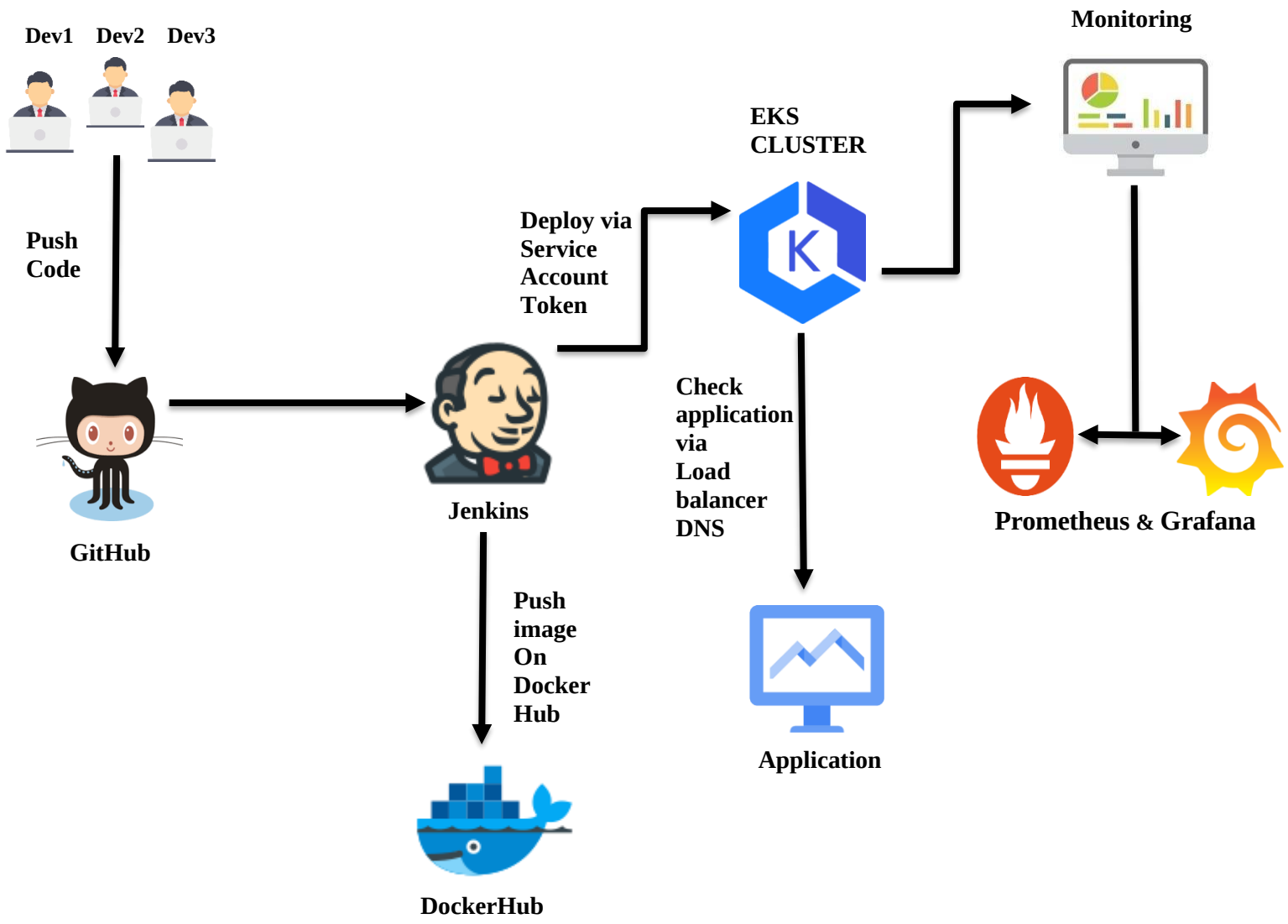
PROJECT

Title -: E-Commerce Web Deployment: Multi-Tier Application with AWS EKS, Jenkins, Docker, and Kubernetes

