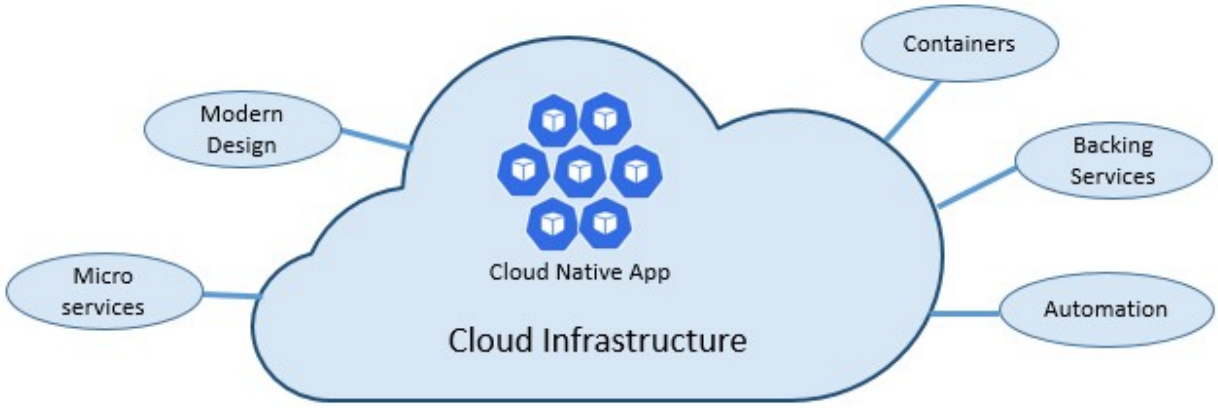
Cloud Native – DevOps Project – Monitoring APP



The cloud

Cloud-native systems take full advantage of the cloud service model.

Designed to thrive in a dynamic, virtualized cloud environment, these systems make extensive use of Platform as a Service (PaaS) compute infrastructure and managed services. They treat the underlying infrastructure as *disposable* - provisioned in minutes and resized, scaled, or destroyed on demand – via automation.

Consider the difference between how we treat pets and commodities. In a traditional data center, servers are treated as pets: a physical machine, given a meaningful name, and cared for. You scale by adding more resources to the same machine (scaling up). If the server becomes sick, you nurse it back to health. Should the server become unavailable, everyone notices.

The commodities service model is different. You provision each instance as a virtual machine or container. They're identical and assigned a system identifier such as Service-01, Service-02, and so on. You scale by creating more instances (scaling out). Nobody notices when an instance becomes unavailable.

The commodities model embraces immutable infrastructure. Servers aren't repaired or modified. If one fails or requires updating, it's destroyed and a new one is provisioned – all done via automation.

Cloud-native systems embrace the commodities service model. They continue to run as the infrastructure scales in or out with no regard to the machines upon which they're running.

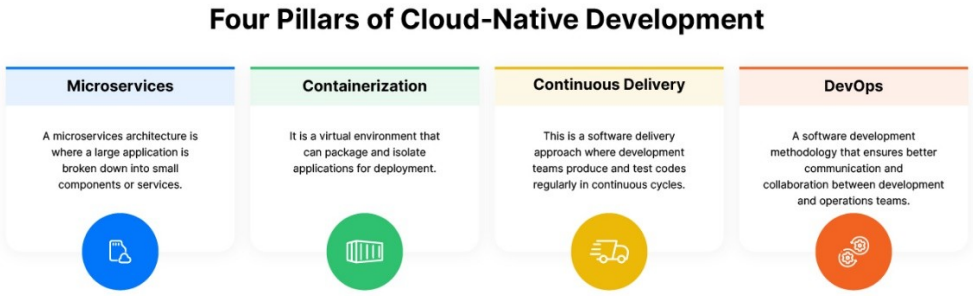
The Azure cloud platform supports this type of highly elastic infrastructure with automatic scaling, self-healing, and monitoring capabilities.

Modern design

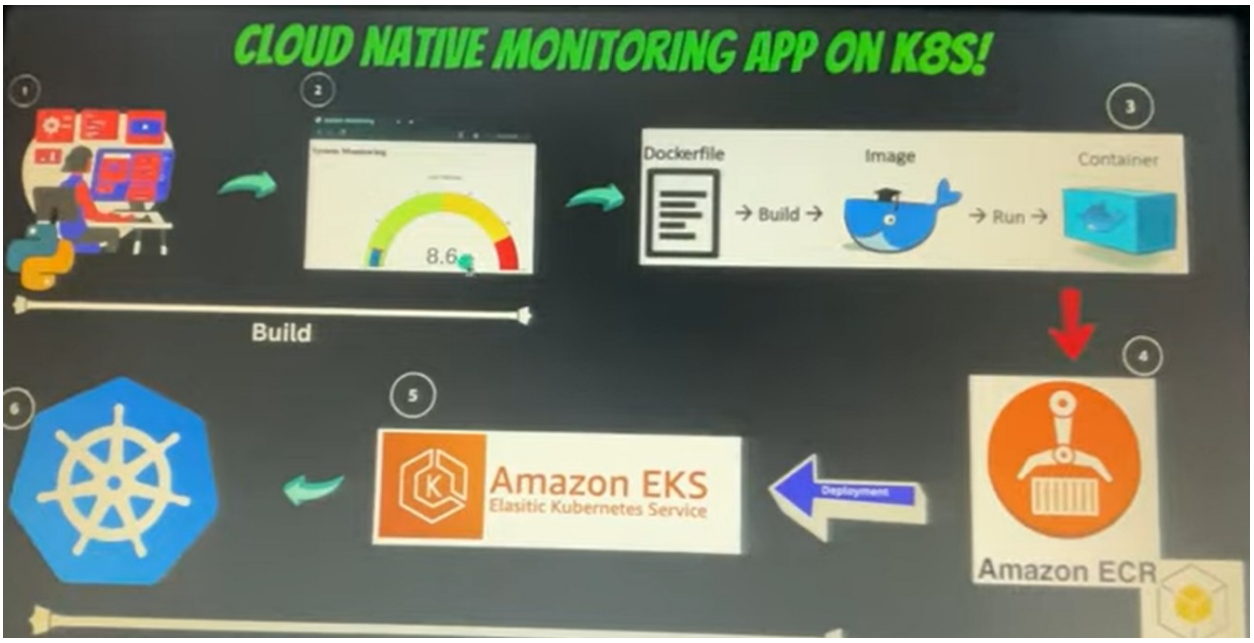
How would you design a cloud-native app? What would your architecture look like? To what principles, patterns, and best practices would you adhere? What infrastructure and operational concerns would be important?

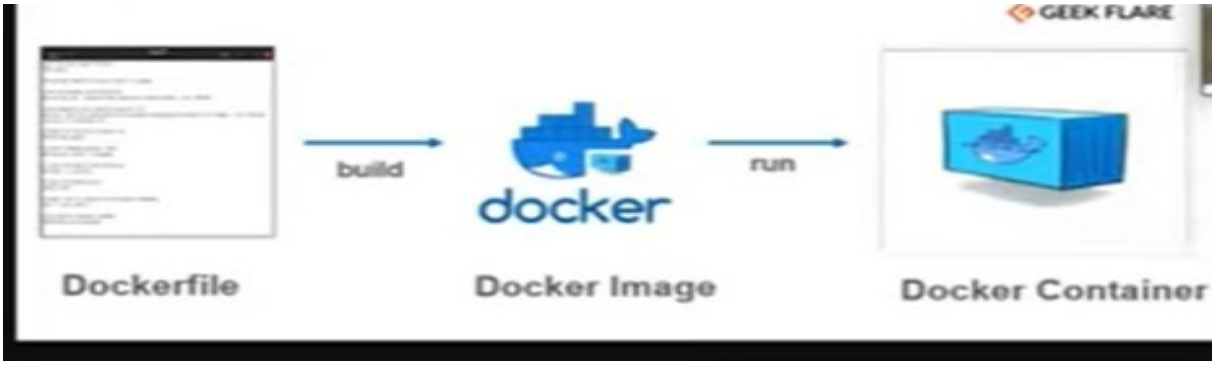
In this Devops project we are covering following topics -

- ✓ Intro
- ✓ Devops project architecture Diagram
- ✓ IMPORTANT Message before starting the project
- ✓ Prerequisites for this DevOps project
- ✓ Creating Monitoring application in Python using Flask and Psutil
- ✓ Monitoring App Deployed locally
- ✓ Creating Dockerfile to containerize the App
- ✓ Run Docker commands to create docker image
- ✓ Run Docker Container
- ✓ Create ECR using Python Boto3
- ✓ Push Docker Image to ECR
- ✓ Create EKS Kubernetes Cluster and Nodes
- ✓ Create Kubernetes Deployment and Service using Kubernetes Python Client
- ✓ Port Forward Kubernetes Service and Access the Application deployed on Kubernetes Pod



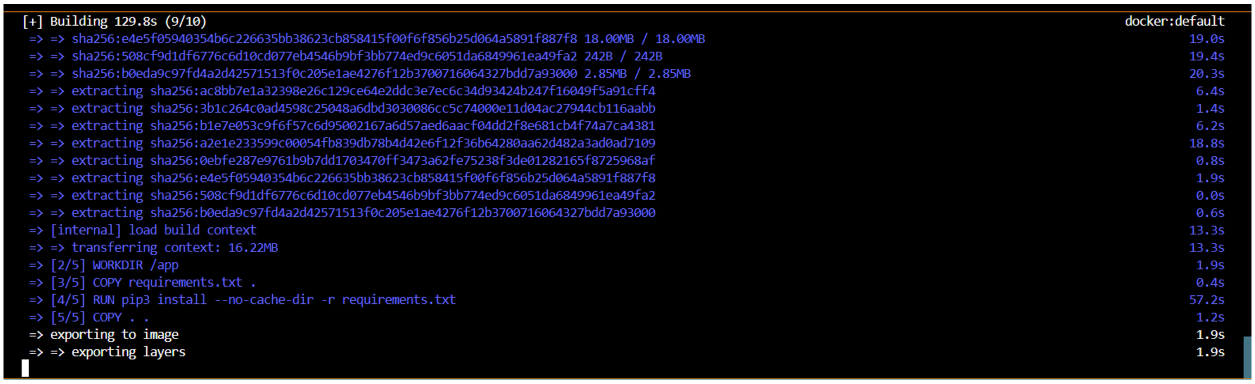
Ref - https://www.ziffity.com/blog/why-developing-cloud-native-applications-is-worth-the-time-and-money/





