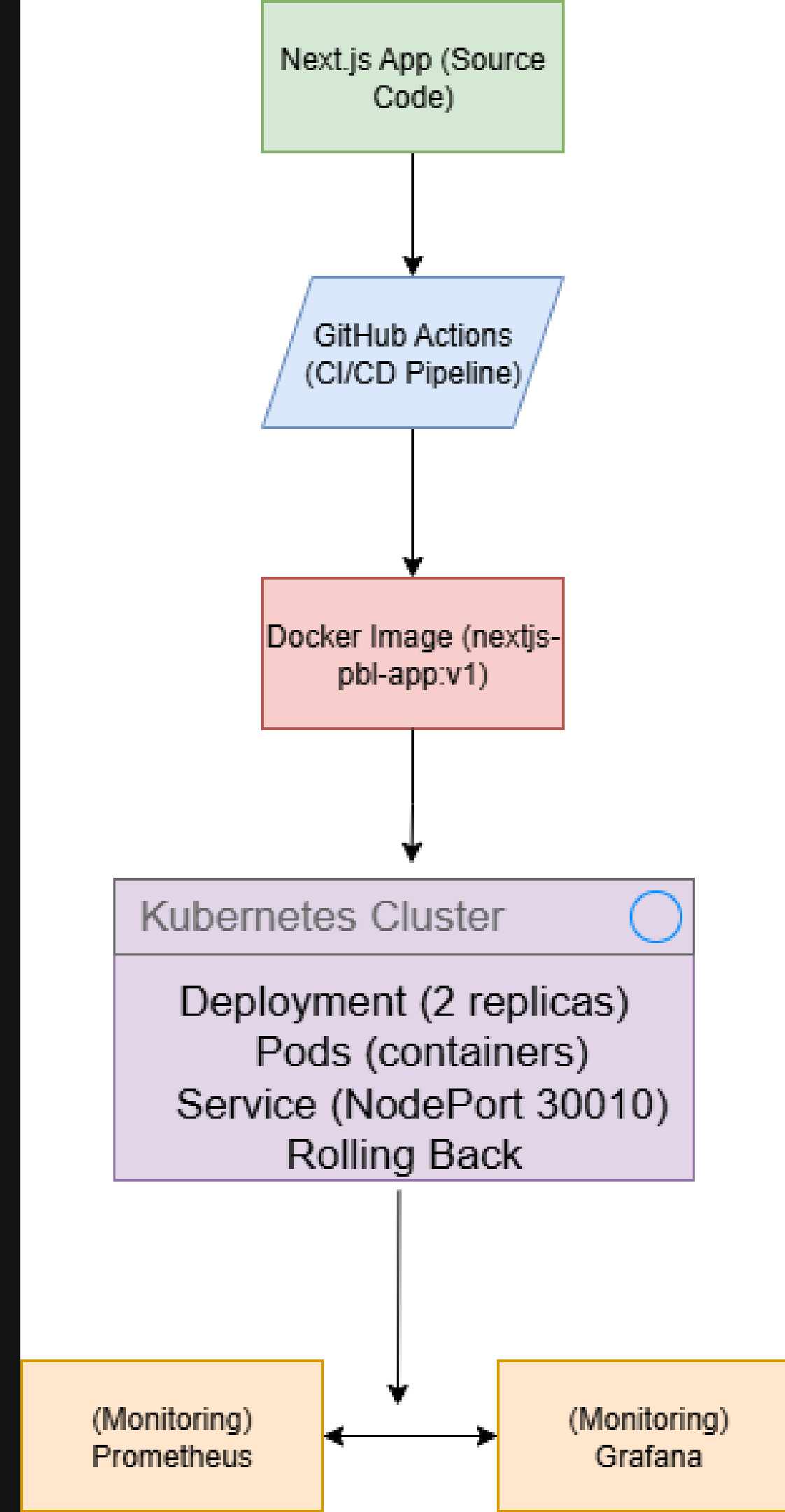
2022-26 (CSE-A1, C1)





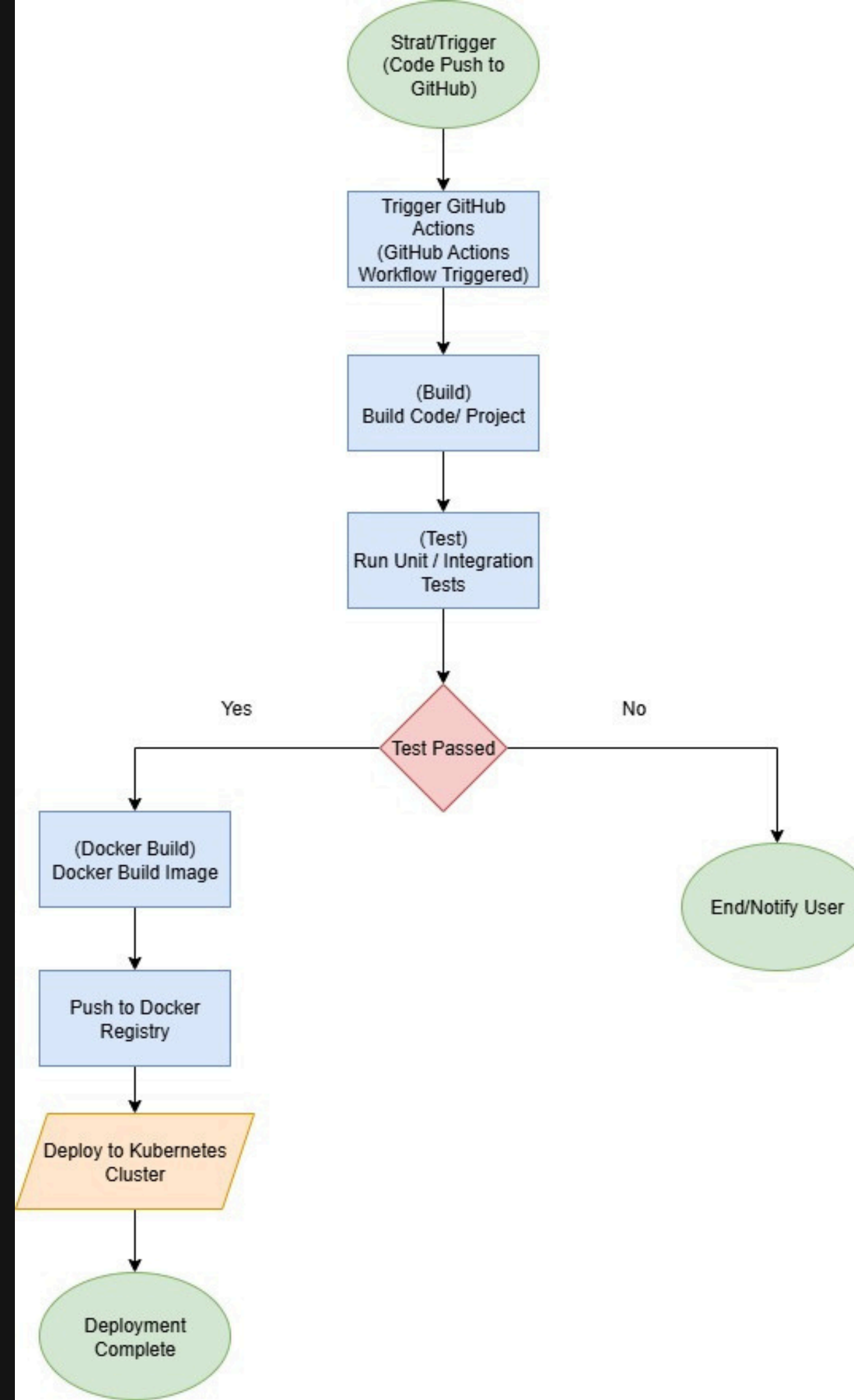
Project Architecture – Next.js App Deployment with GitHub Actions & Kubernetes

The architecture shows a CI/CD flow from code to container, deployed on Kubernetes and monitored via Prometheus & Grafana.