TOOL USE

- AWS Console: Used for managing servers and resources.
- AWS EKS (Elastic Kubernetes Service): For managing Kubernetes clusters on AWS.
- IAM: Manages user permissions and access to AWS resources.
- Jenkins: For automating the CI/CD pipeline and deploying applications.
- GitHub: Hosting code repositories and version control.
- Docker: For containerizing applications to simplify deployment and scaling.
- Docker Hub: Platform to store and manage Docker images.
- kubectl: Command-line tool to interact with Kubernetes clusters
- eksctl: For creating and managing EKS clusters on AWS.
- Kubernetes: Orchestration platform for automating deployment, scaling, and management of containerized applications.
- PROMETHEUS & GRAFANA: Tools for monitoring and visualizing system metrics.



CI/CD Workflow for OnlineBoutique Deployment

STEP-1: Setting Up Your EC2 Instance

Launch two EC2 Instance:

First server (jenkins)

- **Storage**: Attach a 30 GB EBS volume.
- **Instance** Type: t2. large for better performance with 2 vCPUs and 8 GB RAM.
- **IAM Role**: Assign a role with full access to manage AWS resources.

Step 2: Install AWS CLI, kubectl, and eksctl

AWS CLI:

- Installation:

```
curl "https://awscli.amazonaws.com/awscli-exe-linux-x86_64.zip" -o "awscliv2.zip"
sudo apt install unzip
unzip awscliv2.zip
sudo ./aws/install
```

kubectl:

- Installation:

```
curl -o kubectl https://amazon-eks.s3.us-west-2.amazonaws.com/1.19.6/2021-01-05/bin/linux/amd64/kubectl
chmod +x ./kubectl
sudo mv ./kubectl /usr/local/bin
kubectl version --short --client
```

eksctl:

- Installation:

```
curl --silent --location "https://github.com/weaveworks/eksctl/releases/latest/download/eksctl_$(uname -s)_amd64.tar.gz" | tar xz -C /tmp
sudo mv /tmp/eksctl /usr/local/bin
eksctl version
```

Step 3: Configure IAM User Credentials

- Run **aws configure** and enter:
  - AWS Access Key ID -
  - AWS Secret Access Key -
  - Default region name **- us-east-1**
  - Default output format –

Note - Enter only the region name as us-east-1. Not required others details because access is already provided through the IAM role

Step 4: Create Cluster -

- **Cluster Creation**:

  ```
  eksctl create cluster --name=EKS-1 --region= us-east-1 --zones= us-east-1a, us-east-1b
   --without-nodegroup
  ```

- **OIDC Provider**:

  ```
  eksctl utils associate-iam-oidc-provider --region us-east-1 --cluster EKS-1 --approve
  ```

- **Node Group Creation**:

  ```
  eksctl create nodegroup --cluster=EKS-1 --region= us-east-1 --name=node2 --node-type=t3.medium --nodes=3 --nodes-min=2 --nodes-max=4 --node-volume-size=20 --ssh-access --ssh-public-key=DevOps --managed --asg-access --external-dns-access --full-ecr-access --appmesh-access --alb-ingress-access
  ```

Step 5: Install Jenkins & Docker

Install Java**:**

```
sudo apt install openjdk-17-jre-headless -y
```

Install Jenkins:

```
sudo wget -O /usr/share/keyrings/jenkins-keyring.asc https://pkg.jenkins.io/debian-stable/jenkins.io-2023.key
echo "deb [signed-by=/usr/share/keyrings/jenkins-keyring.asc] https://pkg.jenkins.io/debian-stable binary/" | sudo tee /etc/apt/sources.list.d/jenkins.list > /dev/null
sudo apt-get update
sudo apt-get install Jenkins -y
```

Install Docker:

```
sudo apt install docker.io -y
```

sudo chmod 777 /var/run/docker.sock

Configure Jenkins for Docker:

- In Jenkins Dashboard: Manage Jenkins -> Tools -> Docker installations -> Name: docker -> Install automatically -> Docker version: latest.