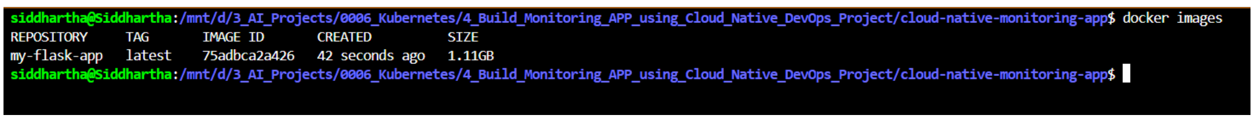
Docker Build Image

```
siddhartha@Siddhartha:/mnt/d/3_AI_Projects/0006_Kubernetes/4_Build_Monitoring_APP_using_Cloud_Native_DevOps_Project/cloud-native-monitoring-app$ docker build -t my-flask-
app .
[+] Building 3.0s (2/3)                                                                                                    docker:default
 => [internal] load .dockerignore                                                                                                   0.1s
 => => transferring context: 2B                                                                                                     0.0s
 => [internal] load build definition from Dockerfile                                                                                0.1s
 => => transferring dockerfile: 240B                                                                                                0.0s
 => [internal] load metadata for docker.io/library/python:3.9-buster                                                                2.9s
```



```
[+] Building 129.8s (9/10)                                                                                   docker:default
 => => sha256:e4e5f05940354b6c226635bb38623cb858415f00f6f856b25d064a5891f887f8 18.00MB / 18.00MB                      19.0s
 => => sha256:508cf9d1df6776c6d10cd077eb4546b9bf3bb774ed9c6051da6849961ea49fa2 242B / 242B                            19.4s
 => => sha256:b0eda9c97fd4a2d42571513f0c205e1ae4276f12b3700716064327bdd7a93000 2.85MB / 2.85MB                        20.3s
 => => extracting sha256:ac8bb7e1a32398e26c129ce64e2ddc3e7ec6c34d93424b247f16049f5a91cff4                               6.4s
 => => extracting sha256:3b1c264c0ad4598c25048a6dbd3030086cc5c74000e11d04ac27944cb116aabb                               1.4s
 => => extracting sha256:b1e7e053c9f6f57c6d95002167a6d57aed6aacf04dd2f8e681cb4f74a7ca4381                               6.2s
 => => extracting sha256:a2e1e233599c00054fb839db78b4d42e6f12f36b64280aa62d482a3ad0ad7109                              18.8s
 => => extracting sha256:0ebfe287e9761b9b7dd1703470ff3473a62fe75238f3de01282165f8725968af                               0.8s
 => => extracting sha256:e4e5f05940354b6c226635bb38623cb858415f00f6f856b25d064a5891f887f8                               1.9s
 => => extracting sha256:508cf9d1df6776c6d10cd077eb4546b9bf3bb774ed9c6051da6849961ea49fa2                               0.0s
 => => extracting sha256:b0eda9c97fd4a2d42571513f0c205e1ae4276f12b3700716064327bdd7a93000                               0.6s
 => [internal] load build context                                                                                      13.3s
 => => transferring context: 16.22MB                                                                                   13.3s
 => [2/5] WORKDIR /app                                                                                                  1.9s
 => [3/5] COPY requirements.txt .                                                                                       0.4s
 => [4/5] RUN pip3 install --no-cache-dir -r requirements.txt                                                          57.2s
 => [5/5] COPY . .                                                                                                      1.2s
 => exporting to image                                                                                                  1.9s
 => => exporting layers                                                                                                 1.9s
```

image

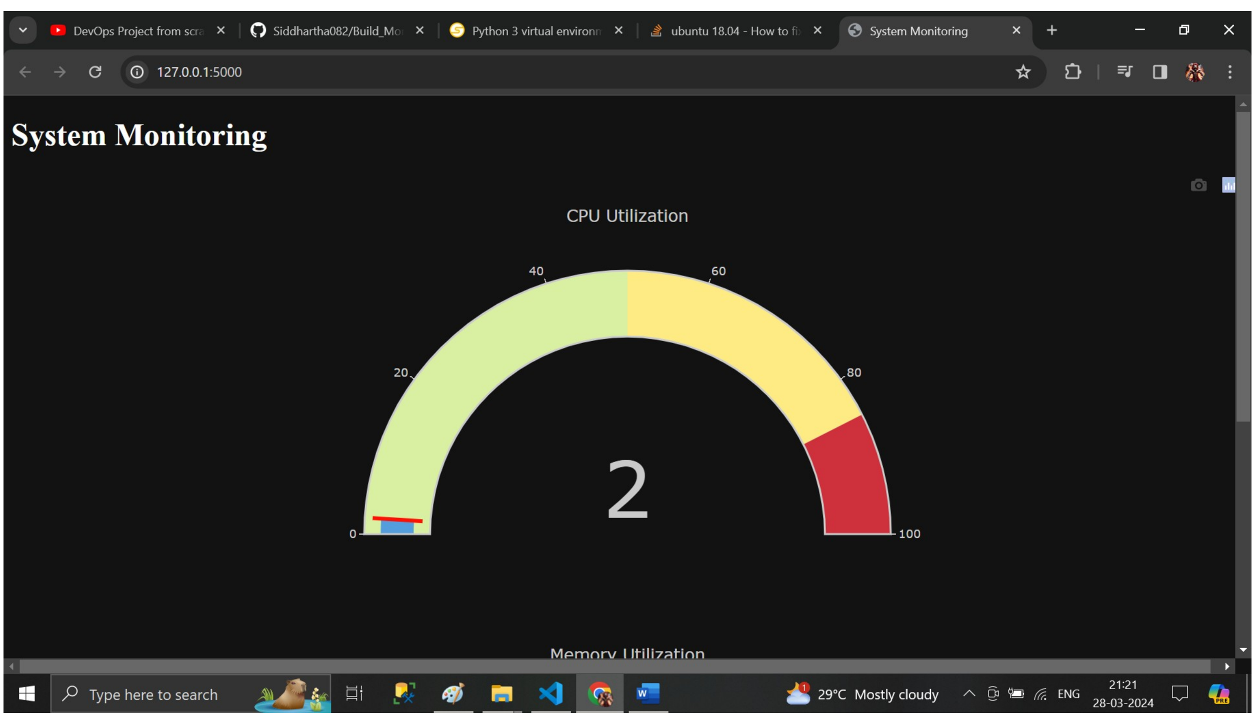


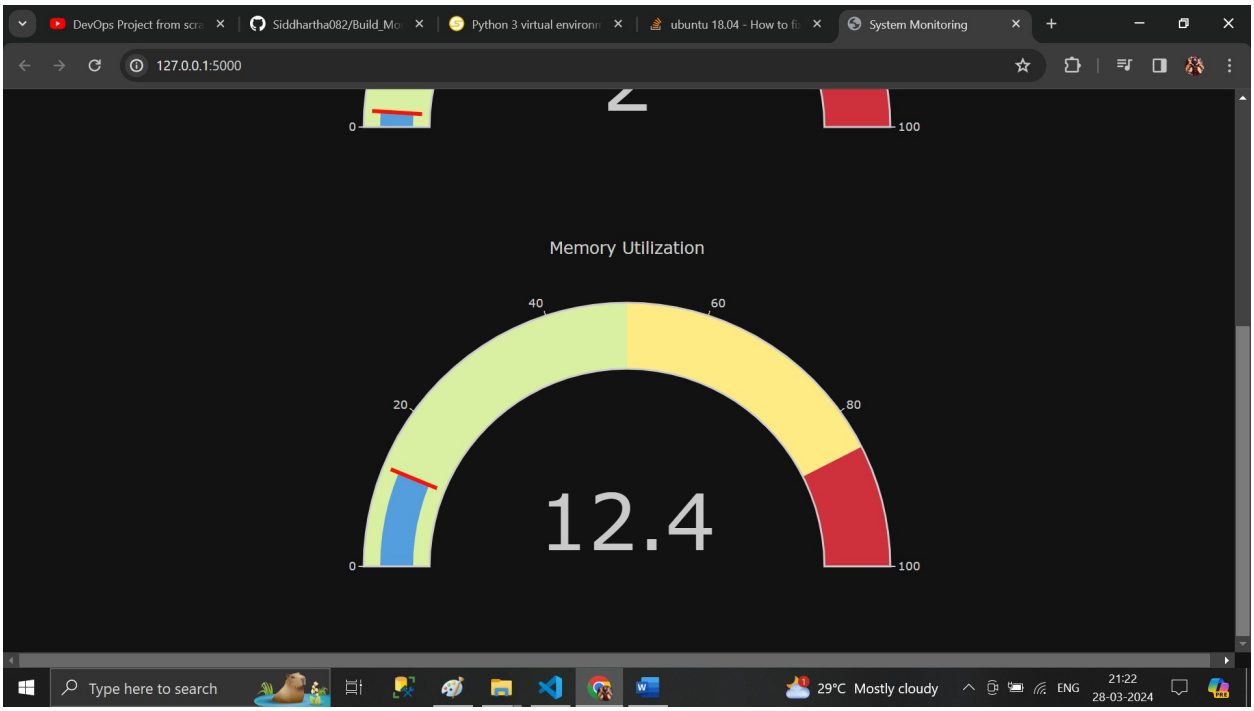
```
siddhartha@Siddhartha:/mnt/d/3_AI_Projects/0006_Kubernetes/4_Build_Monitoring_APP_using_Cloud_Native_DevOps_Project/cloud-native-monitoring-app$ docker images
REPOSITORY     TAG       IMAGE ID       CREATED          SIZE
my-flask-app   latest    75adbca2a426   42 seconds ago   1.11GB
siddhartha@Siddhartha:/mnt/d/3_AI_Projects/0006_Kubernetes/4_Build_Monitoring_APP_using_Cloud_Native_DevOps_Project/cloud-native-monitoring-app$
```

Run the Container

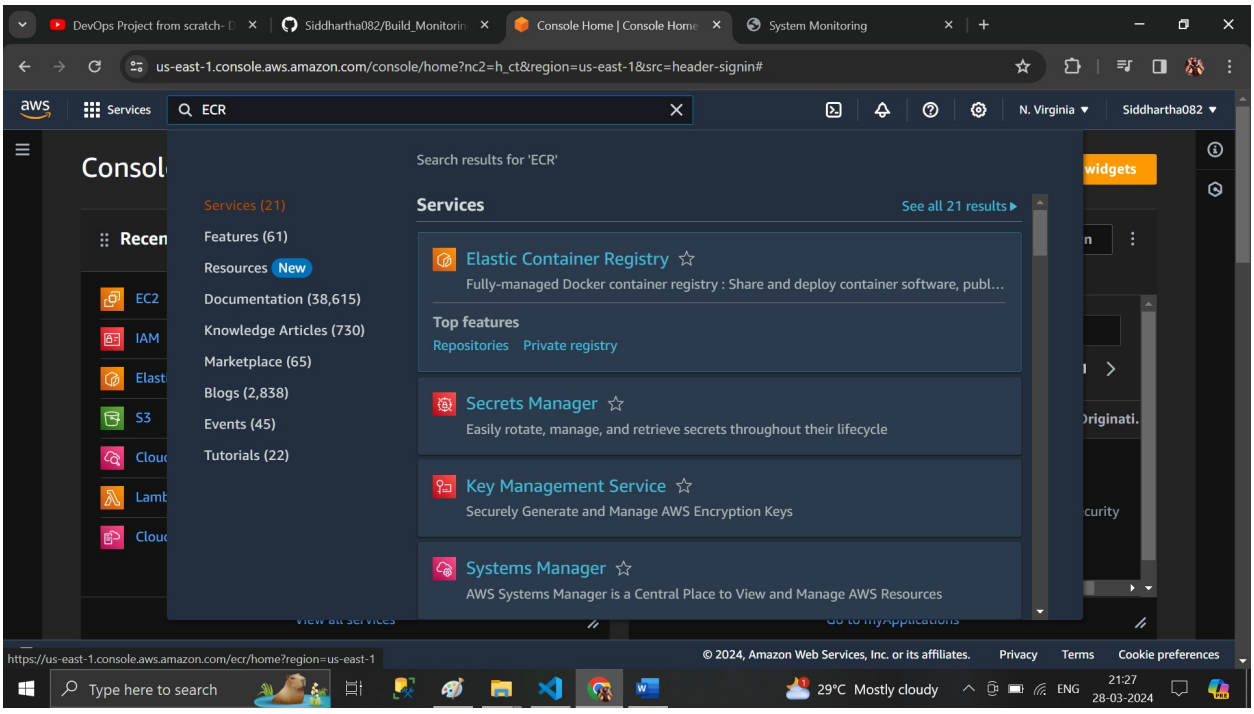
```
siddhartha@Siddhartha:/mnt/d/3_AI_Projects/0006_Kubernetes/4_Build_Monitoring_APP_using_Cloud_Native_DevOps_Project/cloud-native-monitoring-app$ docker run -p 5000:5000
5adbca2a426
 * Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
 * Running on all addresses (0.0.0.0)
 * Running on http://127.0.0.1:5000
 * Running on http://172.17.0.2:5000
Press CTRL+C to quit
```