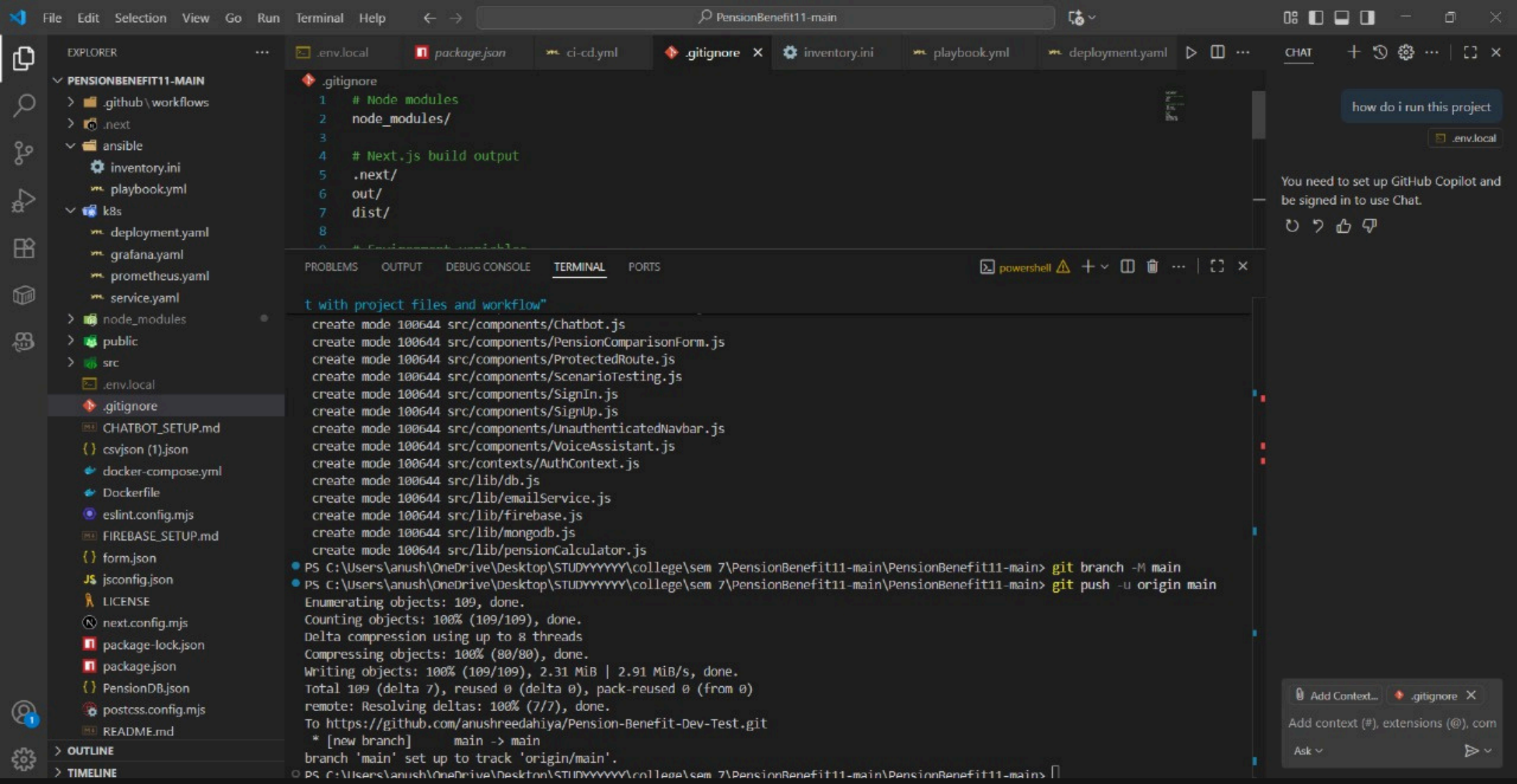


CI/CD Pipeline Flow – GitHub Actions

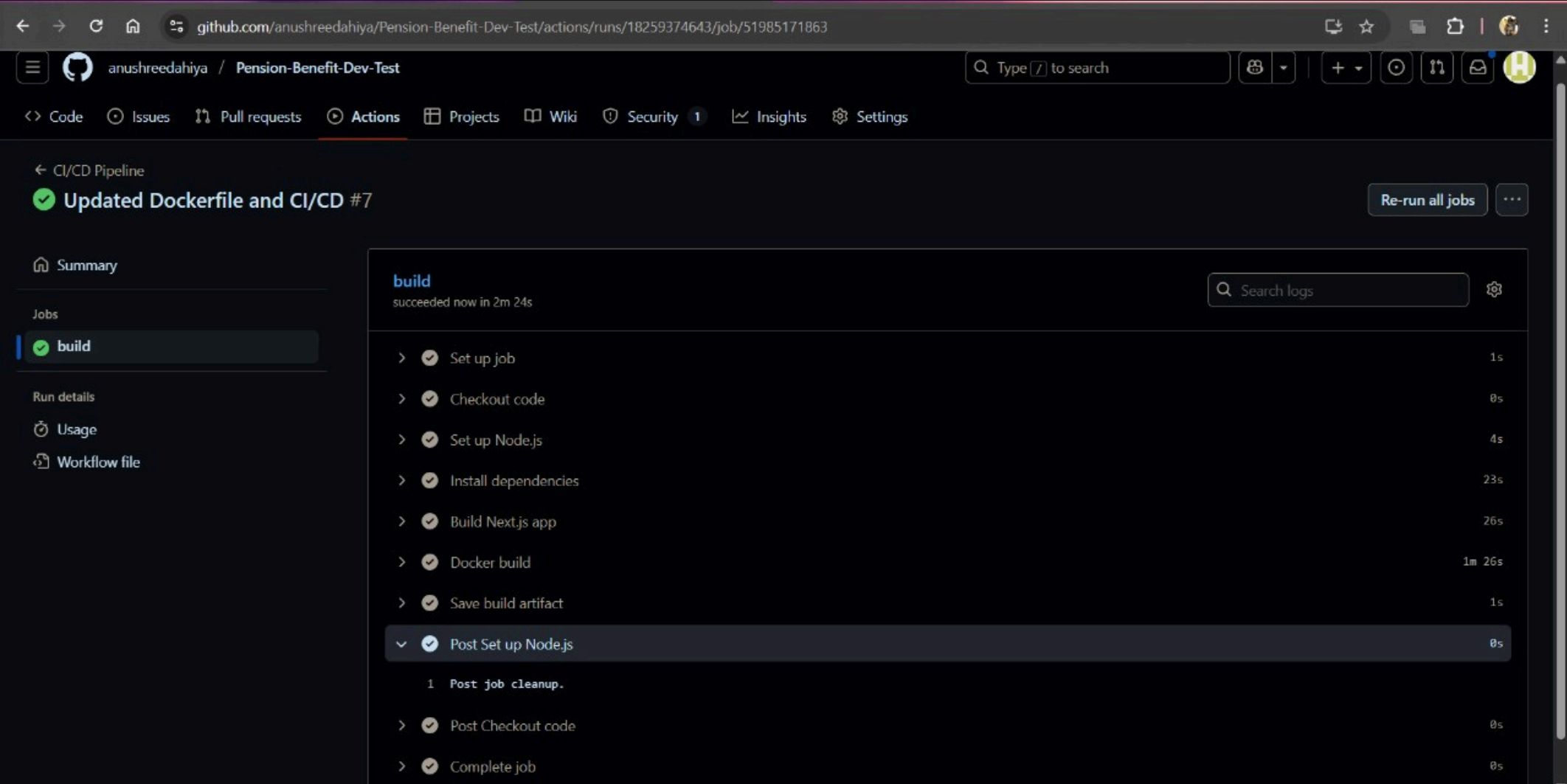
- When code is pushed to GitHub, a workflow triggers automatically.
- The app is built, tested, and containerized with Docker.
- The Docker image is pushed to the registry.
- Finally, it's deployed on Kubernetes using kubectl apply.