Step 6: Download Plugins

- Required Plugins:
  - Docker
  - Docker Pipeline
  - Kubernetes
  - Kubernetes CLI

Step 7: Add Credentials for Docker & GitHub

Add DockerHub Credentials:

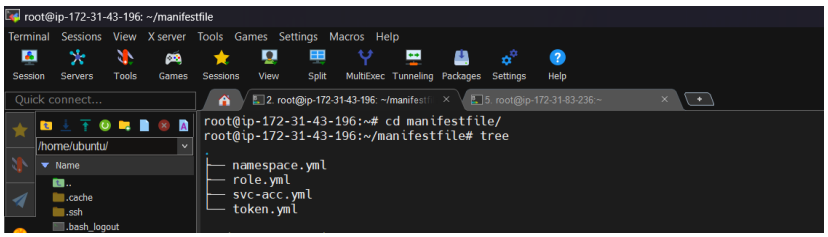
- Dashboard -> Manage Jenkins -> Credentials -> System -> Global credentials (unrestricted).
- Add: Username: bhagyeshpatil99, Password: [Docker password], ID: docker.

Add GitHub Credentials:

Repo - https://github.com/bhagyesh98/microservices-project.git (take code form github)

- Add: Username: bhagyesh98, Password: [GitHub token].

Step 8: Create Service Account, Role, and Role Binding for webapps Namespace



vim namespace.yml

```
apiVersion: v1
kind: Namespace
metadata:
    name: webapps
```

Create for Service Account:

Vim svc-acc.yml

```
apiVersion: v1
kind: ServiceAccount
metadata:
  name: jenkins
  namespace: webapps
```

Create Role and Role Binding:

role.yml:

```
apiVersion: rbac.authorization.k8s.io/v1
kind: Role
metadata:
  name: app-role
  namespace: webapps
rules:
  - apiGroups:
      - ""
      - apps
      - autoscaling
      - batch
      - extensions
      - policy
      - rbac.authorization.k8s.io
    resources:
      - pods
      - componentstatuses
      - configmaps
      - daemonsets
      - deployments
      - events
      - endpoints
      - horizontalpodautoscalers
      - ingress
      - jobs
      - limitranges
      - namespaces
      - nodes
      - pods
      - persistentvolumes
      - persistentvolumeclaims
      - resourcequotas
      - replicasets
      - replicationcontrollers
      - serviceaccounts
      - services
    verbs: ["get", "list", "watch", "create", "update", "patch", "delete"]
---
```

```
apiVersion: rbac.authorization.k8s.io/v1
kind: RoleBinding
metadata:
  name: app-rolebinding
  namespace: webapps
roleRef:
  apiGroup: rbac.authorization.k8s.io
  kind: Role
  name: app-role
subjects:
- namespace: webapps
  kind: ServiceAccount
  name: jenkins
```

Generate Token:

Vim token.yml

```
apiVersion: v1
kind: Secret
type: kubernetes.io/service-account-token
metadata:
  name: bhagyesh
  namespace: webapps
  annotations:
    kubernetes.io/service-account.name: Jenkins
```

Get Token:

- **Command:**

  ```
  kubectl describe secret bhagyesh -n webapps
  ```

Step 9: Add Token to Jenkins Credentials

- Add Token:
  - Dashboard -> Manage Jenkins -> Credentials -> System -> Global credentials (unrestricted).
  - Add: Secret: [Generated token], ID: k8s-secret.