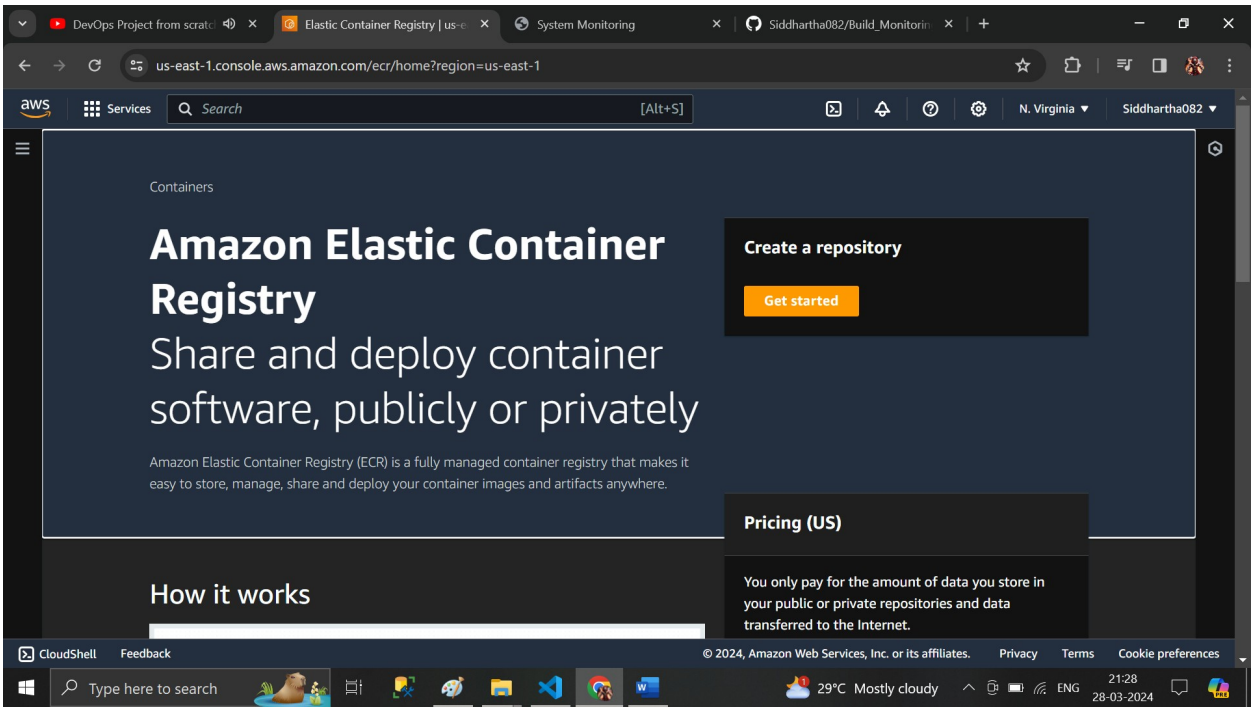
Output – CPU + Memory of Docker Container ….