1. Pushing the code to GitHub



2. In GitHub Actions, the app is getting built, tested and containerized with Docker.



Configuration Management & IaC Through Ansible

1. Infrastructure setup automated using Ansible

Wrote playbook.yml to:

- Update apt package index.
- Install Node.js 18.x, npm, and Docker.
- Ensure Docker service is running.
- Create /opt/nextjs-app directory.
- Copy app files into it.

2. Verified: Node.js, npm, and Docker installed successfully inside the runtime environment.

```
PS C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main\ansible> docker pull geerlingguy/docker-ubuntu2004-ansible
Using default tag: latest
latest: Pulling from geerlingguy/docker-ubuntu2004-ansible
233c62bd96b5: Pull complete
4326705da5ac: Pull complete
13b7e930469f: Pull complete
64ecc960fd70: Pull complete
25ca35afe4ae: Pull complete
097bc46b0ae7: Pull complete
d4bf89240257: Pull complete
5df9c8bce3a9: Pull complete
c8a40668118b: Pull complete
bf55635d1e9f: Pull complete
Digest: sha256:fd9137f13362d1888d3e22e579ca18280054ff4dbf3de06e3f0dc9efe9a77a46
Status: Downloaded newer image for geerlingguy/docker-ubuntu2004-ansible:latest
docker.io/geerlingguy/docker-ubuntu2004-ansible:latest
PS C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main\ansible> docker run -it --rm -v "C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main:/ansible" -w /ansible geerlingguy/docker-ubuntu2004-ansible bash
root@85e0602e0e21:/ansible# ansible --version
ansible [core 2.13.13]
  config file = None
  configured module search path = ['/root/.ansible/plugins/modules', '/usr/share/ansible/plugins/modules']
  ansible python module location = /usr/local/lib/python3.8/dist-packages/ansible
  ansible collection location = /root/.ansible/collections:/usr/share/ansible/collections
  executable location = /usr/local/bin/ansible
  python version = 3.8.10 (default, Mar 18 2025, 20:04:55) [GCC 9.4.0]
  jinja version = 3.1.6
  libyaml = True
```

```
root@85e0602e0e21:/ansible# ansible-playbook -i ansible/inventory.ini ansible/playbook.yml --ask-become-pass
BECOME password:

PLAY [Setup runtime environment] *****

TASK [Gathering Facts] *****
ok: [localhost]

TASK [Update apt] *****
ok: [localhost]

TASK [Install Node.js 18.x] *****
ok: [localhost]

TASK [Install npm] *****
ok: [localhost]

TASK [Install Docker] *****
ok: [localhost]

TASK [Create app user] *****
changed: [localhost]

TASK [Create app directory] *****
changed: [localhost]

TASK [Copy app files] *****
changed: [localhost]

PLAY RECAP *****
localhost                : ok=8    changed=3    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0

root@85e0602e0e21:/ansible# node -v
v10.19.0
root@85e0602e0e21:/ansible# npm -v
6.14.4
root@85e0602e0e21:/ansible# ls -l /opt/nextjs-app
total 8
-rwxr-xr-x 1 nextjs nextjs  45 Oct  5 14:15 inventory.ini
-rwxr-xr-x 1 nextjs nextjs 1078 Oct  5 14:15 playbook.yml
root@85e0602e0e21:/ansible# docker --version
Docker version 26.1.3, build 26.1.3-0ubuntu1~20.04.1
root@85e0602e0e21:/ansible# |
```

2. Formation of docker image for Ansible

Ask Gordon

BETA

Containers

Images

Volumes

Builds

Models

BETA

MCP Toolkit

BETA

Docker Hub

Docker Scout

Extensions

Containers

[Give feedback](#)

View all your running containers and applications.

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Container CPU usage

53.48% / 800% (8 CPUs available)

Container memory usage

2.55GB / 7.29GB

Show charts

Search

Only show running containers

	Name	Container ID	Image	Port(s)	CPU (%)	Last started	Actions
<input type="checkbox"/>	jenkins-slave-1	88b0007d007c	jenkins/jenkins-slave		0%	1 month ago	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/>	retailapp-container	7ac3d749f785	retailapp:1.0	9090:8080	0%	1 month ago	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/>	angular-container-v2	d2c58cb0fe25	angular-app	8080:80	0%		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/>	jenkins3-docker	fe1d5dee98a0	jenkins/jenkins:its	9090:8080	0%	3 months ago	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/>	jenkins2-docker	26d3a827f94a	jenkins/jenkins:its	9191:8080	0%	3 months ago	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/>	jenkins-container	3d599fd0626b	myjenkins	50000:50000 Show all ports (2)	0%	3 months ago	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/>	k8s_mongo_mongo-78dd7	84de0c80501d	4bf2adba7807		0.6%	2 hours ago	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/>	minikube	70e1a474bd7a	k8s-minikube/kicbase:v0.0	52170:22 Show all ports (5)	18.65%	2 hours ago	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/>	youthful_proskuriakova	85e0602e0e21	geerlingguy/docker-ubuntu		34.36%	3 minutes ago	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/>	my-angular-app	-	-	-	0%	3 months ago	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Showing 13 items