Step 10: Change DockerHub ID and Token in All Services and Main Branch

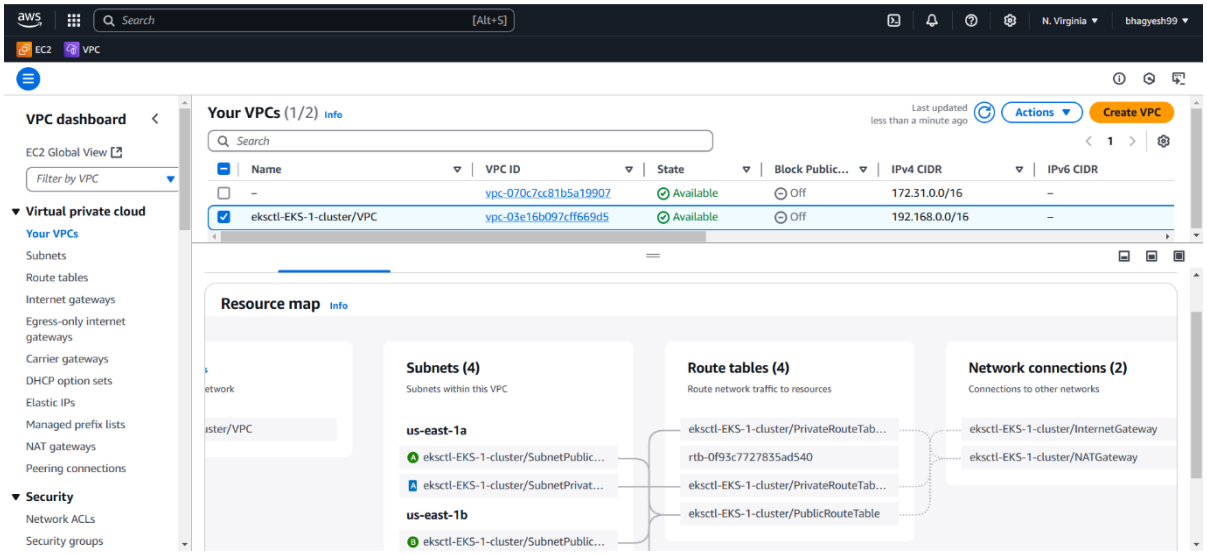
- Update DockerHub ID: Update your DockerHub credentials in your Jenkins pipelines and services.
- Update Token and Endpoint: Ensure the token and endpoint are correctly set in the main branch of your project repository.

Step 11: Monitoring Prometheus with Grafana

1. Install Components:
    - Install Grafana, Prometheus, and Node Exporter on the monitoring server.
2. Access Grafana:
    - Port: 3000, Username/Password: admin/admin.
3. Connect Prometheus to Grafana:
    - Navigate to Data Sources → Add Prometheus → Enter Prometheus URL → Save & Test.
4. Import Dashboard:
    - Click + → Import → Enter Dashboard ID 1860 → Load → Select Prometheus → Import.

Snapshot:

EKS CLUSTER:



EKS Nodes and Servers:

```
root@ip-172-31-43-196:~/manifestfile# cat namespace.yml
apiVersion: v1
kind: Namespace
metadata:
  name: webapps
root@ip-172-31-43-196:~/manifestfile# cat role.yml
apiVersion: rbac.authorization.k8s.io/v1
kind: Role
metadata:
  name: app-role
  namespace: webapps
rules:
  - apiGroups:
      - ""
      - apps
      - autoscaling
      - batch
      - extensions
      - policy
      - rbac.authorization.k8s.io
    resources:
      - pods
      - componentstatuses
      - configmaps
      - daemonsets
      - deployments
      - events
      - endpoints
      - horizontalpodautoscalers
      - ingress
      - jobs
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      - nodes
      - persistentvolumes
      - persistentvolumeclaims
      - resourcequotas
      - replicasets
      - replicationcontrollers
      - serviceaccounts
      - services
    verbs: ["get", "list", "watch", "create", "update", "patch", "delete"]
```
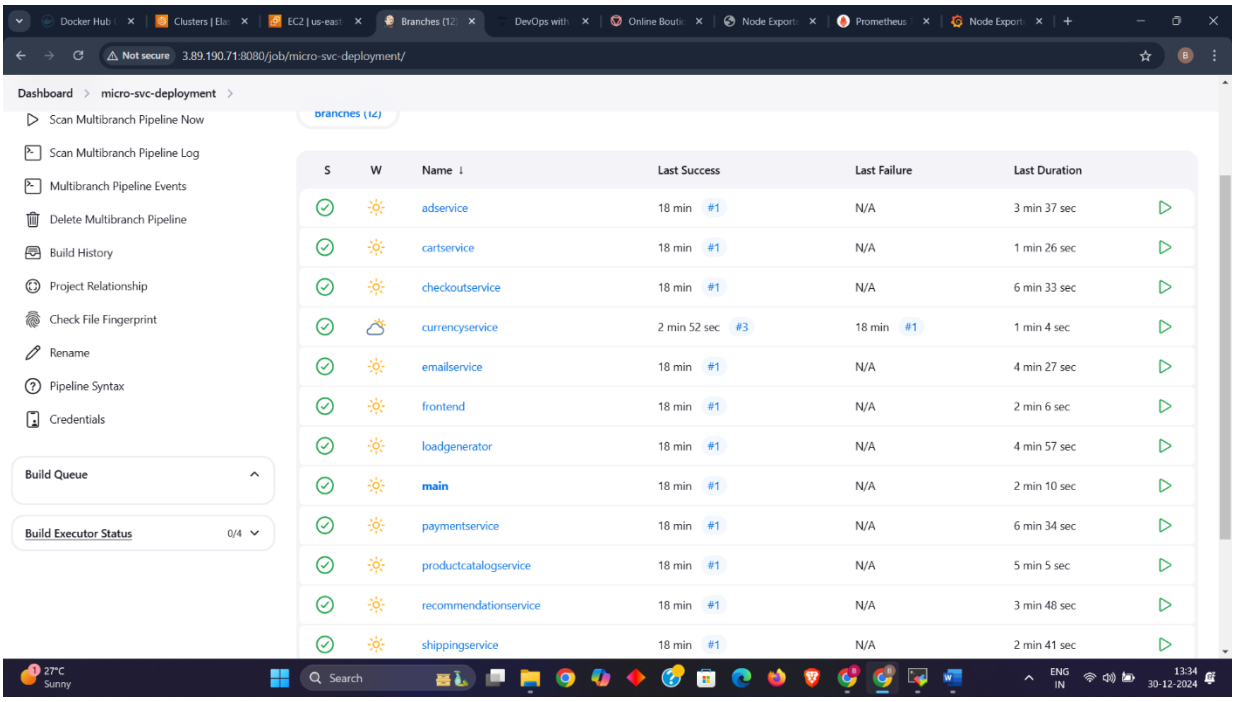
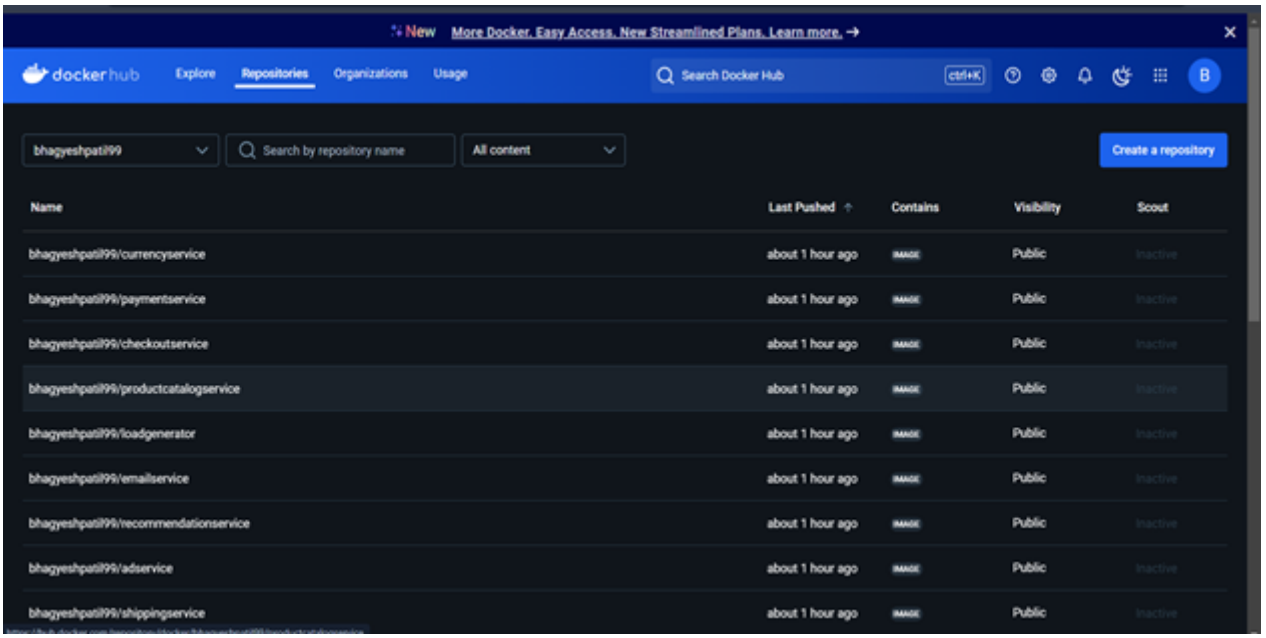