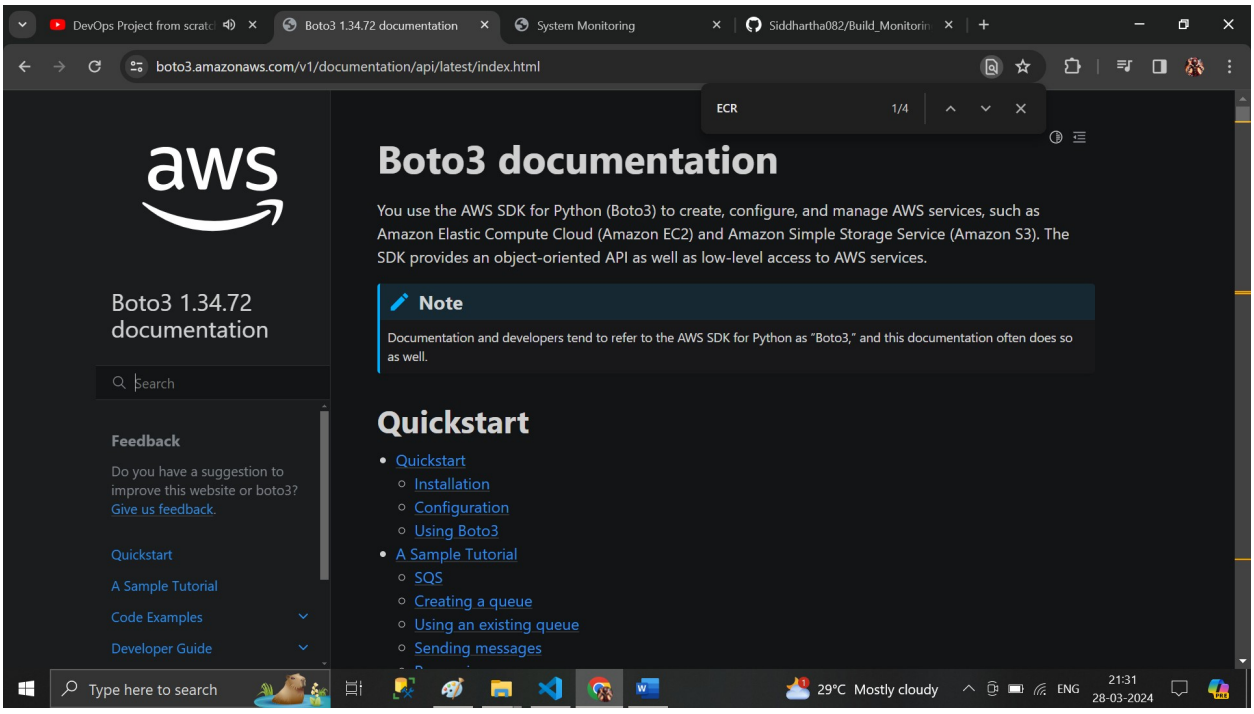


Now Push this Image in AWS ECR service



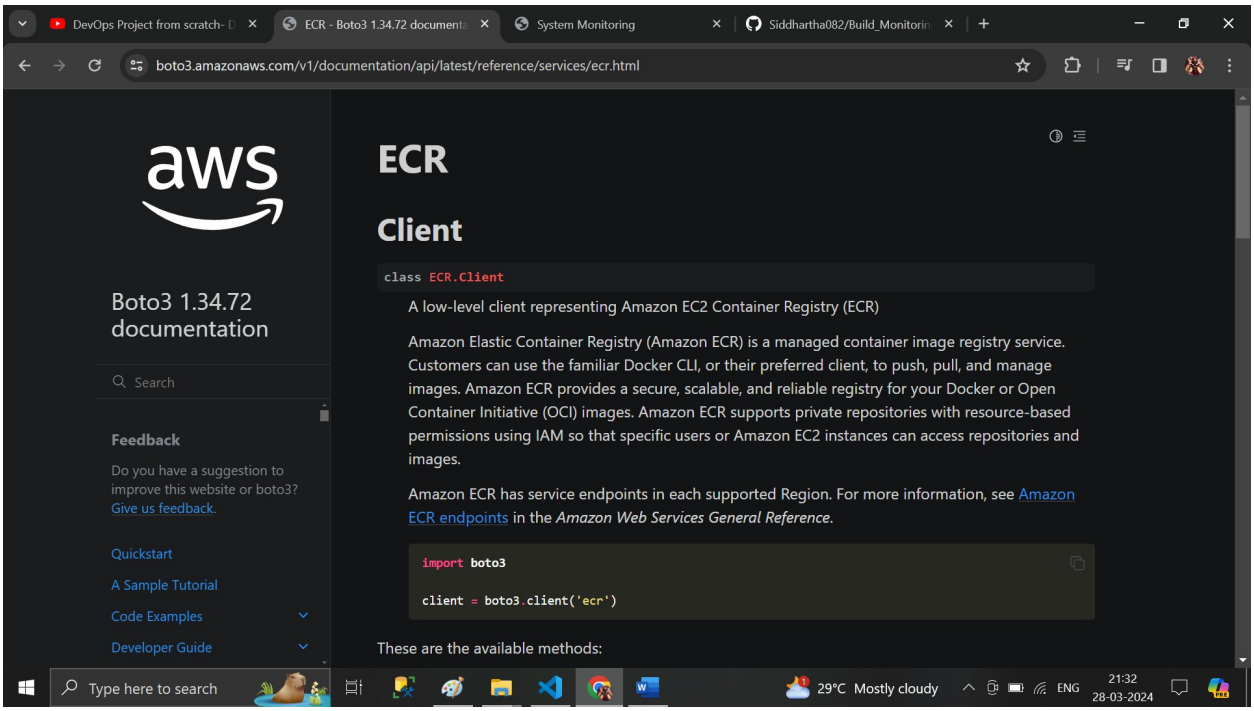


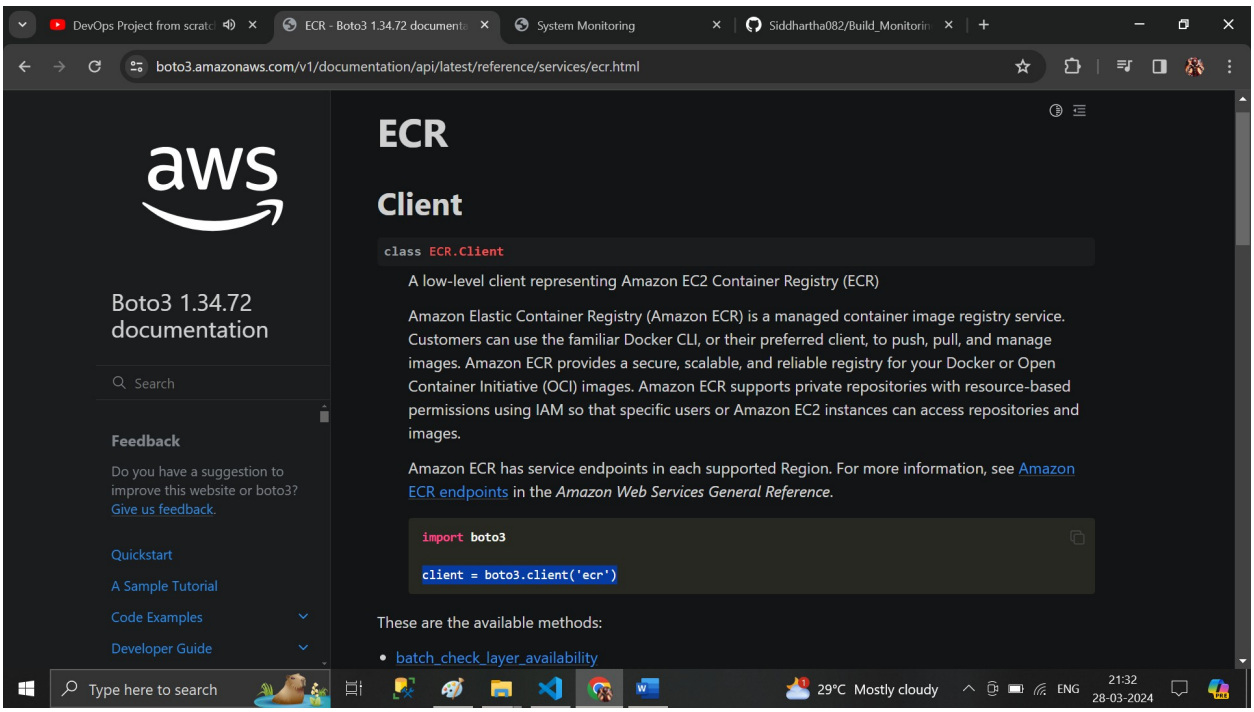
Here is the twist … from Boto3 Documentation Access AWS ECR Service .. using ECR.py code



https://boto3.amazonaws.com/v1/documentation/api/latest/index.html

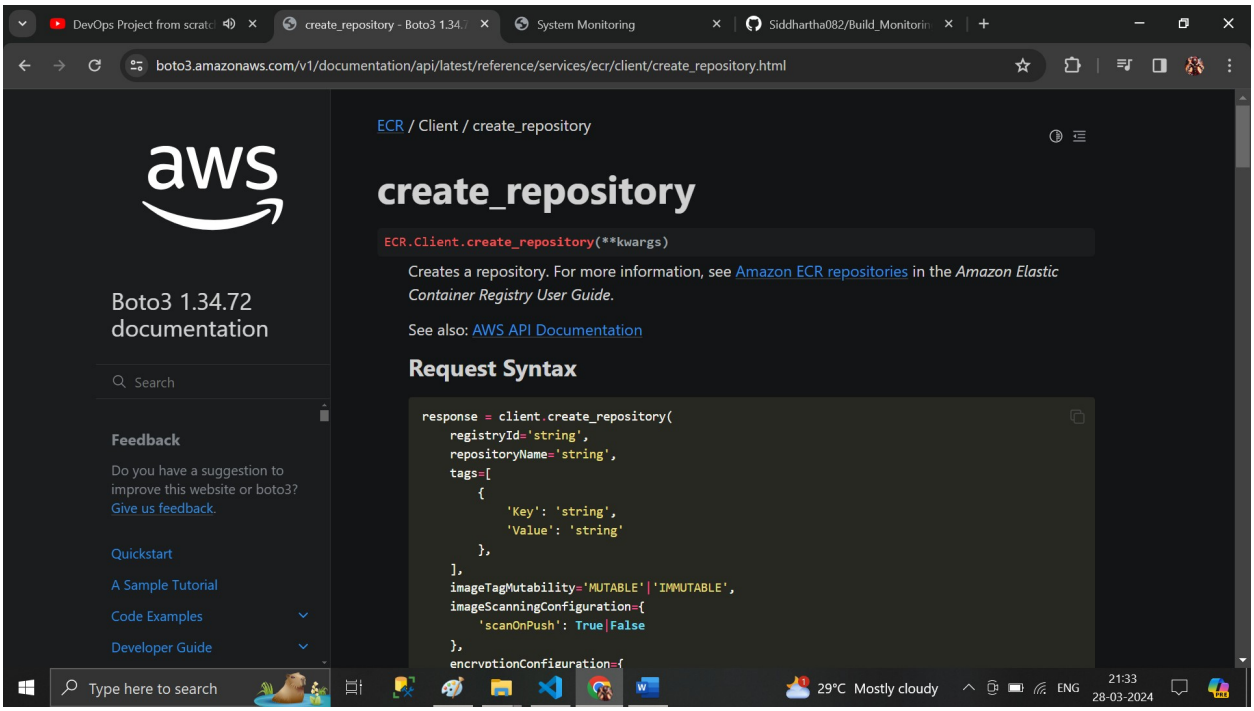
ECR





API calls- - click on Create Repo

https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/ecr/client/create_repository.html


DevOps Project from scratc
create_repository - Boto3 1.34.
System Monitoring
Siddhartha082/Build_Monitorin
boto3.amazonaws.com/v1/documentation/api/latest/reference/services/ecr/client/create_repository.html
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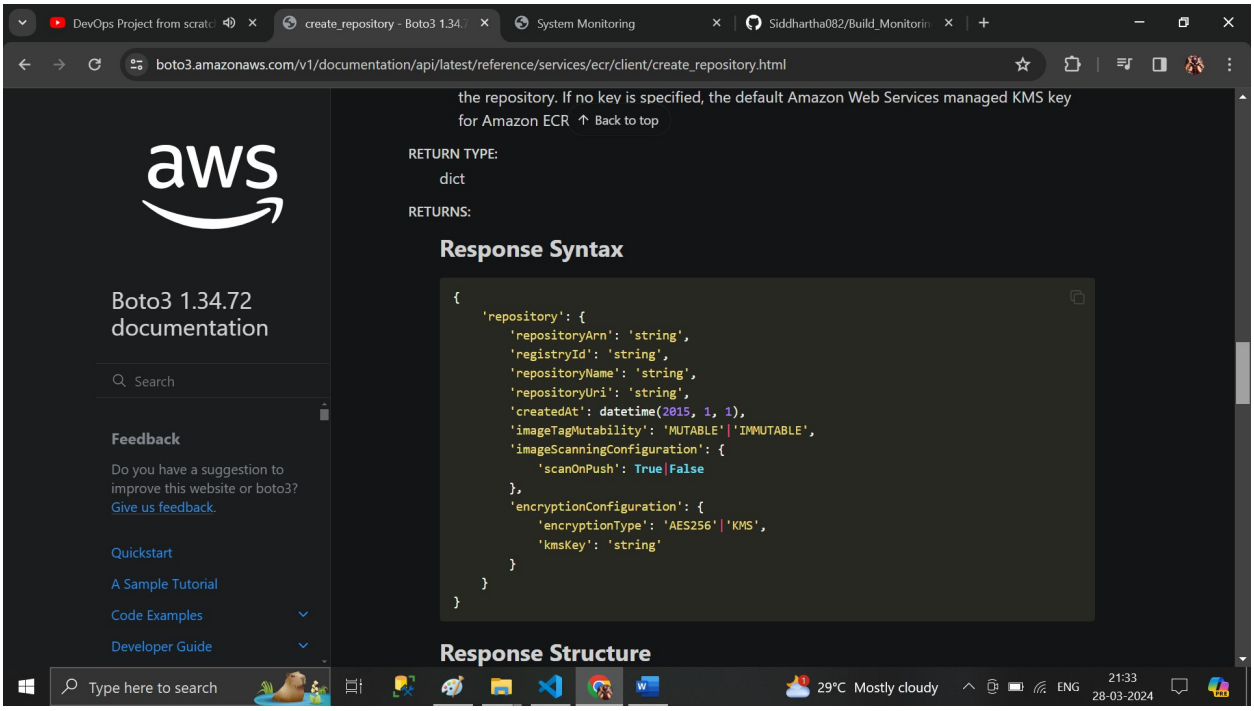
ECR / Client / create_repository
create_repository
ECR.Client.create_repository(**kwargs)
Creates a repository. For more information, see Amazon ECR repositories in the Amazon Elastic Container Registry User Guide.
See also: AWS API Documentation
Request Syntax
response = client.create_repository(
registryId='string',
repositoryName='string',
tags=[
{
'Key': 'string',
'Value': 'string'
},
],
imageTagMutability='MUTABLE'|'IMMUTABLE',
imageScanningConfiguration={
'scanOnPush': True|False
},
encryptionConfiguration={
Type here to search
29°C Mostly cloudy
ENG
21:33
28-03-2024