Engine running

Kubernetes running

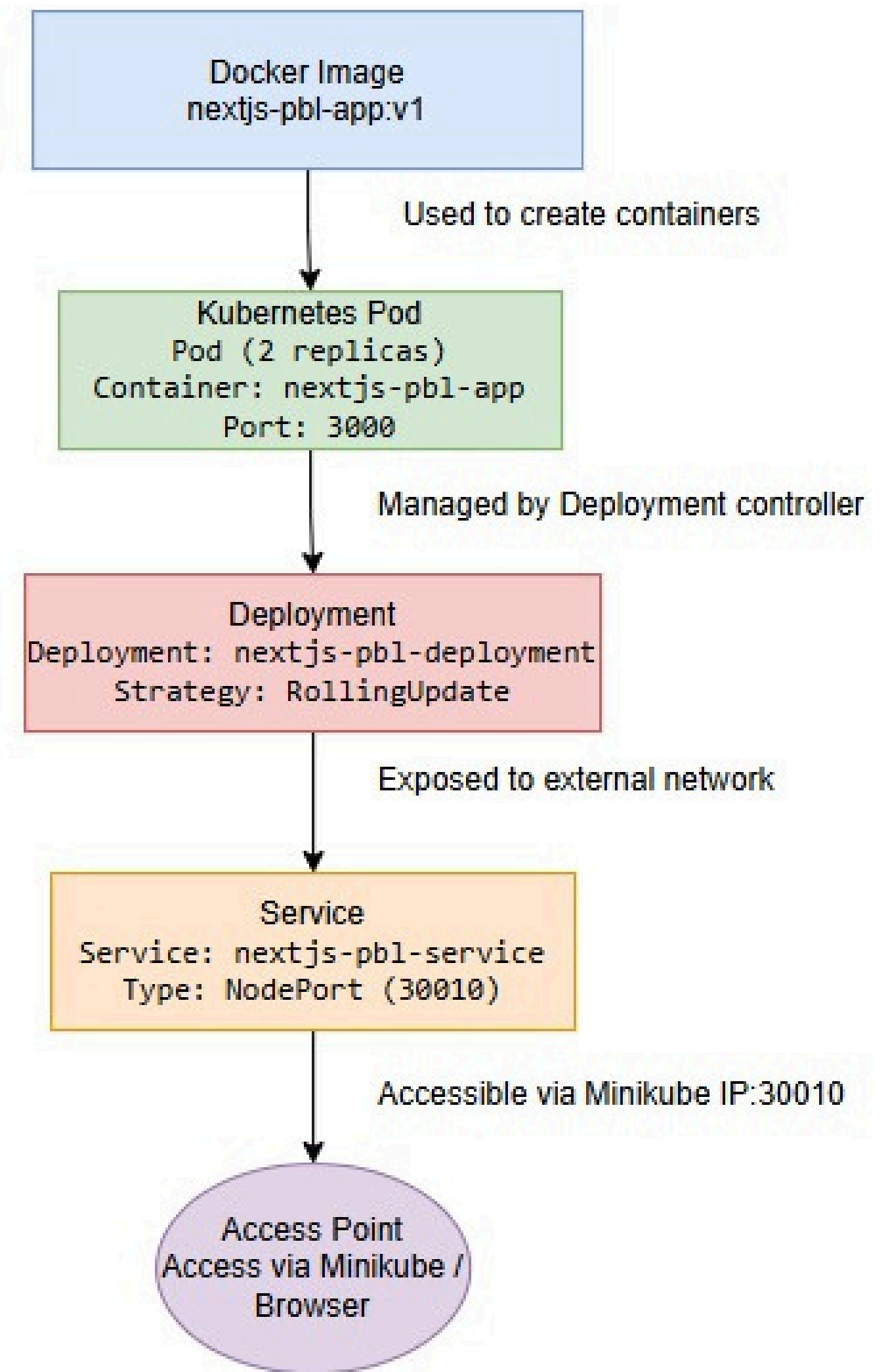
RAM 7.17 GB CPU 17.77% Disk: 31.35 GB used (limit 1006.85 GB)

Terminal

New version available

Containerization & Orchestration

1. Created Dockerfile
2. Built and tagged the image: `docker build -t nextjs-pbl-app:v1`
3. Verified image via `docker images`.
4. Created `deployment.yaml` and `service.yaml` for Kubernetes.
5. Applied manifests:
 - a. `kubectl apply -f deployment.yaml`
 - b. `kubectl apply -f service.yaml`
6. Verified pods: `kubectl get pods`
7. Tested rolling updates and rollback:
 - a. `kubectl set image deployment/nextjs-pbl-deployment nextjs-pbl-container=nextjs-pbl-app:v2`
 - b. `kubectl rollout undo deployment/nextjs-pbl-deployment`



Containerization & Orchestration

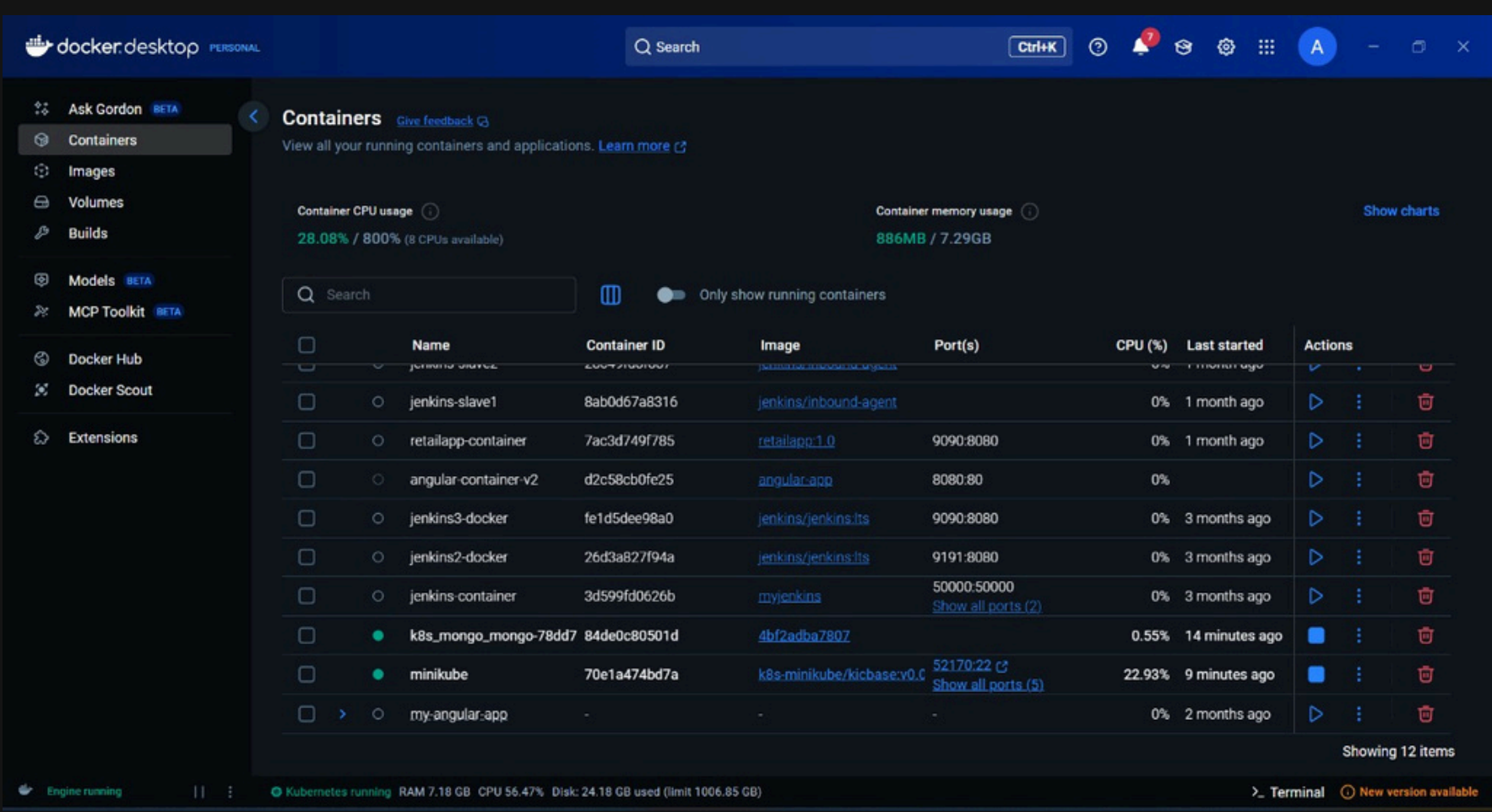
1. Docker Build

```
C:\Users\anush\OneDrive\Desktop\STUDYYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main>docker build -t nextjs-pbl-app:latest .
[+] Building 418.8s (13/13) FINISHED
=> [internal] load build definition from Dockerfile
=> [internal] load metadata for docker.io/library/node:18-alpine
=> [auth] library/node:pull token for registry-1.docker.io
=> [internal] load .dockerignore
=> [builder 1/6] FROM docker.io/library/node:18-alpine@sha256:8d6421d663b4c28fd3ebc498332f249011d118945588d0a35c5cb9bc4b8c
=> sha256:929b04d7c782f04f615cf785488fed452b6569f87c73ff666ad553a7554f0806 1.72kB / 1.72kB
=> sha256:ee77c6cd7c1886ecc802ad6cedef3a8ec1ea27d1fb96162bf03dd3710839b8da 6.18kB / 6.18kB
=> sha256:f18232174bc91741fd3da96d85011092101a032a93a388b79e99e69c2d5c870 3.64MB / 3.64MB
=> sha256:8d6421d663b4c28fd3ebc498332f249011d118945588d0a35cb9bc4b8c 7.67kB / 7.67kB
=> sha256:dd71dde834b5c203d162902e6b8994cb2309ae049a0eabc4efea161b2b5a3d0e 40.01MB / 40.01MB
=> sha256:1e5a4c89cee5c0826c540ab06d4b6b491c96eda01837f430bd47f0d26702d6e3 1.26MB / 1.26MB
=> extracting sha256:f18232174bc91741fd3da96d85011092101a032a93a388b79e99e69c2d5c870 1.6s
=> sha256:25ff2da83641908f65c3a74d80409d6b1b62ccfaab220b9ea70b80df5a2e0549 446B / 446B
=> extracting sha256:dd71dde834b5c203d162902e6b8994cb2309ae049a0eabc4efea161b2b5a3d0e 12.6s
=> extracting sha256:1e5a4c89cee5c0826c540ab06d4b6b491c96eda01837f430bd47f0d26702d6e3 0.3s
=> extracting sha256:25ff2da83641908f65c3a74d80409d6b1b62ccfaab220b9ea70b80df5a2e0549 0.0s
[internal] load build context
=> transferring context: 616.14MB
=> [builder 2/6] WORKDIR /app
=> [builder 3/6] COPY package*.json ./
=> [builder 4/6] RUN npm install
=> [builder 5/6] COPY . .
=> [builder 6/6] RUN npm run build
=> [stage-1 3/3] COPY --from=builder /app ./
=> exporting to image
=> exporting layers
=> writing image sha256:8a5edc7f384b8c30abe877dc28bc21935ec3dc9fd94ceda9f9d35faca9536562
=> naming to docker.io/library/nextjs-pbl-app:latest

View build details: docker-desktop://dashboard/build/default/default/yvdrp9pzkv9jzv33ih7o7zebb

C:\Users\anush\OneDrive\Desktop\STUDYYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main>docker images
REPOSITORY          TAG         IMAGE ID      CREATED       SIZE
nextjs-pbl-app       latest      8a5edc7f384b 32 seconds ago 1.18GB
registry.k8s.io/kube-apiserver  v1.34.0    90550c43ad2b 5 weeks ago  88MB
registry.k8s.io/kube-proxy  v1.34.0    df0860106674 5 weeks ago  71.9MB
```