ROLE CREATION:

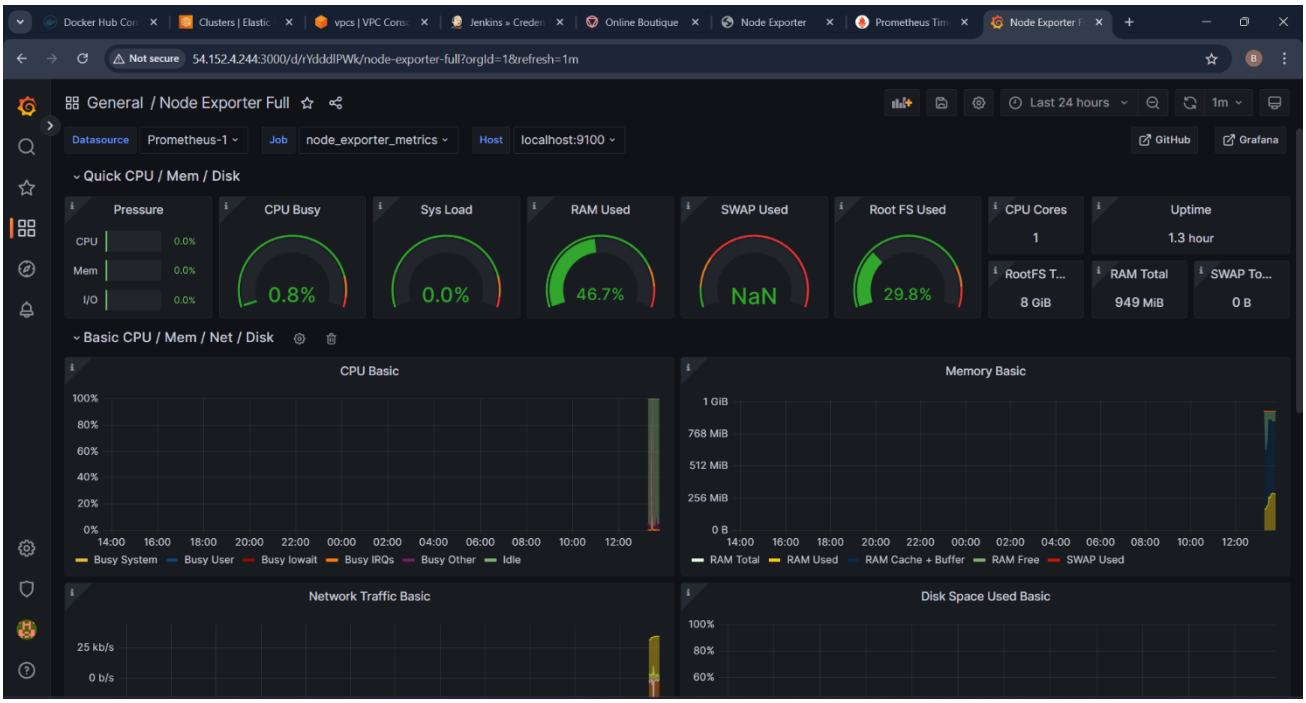


THE PIPELINE CODE IS TAKEN FROM GITHUB IN THE JENKINSFILE:

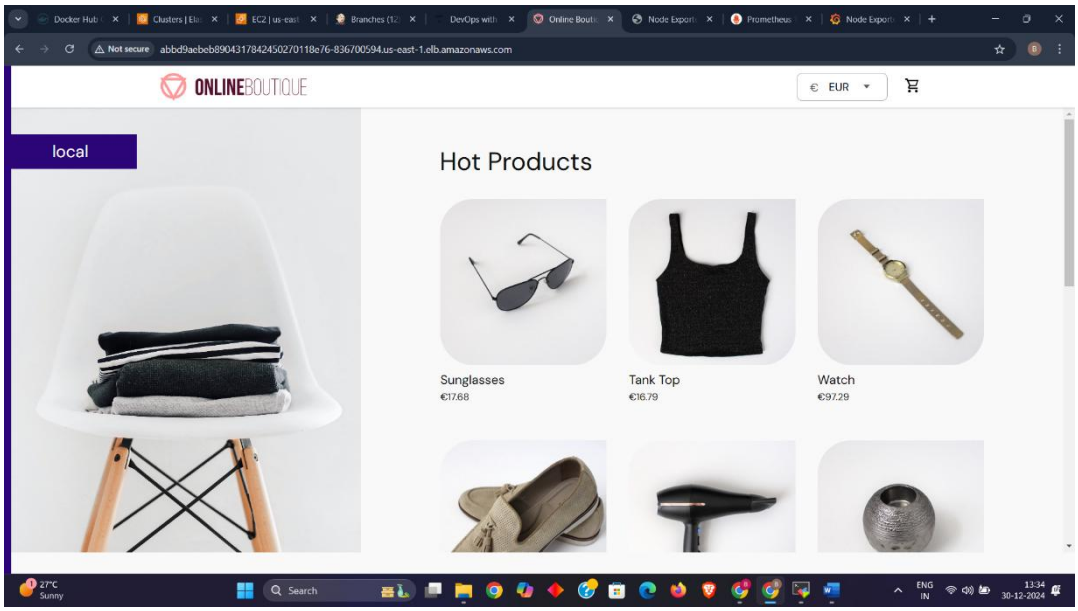
DOCKERHUB IAMGE:

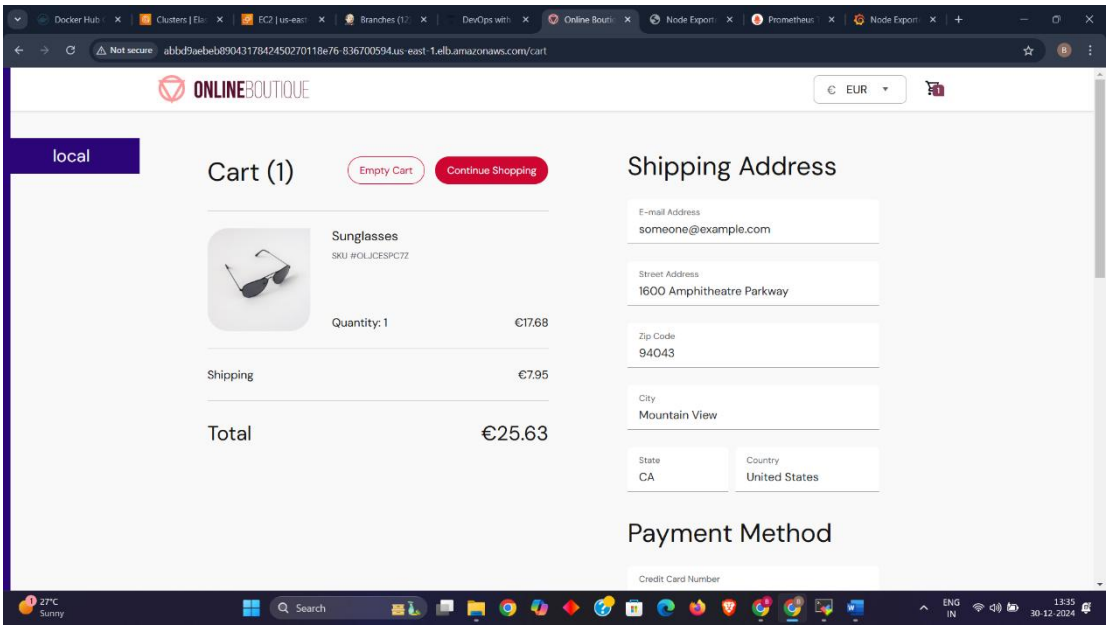


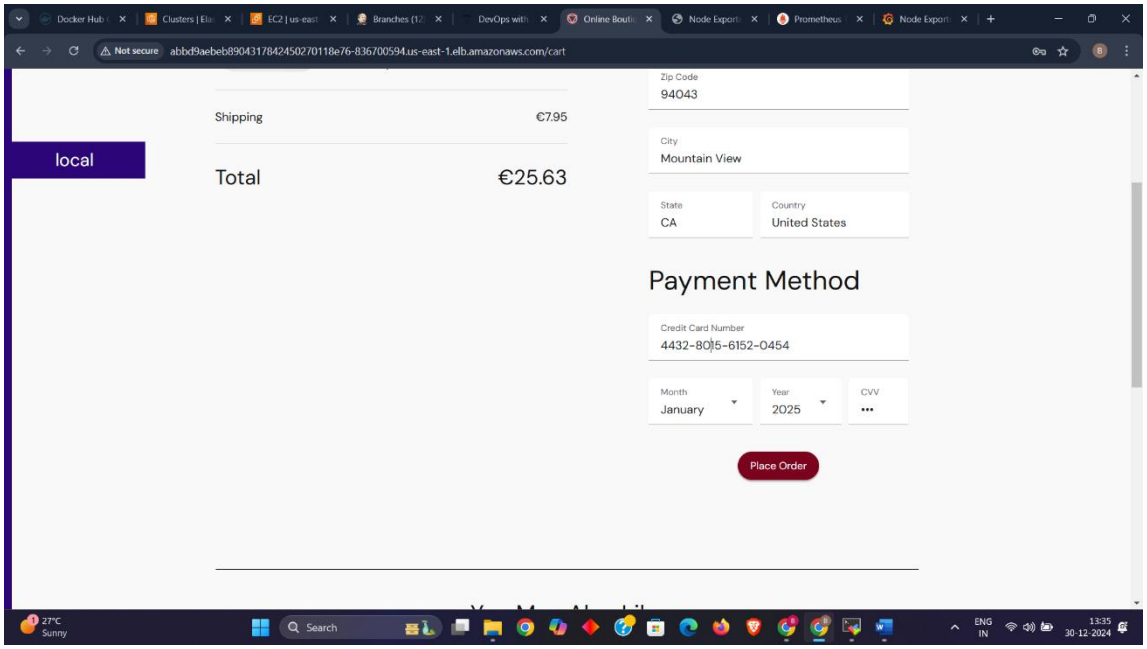
Monitoring Prometheus with Grafana:



WEBSITE OUTPUT:






Not secure
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local
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Total
€25.63
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City
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State
CA
Country
United States
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Credit Card Number
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Month
January
Year
2025
CVV
Place Order