DevOps Project from scratc
create_repository - Boto3 1.34.
System Monitoring
Siddhartha082/Build_Monitorin
boto3.amazonaws.com/v1/documentation/api/latest/reference/services/ecr/client/create_repository.html
the repository. If no key is specified, the default Amazon Web Services managed KMS key for Amazon ECR
Back to top
RETURN TYPE:
dict
RETURNS:
Response Syntax
{
'repository': {
'repositoryArn': 'string',
'registryId': 'string',
'repositoryName': 'string',
'repositoryUri': 'string',
'createdAt': datetime(2015, 1, 1),
'imageTagMutability': 'MUTABLE'|'IMMUTABLE',
'imageScanningConfiguration': {
'scanOnPush': True|False
},
'encryptionConfiguration': {
'encryptionType': 'AES256'|'KMS',
'kmsKey': 'string'
}
}
}
Response Structure
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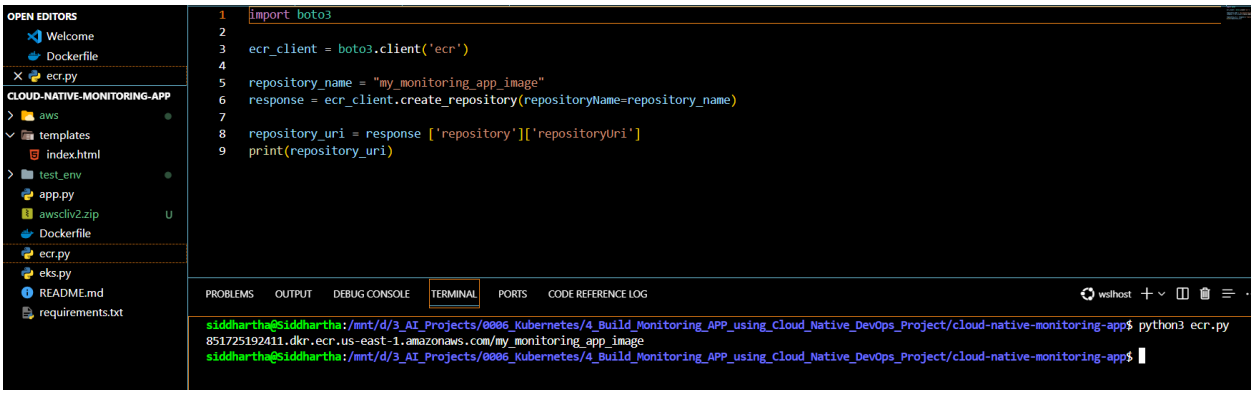
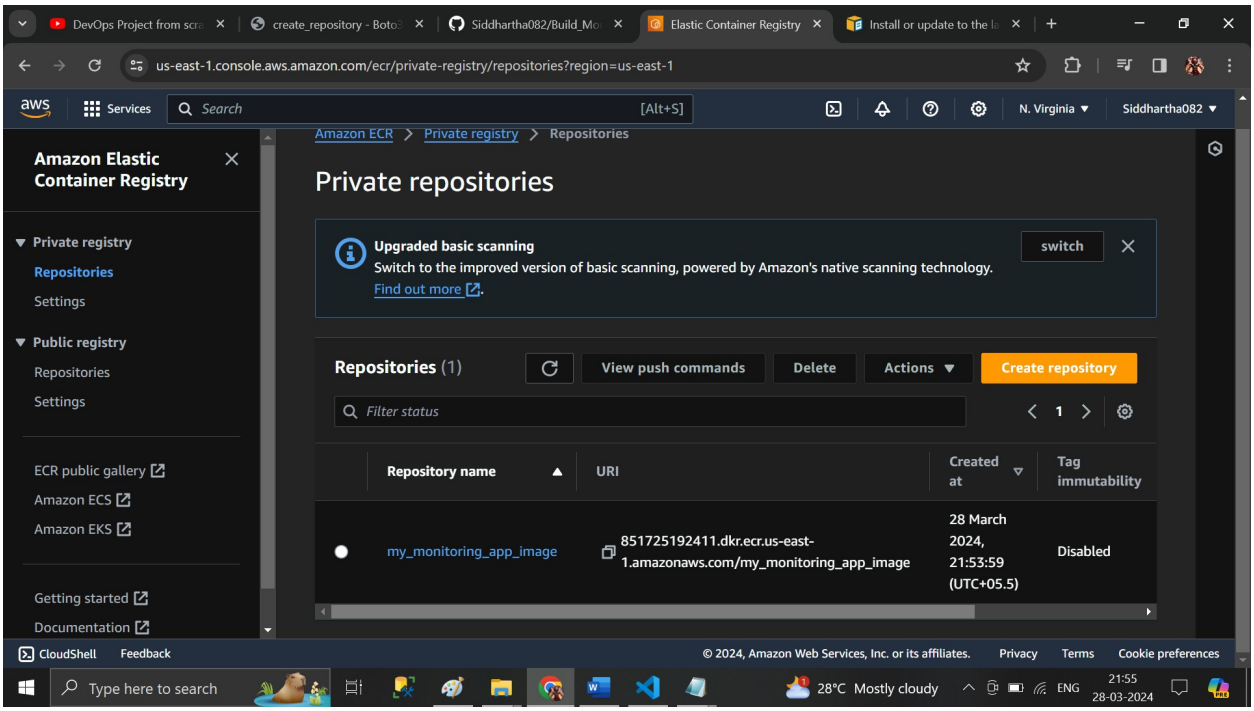
Code

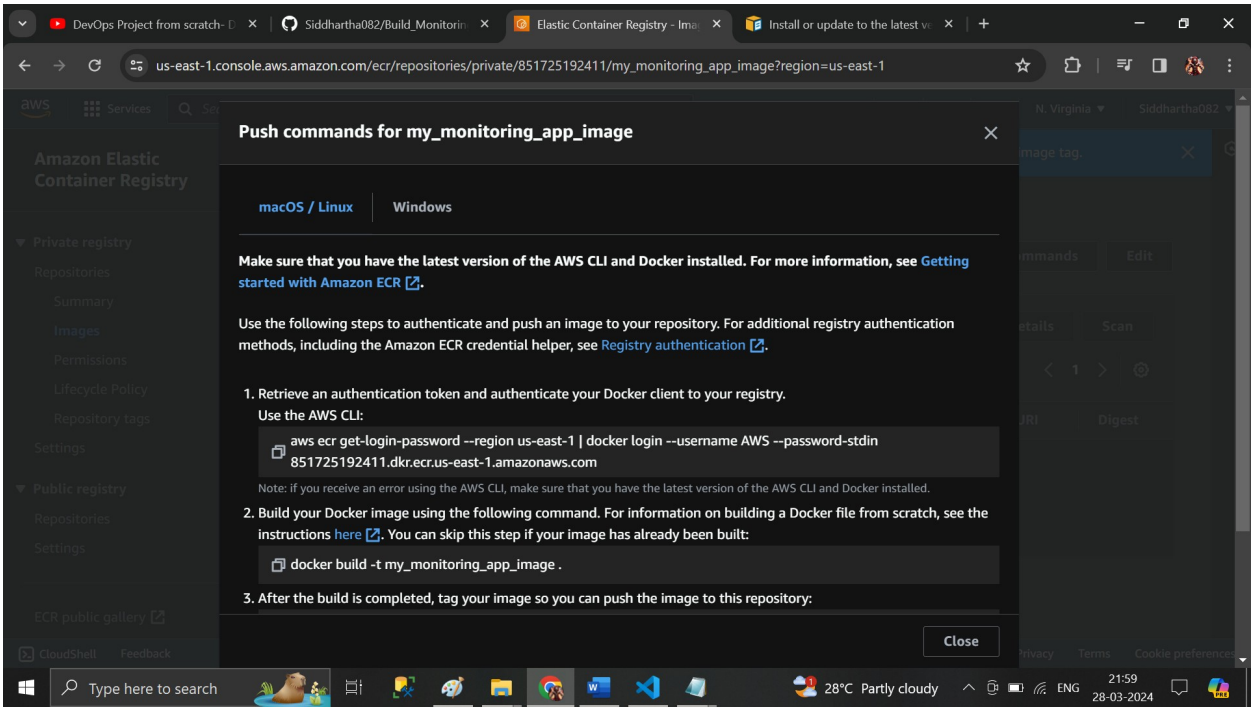
ECR Repo -image

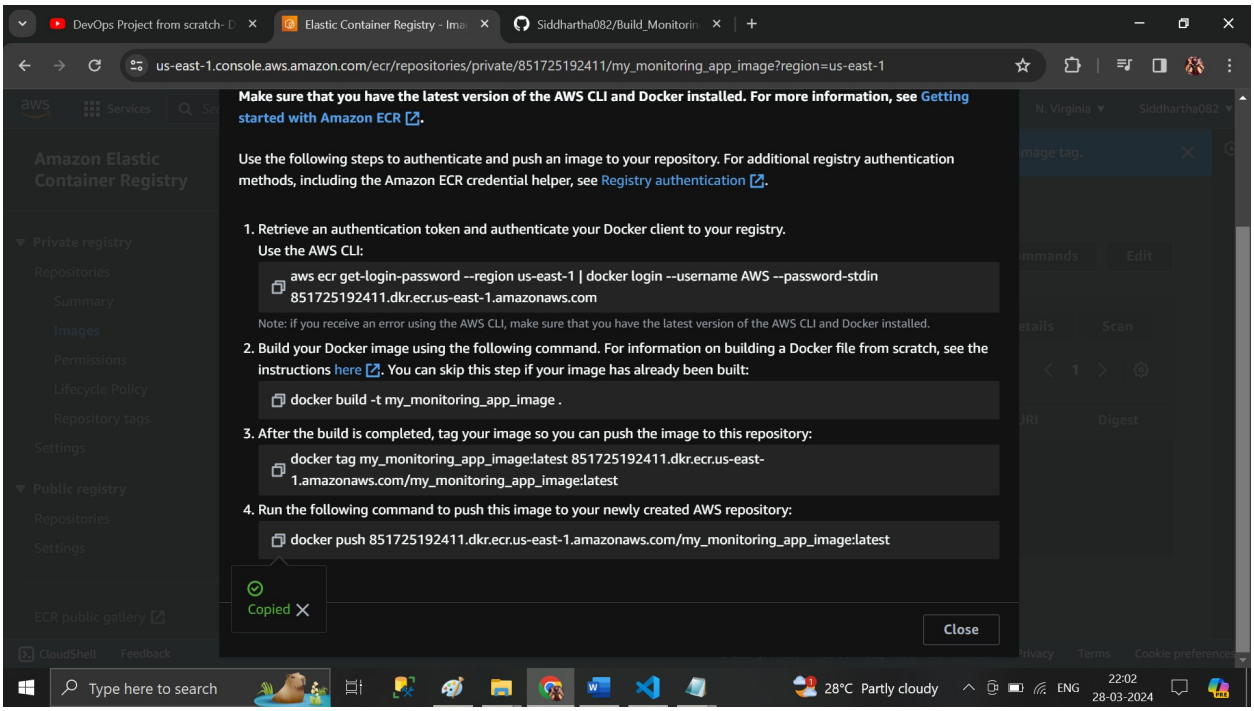


Repo Create through aws configure (giving access key+ secrete key) – Just using python ECR Repo is created below



Click on Push Command below instruction will help to install image in this ECR- image