2. Image generation



3. Formation of Docker Image

```
View build details: docker-desktop://dashboard/build/desktop-linux/desktop-linux/lib0z7s0k15ropgba8c6g82fa

C:\Users\anush\OneDrive\Desktop\STUDYYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main>docker images
REPOSITORY          TAG         IMAGE ID      CREATED       SIZE
nextjs-pbl-app       latest      7b83e89d9ca6  About a minute 1.63GB
```


4. Applying kubernetes deployment.yaml file

```
C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main>kubectl apply -f k8s/deployment.yaml
deployment.apps/nextjs-pbl-deployment created

C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main>kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
nextjs-pbl-deployment-7996476b8d-996kj  1/1     Running   0           4s
nextjs-pbl-deployment-7996476b8d-kd4dp  1/1     Running   0           4s
```

5. checking Status of Pods and through minikube calling the application

```
C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main>kubectl get pods -w
NAME                                READY   STATUS    RESTARTS   AGE
nextjs-pbl-deployment-85b9fb455c-9d4zs  1/1     Running   0           20s
nextjs-pbl-deployment-85b9fb455c-mvqjq  1/1     Running   0           20s

C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main>kubectl logs -l app=nextjs-pbl

▲ Next.js 15.4.6
- Local:      http://localhost:3001
- Network:    http://10.244.0.10:3001

✓ Starting...
✓ Ready in 1482ms
(node:18) Warning: Setting the NODE_TLS_REJECT_UNAUTHORIZED environment variable to '0' makes TLS connections and HTTPS requests insecure by disabling certificate verification.
(Use 'node --trace-warnings ...' to show where the warning was created)
Transporter is ready to send emails

▲ Next.js 15.4.6
- Local:      http://localhost:3001
- Network:    http://10.244.0.11:3001

✓ Starting...
✓ Ready in 1485ms
(node:18) Warning: Setting the NODE_TLS_REJECT_UNAUTHORIZED environment variable to '0' makes TLS connections and HTTPS requests insecure by disabling certificate verification.
(Use 'node --trace-warnings ...' to show where the warning was created)
Transporter is ready to send emails

C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main>minikube service nextjs-pbl-service
```

NAMESPACE	NAME	TARGET PORT	URL
default	nextjs-pbl-service	3001	http://192.168.49.2:30010

```
* Starting tunnel for service nextjs-pbl-service.
NAMESPACE   NAME           TARGET PORT   URL
default     nextjs-pbl-service  3001          http://127.0.0.1:62729

* Starting tunnel for service nextjs-pbl-service.
* Opening service default/nextjs-pbl-service in default browser...
! Because you are using a Docker driver on windows, the terminal needs to be open to run it.
```

6. output of minikube call



7. Tested rolling updates and rollback

```
C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main>kubectl set image deployment/nextjs-pbl-deployment nextjs-pbl-container=nextjs-pbl-app:v2
deployment.apps/nextjs-pbl-deployment image updated
```

```
C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main>kubectl rollout status deployment/nextjs-pbl-deployment
deployment "nextjs-pbl-deployment" successfully rolled out
```

```
C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main>kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
nextjs-pbl-deployment-596bb66d5d-59zw2  1/1     Running   0           12s
nextjs-pbl-deployment-596bb66d5d-85gzh   1/1     Running   0           10s
```

```
C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main>kubectl rollout undo deployment/nextjs-pbl-deployment
deployment.apps/nextjs-pbl-deployment rolled back
```

```
C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main>kubectl get pods
NAME                                READY   STATUS             RESTARTS   AGE
nextjs-pbl-deployment-596bb66d5d-59zw2  1/1     Running            0           26s
nextjs-pbl-deployment-596bb66d5d-85gzh   1/1     Running            0           24s
nextjs-pbl-deployment-85b9fb455c-pj4jk   0/1     ContainerCreating  0            6s
```

```
C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main>
```