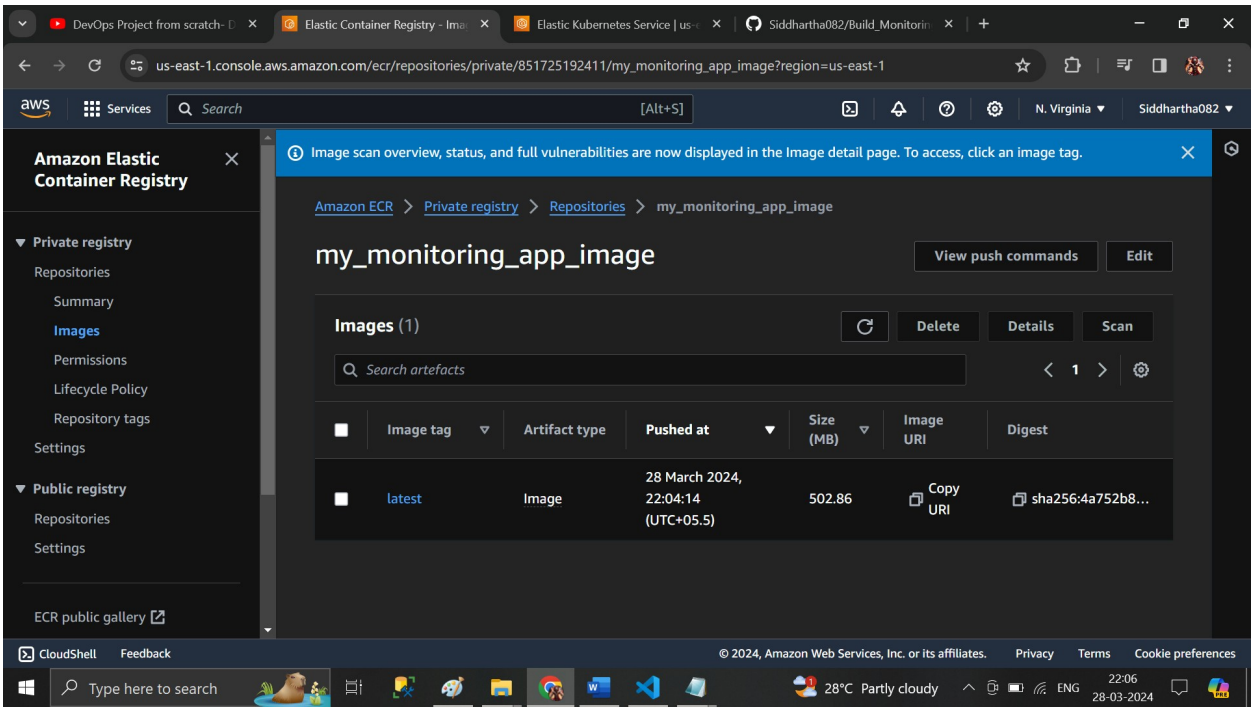


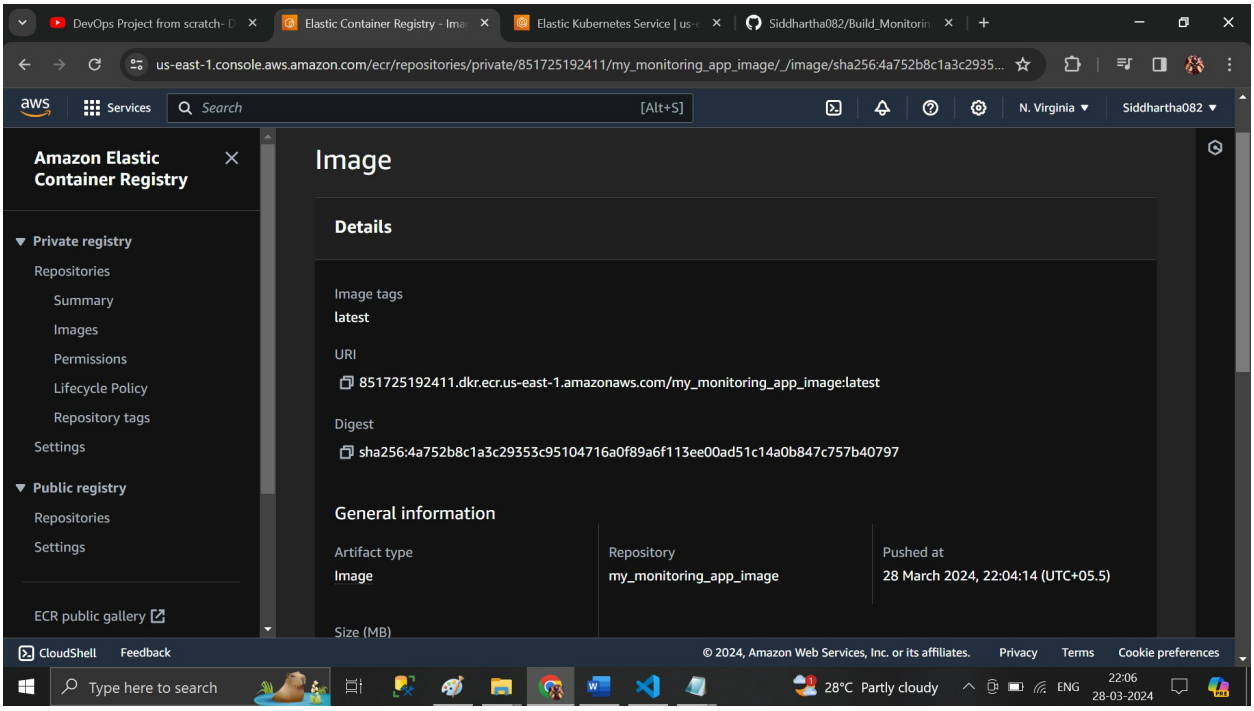

```
siddhartha@Siddhartha:/mnt/d/3_AI_Projects/0006_Kubernetes/4_Build_Monitoring_APP_using_Cloud_Native_DevOps_Project/cloud-native-monitoring-app$ python3 ecr.py
851725192411.dkr.ecr.us-east-1.amazonaws.com/my_monitoring_app_image
siddhartha@Siddhartha:/mnt/d/3_AI_Projects/0006_Kubernetes/4_Build_Monitoring_APP_using_Cloud_Native_DevOps_Project/cloud-native-monitoring-app$ aws ecr get-login-passwor
d --region us-east-1 | docker login --username AWS --password-stdin 851725192411.dkr.ecr.us-east-1.amazonaws.com
WARNING! Your password will be stored unencrypted in /home/siddhartha/snap/docker/2915/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
siddhartha@Siddhartha:/mnt/d/3_AI_Projects/0006_Kubernetes/4_Build_Monitoring_APP_using_Cloud_Native_DevOps_Project/cloud-native-monitoring-app$ docker build -t my_monito
ring_app_image .
[+] Building 1.8s (2/3)                                                                                                  docker:default
 => [internal] load build definition from Dockerfile                                                                             0.0s
 => => transferring dockerfile: 240B                                                                                             0.0s
 => [internal] load .dockerignore                                                                                                0.0s
 => => transferring context: 2B                                                                                                  0.0s
 => [internal] load metadata for docker.io/library/python:3.9-buster                                                             1.8s
```

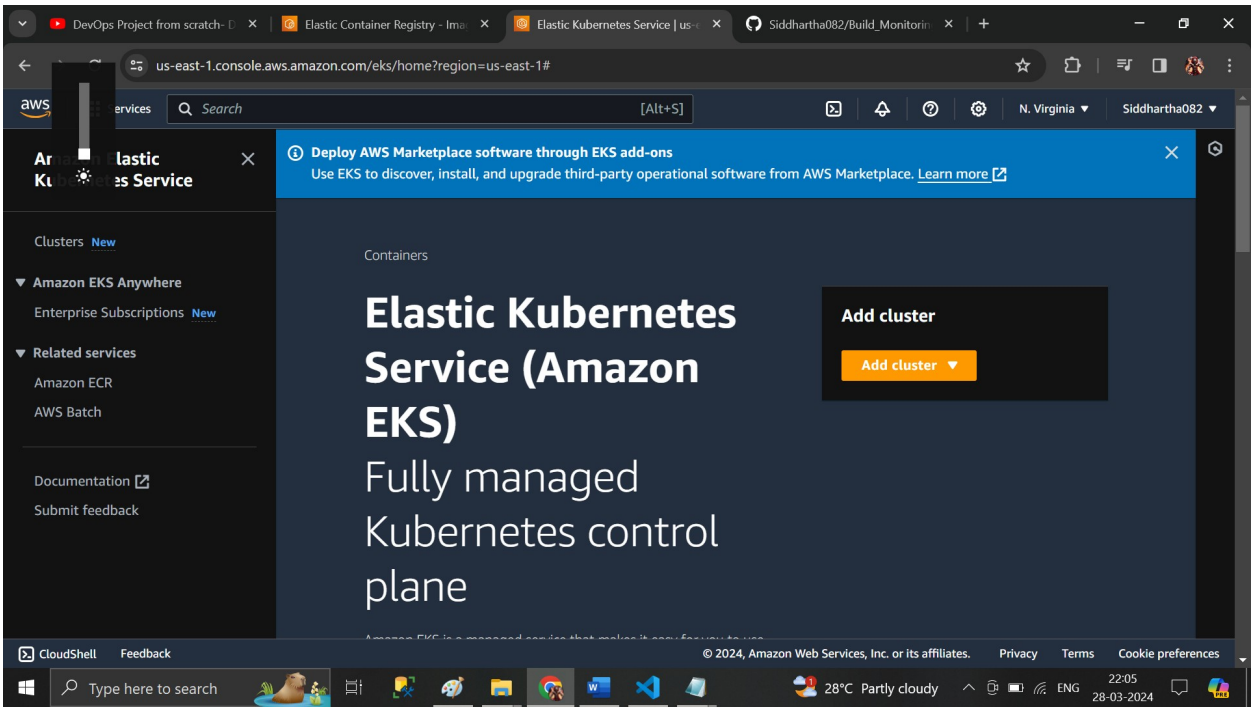
```
 => => exporting layers                                                                                                          3.3s
 => => writing image sha256:44548859c8f87aa4ff1dc73eea726ce88a8140a9edbd7c68f9f00a8f4f876d37                                     0.0s
 => => naming to docker.io/library/my_monitoring_app_image                                                                       0.1s
siddhartha@Siddhartha:/mnt/d/3_AI_Projects/0006_Kubernetes/4_Build_Monitoring_APP_using_Cloud_Native_DevOps_Project/cloud-native-monitoring-app$ docker tag my_monitoring_
app_image:latest 851725192411.dkr.ecr.us-east-1.amazonaws.com/my_monitoring_app_image:latest
siddhartha@Siddhartha:/mnt/d/3_AI_Projects/0006_Kubernetes/4_Build_Monitoring_APP_using_Cloud_Native_DevOps_Project/cloud-native-monitoring-app$ docker push 851725192411.
dkr.ecr.us-east-1.amazonaws.com/my_monitoring_app_image:latest
The push refers to repository [851725192411.dkr.ecr.us-east-1.amazonaws.com/my_monitoring_app_image]
c751f25cab0e: Pushing [========>                                          ]  54.62MB/284.6MB
0aa58b7c477c: Pushing [================>                                  ]  75.45MB/211MB
e9743305a5f7: Pushing [==================================================>]  2.56kB
e704d0c078b6: Pushed
6708fb287a81: Pushing [==================================================>]  10.48MB
80be4d1ba48b: Pushing [==================================================>]  5.12kB
cc03a41bc194: Waiting
474c7af10697: Waiting
dcc1cfeee1ab: Waiting
eccb9ed74974: Waiting
53d40515380c: Waiting
6af7a54a0a0d: Waiting
```

Check the image in the ECR-





now head towards EKS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Elastic Container Registry - Ima
Elastic Kubernetes Service | us-
Siddhartha082/Build_Monitorin
us-east-1.console.aws.amazon.com/eks/home?region=us-east-1#
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Elastic Kubernetes Service (Amazon EKS)
Fully managed Kubernetes control plane
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Add cluster
CloudShell
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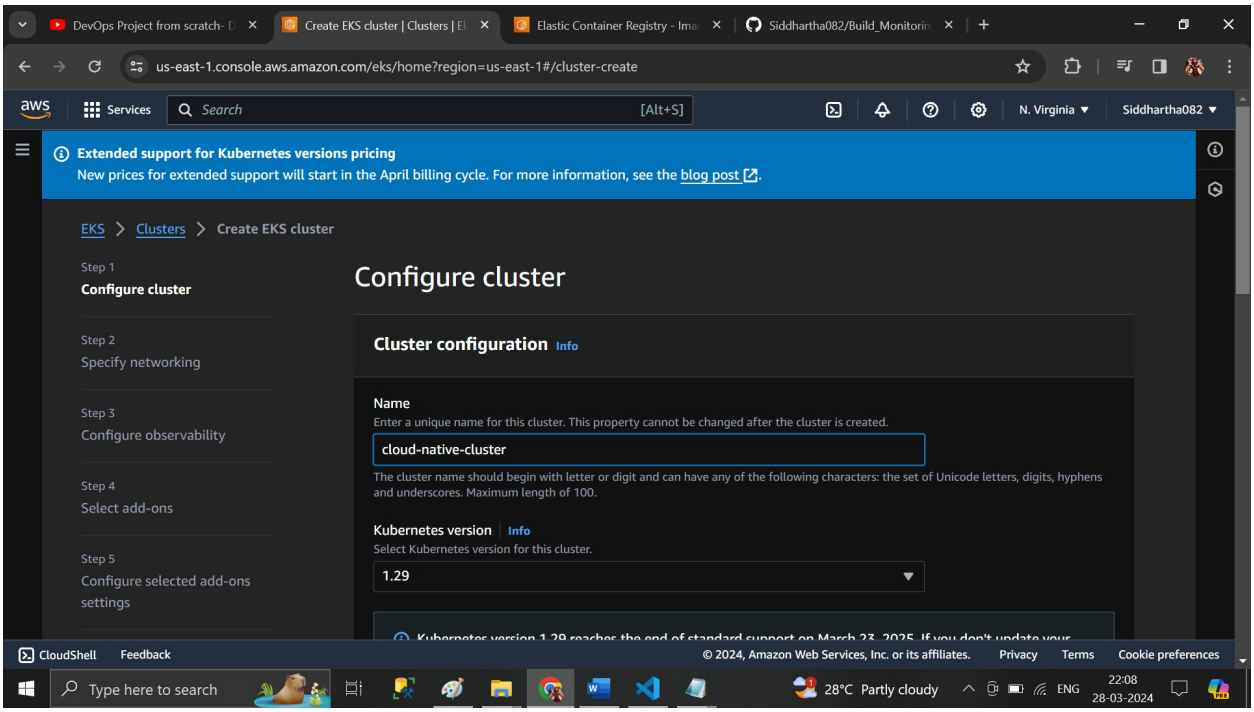
ENG
22:05
28-03-2024


DevOps Project from scratch- D
Create EKS cluster | Clusters | El
Elastic Container Registry - Ima
Siddhartha082/Build_Monitorin
us-east-1.console.aws.amazon.com/eks/home?region=us-east-1#/cluster-create
Services
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Siddhartha082
Extended support for Kubernetes versions pricing
New prices for extended support will start in the April billing cycle. For more information, see the blog post.
EKS > Clusters > Create EKS cluster
Step 1
Configure cluster
Step 2
Specify networking
Step 3
Configure observability
Step 4
Select add-ons
Step 5
Configure selected add-ons settings
Configure cluster
Cluster configuration Info
Name
Enter a unique name for this cluster. This property cannot be changed after the cluster is created.
cloud-native-cluster
The cluster name should begin with letter or digit and can have any of the following characters: the set of Unicode letters, digits, hyphens and underscores. Maximum length of 100.
Kubernetes version Info
Select Kubernetes version for this cluster.
1.29
CloudShell
Feedback
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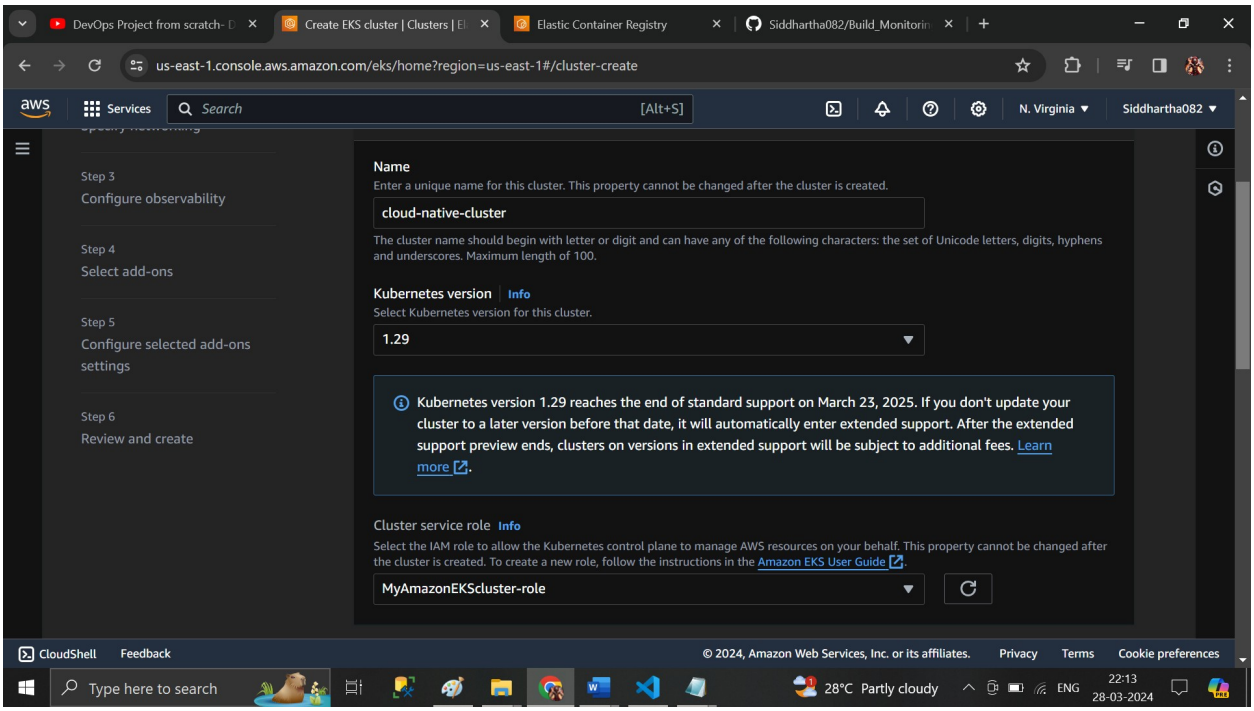
Privacy
Terms
Cookie preferences
Type here to search
28°C Partly cloudy
ENG
22:08
28-03-2024


DevOps Project from scratch- D
Create EKS cluster | Clusters | El
Elastic Container Registry
Siddhartha082/Build_Monitorin
us-east-1.console.aws.amazon.com/eks/home?region=us-east-1#/cluster-create
aws
Services
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N. Virginia
Siddhartha082
Step 3
Configure observability
Step 4
Select add-ons
Step 5
Configure selected add-ons settings
Step 6
Review and create
Name
Enter a unique name for this cluster. This property cannot be changed after the cluster is created.
cloud-native-cluster
The cluster name should begin with letter or digit and can have any of the following characters: the set of Unicode letters, digits, hyphens and underscores. Maximum length of 100.
Kubernetes version Info
Select Kubernetes version for this cluster.
1.29
Kubernetes version 1.29 reaches the end of standard support on March 23, 2025. If you don't update your cluster to a later version before that date, it will automatically enter extended support. After the extended support preview ends, clusters on versions in extended support will be subject to additional fees. Learn more.
Cluster service role Info
Select the IAM role to allow the Kubernetes control plane to manage AWS resources on your behalf. This property cannot be changed after the cluster is created. To create a new role, follow the instructions in the Amazon EKS User Guide.
MyAmazonEKScluster-role
CloudShell
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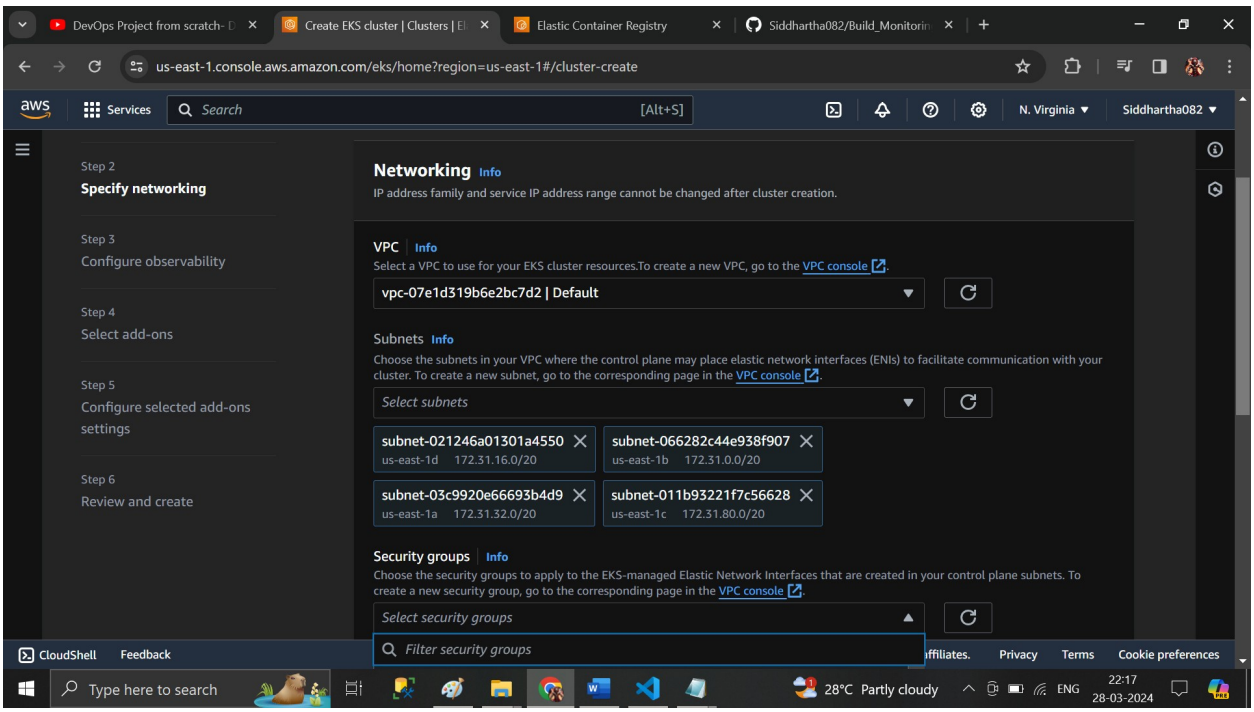
ENG
22:13
28-03-2024