Monitoring & Logging

1. Installed Helm using Chocolatey : choco install kubernetes-helm -y

2. Added Helm repositories:

a. helm repo add prometheus-community

<https://prometheus-community.github.io/helm-charts>

b. helm repo add grafana

<https://grafana.github.io/helm-charts>

c. helm repo update

3. Installed Prometheus : helm install prometheus prometheus-community/prometheus

4. Installed Grafana: helm install grafana grafana/grafana

```
Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\WINDOWS\system32> choco --version
2.3.0
PS C:\WINDOWS\system32> choco install kubernetes-helm -y
Chocolatey v2.3.0
Installing the following packages:
kubernetes-helm
By installing, you accept licenses for the packages.
Downloading package from source 'https://community.chocolatey.org/api/v2/'
Progress: Downloading kubernetes-helm 3.18.6... 100%

kubernetes-helm v3.18.6 [Approved]
kubernetes-helm package files install completed. Performing other installation steps.
Downloading kubernetes-helm 64 bit
  from 'https://get.helm.sh/helm-v3.18.6-windows-amd64.zip'
Progress: 100% - Completed download of C:\Users\anush\AppData\Local\Temp\chocolatey\kubernetes-helm\3.18.6\helm-v3.18.6-windows-amd64.zip (17.59 MB).
Download of helm-v3.18.6-windows-amd64.zip (17.59 MB) completed.
Hashes match.
Extracting C:\Users\anush\AppData\Local\Temp\chocolatey\kubernetes-helm\3.18.6\helm-v3.18.6-windows-amd64.zip to C:\ProgramData\chocolatey\lib\kubernetes-helm\tools...
C:\ProgramData\chocolatey\lib\kubernetes-helm\tools
ShimGen has successfully created a shim for helm.exe
The install of kubernetes-helm was successful.
  Deployed to 'C:\ProgramData\chocolatey\lib\kubernetes-helm\tools'

Chocolatey installed 1/1 packages.
  See the log for details (C:\ProgramData\chocolatey\logs\chocolatey.log).
PS C:\WINDOWS\system32> helm version
>>
version.BuildInfo{Version:"v3.18.6", GitCommit:"b76a950f6835474e0906b96c9ec68a2eff3a6430", GitTreeState:"clean", GoVersion:"go1.24.6"}
PS C:\WINDOWS\system32> █
```

```
Command Prompt - call SET C x Windows PowerShell x Windows PowerShell x + v -
PS C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main> helm repo add prometheus-community https://prometheus-community.g
ithub.io/helm-charts
"prometheus-community" has been added to your repositories
PS C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main> helm repo add grafana https://grafana.github.io/helm-charts
"grafana" has been added to your repositories
PS C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main> helm repo update
Hang tight while we grab the latest from your chart repositories...
...Successfully got an update from the "grafana" chart repository
...Successfully got an update from the "prometheus-community" chart repository
Update Complete. ☺Happy Helming!☺
PS C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main> helm install prometheus prometheus-community/prometheus
I1005 20:08:34.018492 16208 warnings.go:110] "Warning: spec.SessionAffinity is ignored for headless services"
NAME: prometheus
LAST DEPLOYED: Sun Oct 5 20:08:32 2025
NAMESPACE: default
STATUS: deployed
REVISION: 1
TEST SUITE: None
NOTES:
The Prometheus server can be accessed via port 80 on the following DNS name from within your cluster:
prometheus-server.default.svc.cluster.local

Get the Prometheus server URL by running these commands in the same shell:
export POD_NAME=$(kubectl get pods --namespace default -l "app.kubernetes.io/name=prometheus,app.kubernetes.io/instance=prometheus" -o jsonpath="{.items[0].metadata.name}")
kubectl --namespace default port-forward $POD_NAME 9090

The Prometheus alertmanager can be accessed via port 9093 on the following DNS name from within your cluster:
prometheus-alertmanager.default.svc.cluster.local

Get the Alertmanager URL by running these commands in the same shell:
export POD_NAME=$(kubectl get pods --namespace default -l "app.kubernetes.io/name=alertmanager,app.kubernetes.io/instance=prometheus" -o jsonpath="{.items[0].metadata.name}")
kubectl --namespace default port-forward $POD_NAME 9093
#####
##### WARNING: Pod Security Policy has been disabled by default since #####
##### it deprecated after k8s 1.25+. use #####
##### (index .Values "prometheus-node-exporter" "rbac" #####
##### . "pspEnabled") with (index .Values #####
##### "prometheus-node-exporter" "rbac" "pspAnnotations") #####
##### in case you still need it. #####
#####
```


5.Verified pods : kubectl get pods

6. Forwarded Grafana service to a free local port:

- kubectl port-forward svc/grafana 35000:80

7. Logged into Grafana

(http://localhost:35000, admin/admin).

8. Added Prometheus Data Source →

URL http://prometheus-

server.default.svc.cluster.local:80.

9. Created dashboards with queries such as:

- Memory usage per pod :
sum(container_memory_usage_bytes {namespace="default"}) by (pod)
- CPU usage per pod :
sum(rate(container_cpu_usage_seconds_total{namespace="default"}[1m])) by (pod)

10. Saved dashboards for continuous monitoring.

```
PS C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main> kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
nextjs-pbl-deployment-85b9fb455c-72psl 1/1     Running   0           63m
nextjs-pbl-deployment-85b9fb455c-pj4jk 1/1     Running   0           63m
prometheus-alertmanager-0              1/1     Running   0           2m13s
prometheus-kube-state-metrics-5f64969966-qvh7j 1/1     Running   0           2m13s
prometheus-prometheus-node-exporter-699rg 1/1     Running   0           2m13s
prometheus-prometheus-pushgateway-65bc997fdf-bf8ts 1/1     Running   0           2m13s
prometheus-server-65888dcd6-wvfn9      2/2     Running   0           2m13s
```

```
PS C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main> helm install grafana grafana/grafana
NAME: grafana
LAST DEPLOYED: Sun Oct  5 20:13:06 2025
NAMESPACE: default
STATUS: deployed
REVISION: 1
NOTES:
1. Get your 'admin' user password by running:

    kubectl get secret --namespace default grafana -o jsonpath="{.data.admin-password}" | base64 --decode ; echo

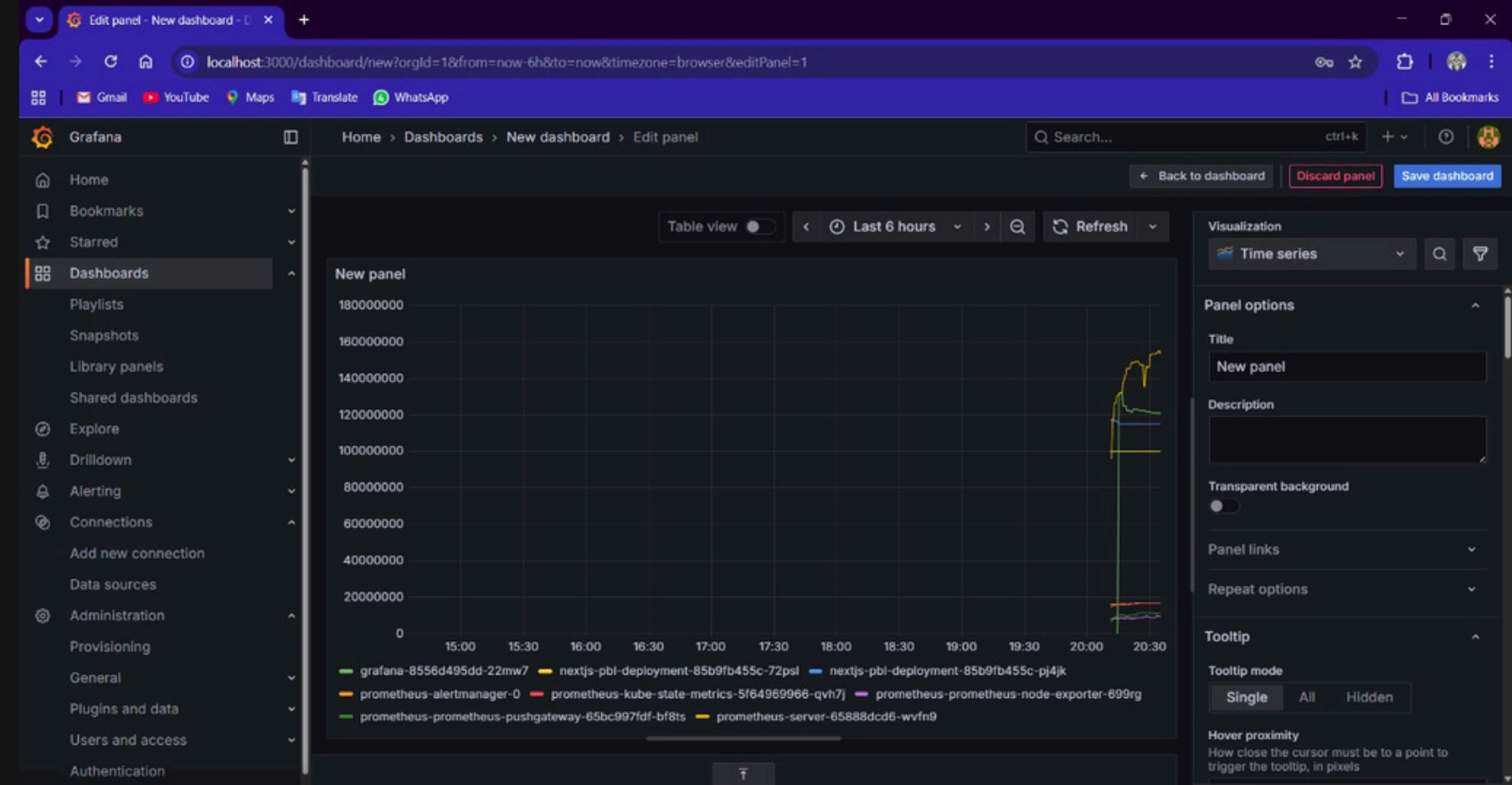
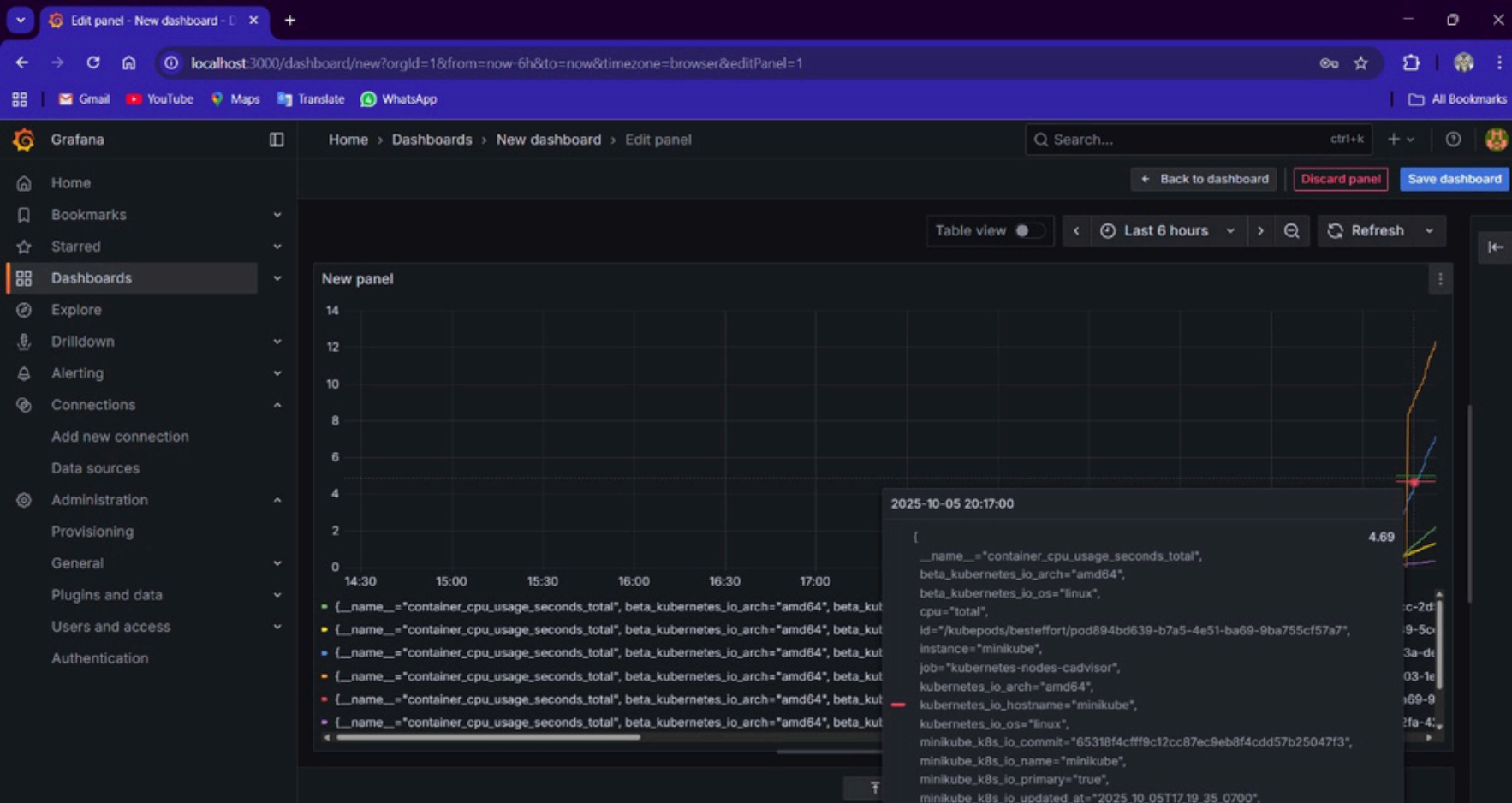
2. The Grafana server can be accessed via port 80 on the following DNS name from within your cluster:

    grafana.default.svc.cluster.local

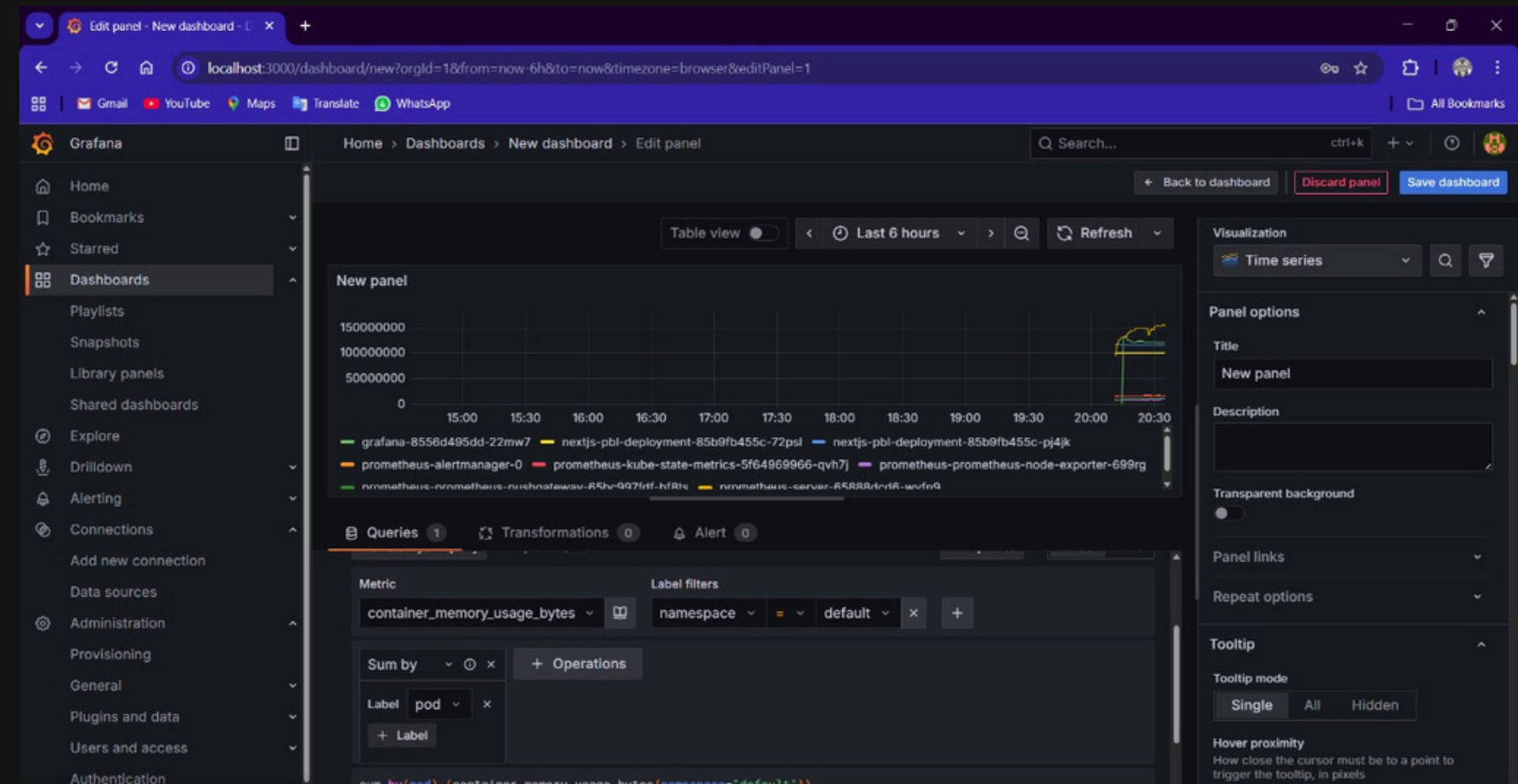
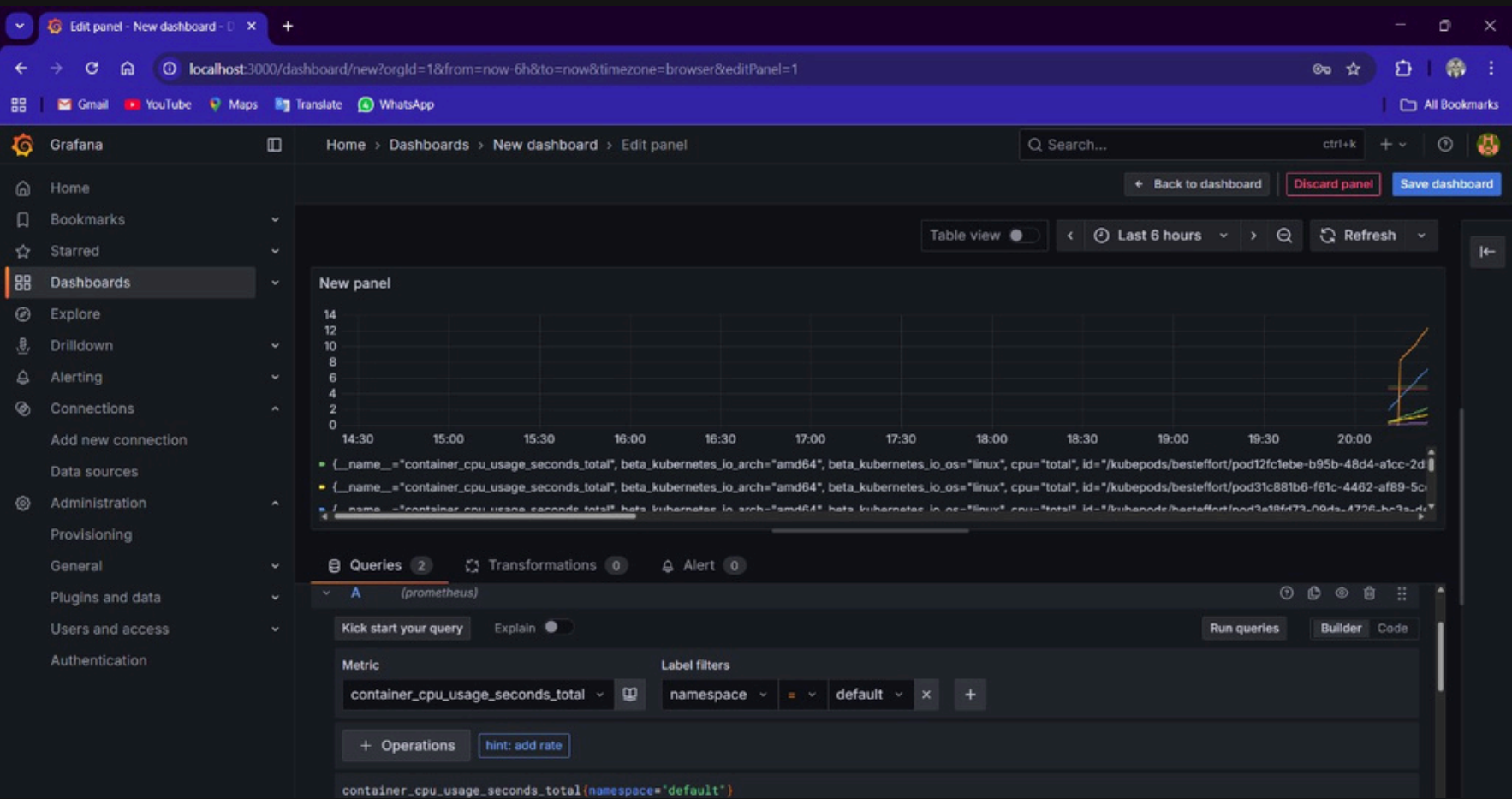
    Get the Grafana URL to visit by running these commands in the same shell:
    export POD_NAME=$(kubectl get pods --namespace default -l "app.kubernetes.io/name=grafana,app.kubernetes.io/instance=grafana" -o jsonpath="{.items[0].metadata.name}")
    kubectl --namespace default port-forward $POD_NAME 3000

3. Login with the password from step 1 and the username: admin
#####
##### WARNING: Persistence is disabled!!! You will lose your data when #####
##### the Grafana pod is terminated. #####
#####
```

```
PS C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main> kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
grafana-8556d495dd-22mw7            1/1     Running   0           109s
nextjs-pbl-deployment-85b9fb455c-72psl 1/1     Running   0           67m
nextjs-pbl-deployment-85b9fb455c-pj4jk 1/1     Running   0           67m
prometheus-alertmanager-0           1/1     Running   0           6m21s
prometheus-kube-state-metrics-5f64969966-qvh7j 1/1     Running   0           6m21s
prometheus-prometheus-node-exporter-699rg 1/1     Running   0           6m21s
prometheus-prometheus-pushgateway-65bc997fdf-bf8ts 1/1     Running   0           6m21s
prometheus-server-65888dcd6-wvfn9      2/2     Running   0           6m21s
PS C:\Users\anush\OneDrive\Desktop\STUDYYYYYY\college\sem 7\PensionBenefit11-main\PensionBenefit11-main>
```

Grafana Dashboard and Testing



Challenges Faced

- Port Conflicts (Grafana & Next.js) : Local ports (3000, 8080) were occupied. Resolved by identifying processes using `netstat -ano`, terminating them, and port-forwarding Grafana to 35000.
- Running Ansible in Docker : Faced permission and dependency issues. Fixed by adjusting playbook configurations and removing unnecessary privilege escalation.
- Docker Build & Deployment Errors : Build failed due to incorrect Dockerfile path. Reorganized project structure, verified build context, and successfully tested rolling updates and rollbacks.
- Prometheus–Grafana Integration : Faced data source connection issues. Solved by verifying service endpoints, correcting ports, and creating dashboards for CPU & memory usage per Pod.

Lesson learned

- *CI/CD Automation* : GitHub Actions streamlined build and deployment, ensuring faster and consistent releases.
- *Containerization & Scalability* : Docker and Kubernetes enabled easy scaling, replica management, and smooth rollbacks.
- *Monitoring & Observability* : Prometheus and Grafana provided real-time insights into CPU, memory, and app stability.
- *Simplified Deployments with Helm* : Helm charts reduced setup complexity and made upgrades effortless.
- *End-to-End DevOps Exposure* : Gained hands-on experience in automation, orchestration, and monitoring across the full DevOps pipeline.

Thank You