DevOps Project from scratch- D
Create EKS cluster | Clusters | El
Elastic Container Registry
Siddhartha082/Build_Monitorin
us-east-1.console.aws.amazon.com/eks/home?region=us-east-1#/cluster-create
aws
Services
Search
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Siddhartha082
Step 2
Specify networking
Step 3
Configure observability
Step 4
Select add-ons
Step 5
Configure selected add-ons settings
Step 6
Review and create
Networking Info
IP address family and service IP address range cannot be changed after cluster creation.
VPC Info
Select a VPC to use for your EKS cluster resources.To create a new VPC, go to the VPC console.
vpc-07e1d319b6e2bc7d2 | Default
Subnets Info
Choose the subnets in your VPC where the control plane may place elastic network interfaces (ENIs) to facilitate communication with your cluster. To create a new subnet, go to the corresponding page in the VPC console.
Select subnets
subnet-021246a01301a4550
us-east-1d 172.31.16.0/20
subnet-066282c44e938f907
us-east-1b 172.31.0.0/20
subnet-03c9920e66693b4d9
us-east-1a 172.31.32.0/20
subnet-011b93221f7c56628
us-east-1c 172.31.80.0/20
Security groups Info
Choose the security groups to apply to the EKS-managed Elastic Network Interfaces that are created in your control plane subnets. To create a new security group, go to the corresponding page in the VPC console.
Select security groups
Filter security groups
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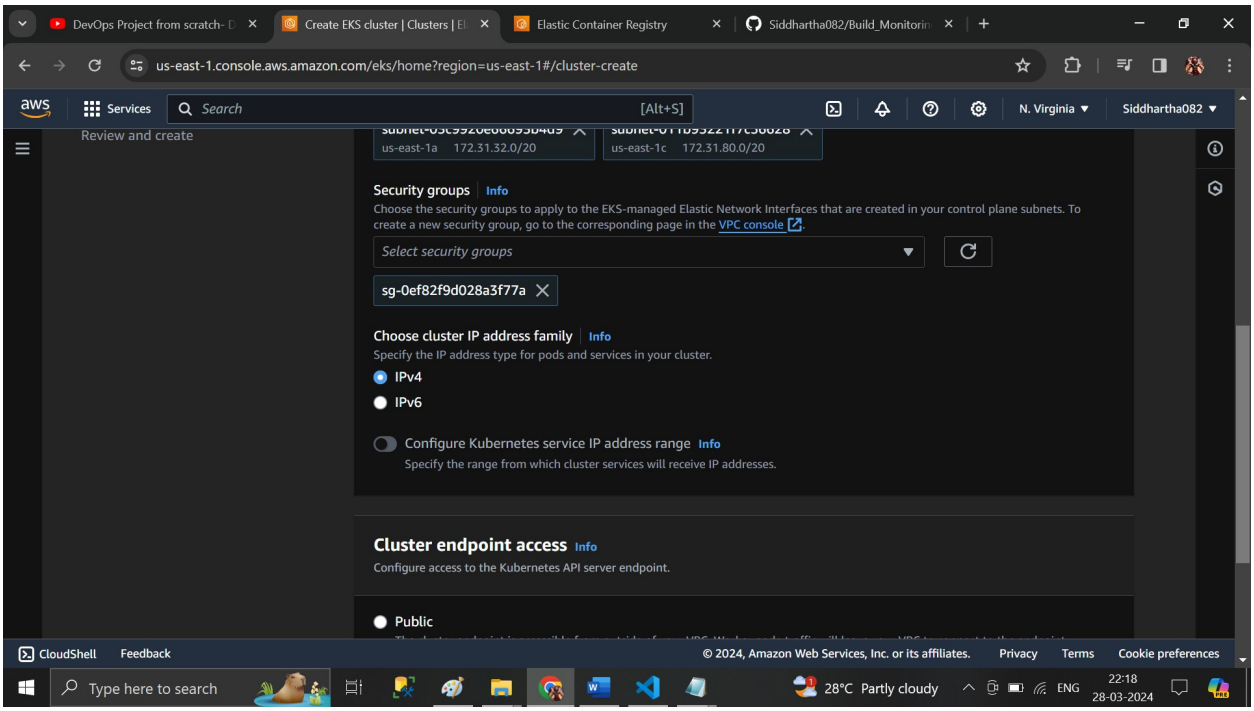
28-03-2024


DevOps Project from scratch- D
Create EKS cluster | Clusters | El
Elastic Container Registry
Siddhartha082/Build_Monitorin
us-east-1.console.aws.amazon.com/eks/home?region=us-east-1#/cluster-create
aws
Services
Search
[Alt+S]
N. Virginia
Siddhartha082
Review and create
us-east-1a 172.31.32.0/20
us-east-1c 172.31.80.0/20
Security groups Info
Choose the security groups to apply to the EKS-managed Elastic Network Interfaces that are created in your control plane subnets. To create a new security group, go to the corresponding page in the VPC console.
Select security groups
sg-0ef82f9d028a3f77a
Choose cluster IP address family Info
Specify the IP address type for pods and services in your cluster.
IPv4
IPv6
Configure Kubernetes service IP address range Info
Specify the range from which cluster services will receive IP addresses.
Cluster endpoint access Info
Configure access to the Kubernetes API server endpoint.
Public
CloudShell
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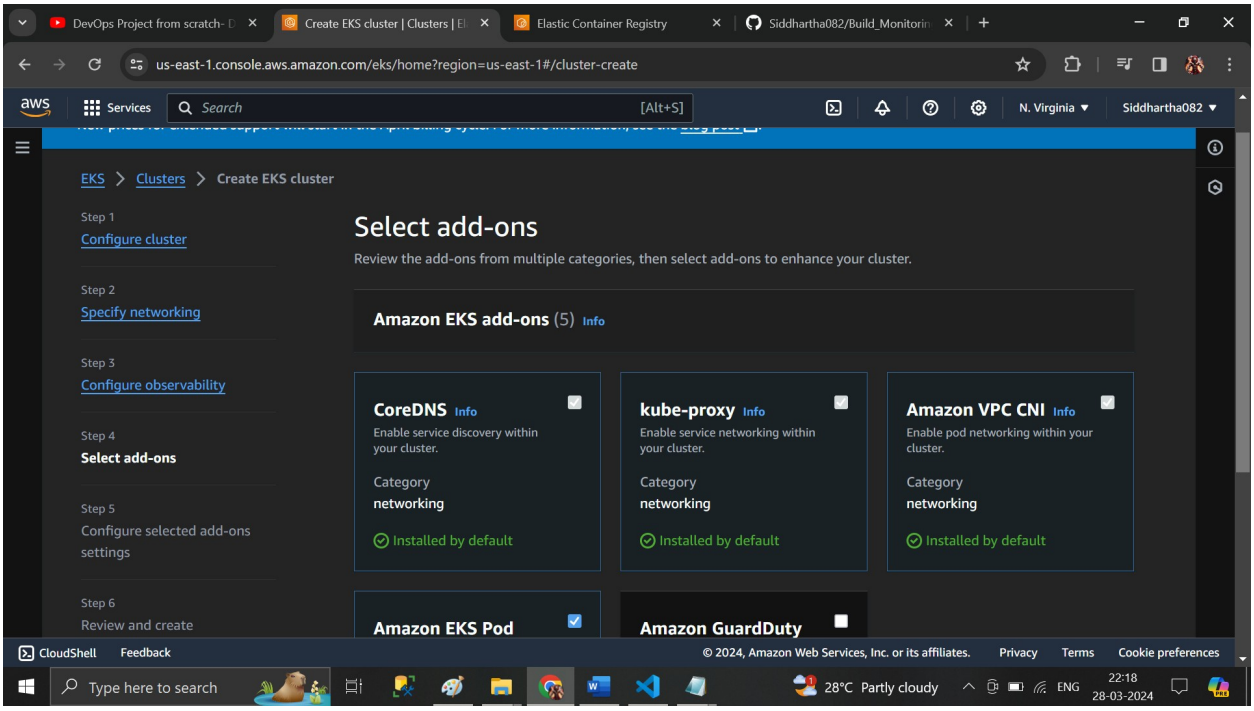
DevOps Project from scratch- D
Create EKS cluster | Clusters | El
Elastic Container Registry
Siddhartha082/Build_Monitorin
us-east-1.console.aws.amazon.com/eks/home?region=us-east-1#/cluster-create
aws
Services
Search
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EKS > Clusters > Create EKS cluster
Step 1
Configure cluster
Step 2
Specify networking
Step 3
Configure observability
Step 4
Select add-ons
Step 5
Configure selected add-ons settings
Step 6
Review and create
Select add-ons
Review the add-ons from multiple categories, then select add-ons to enhance your cluster.
Amazon EKS add-ons (5) Info
CoreDNS Info
Enable service discovery within your cluster.
Category
networking
Installed by default
kube-proxy Info
Enable service networking within your cluster.
Category
networking
Installed by default
Amazon VPC CNI Info
Enable pod networking within your cluster.
Category
networking
Installed by default
Amazon EKS Pod
Amazon GuardDuty
CloudShell
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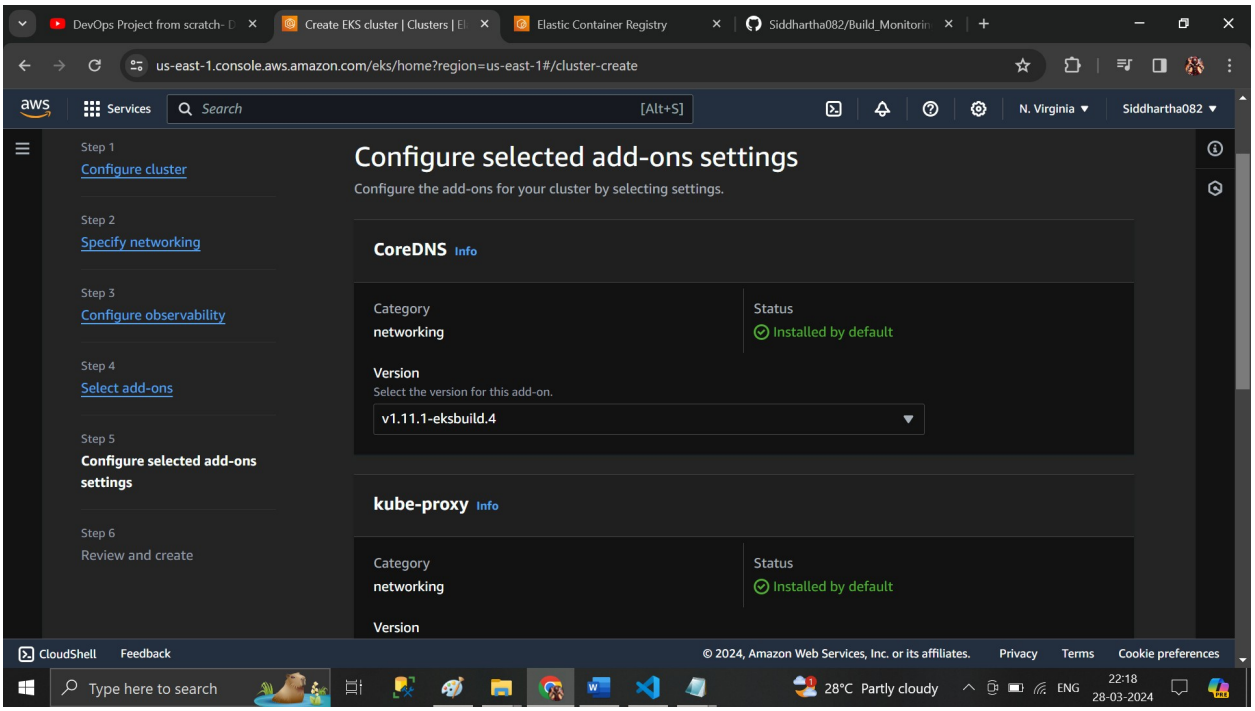
22:18
28-03-2024


DevOps Project from scratch- D
Create EKS cluster | Clusters | El
Elastic Container Registry
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us-east-1.console.aws.amazon.com/eks/home?region=us-east-1#/cluster-create
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Step 1
Configure cluster
Step 2
Specify networking
Step 3
Configure observability
Step 4
Select add-ons
Step 5
Configure selected add-ons settings
Step 6
Review and create
Configure selected add-ons settings
Configure the add-ons for your cluster by selecting settings.
CoreDNS Info
Category
networking
Status
Installed by default
Version
Select the version for this add-on.
v1.11.1-eksbuild.4
kube-proxy Info
Category
networking
Status
Installed by default
Version
CloudShell
Feedback
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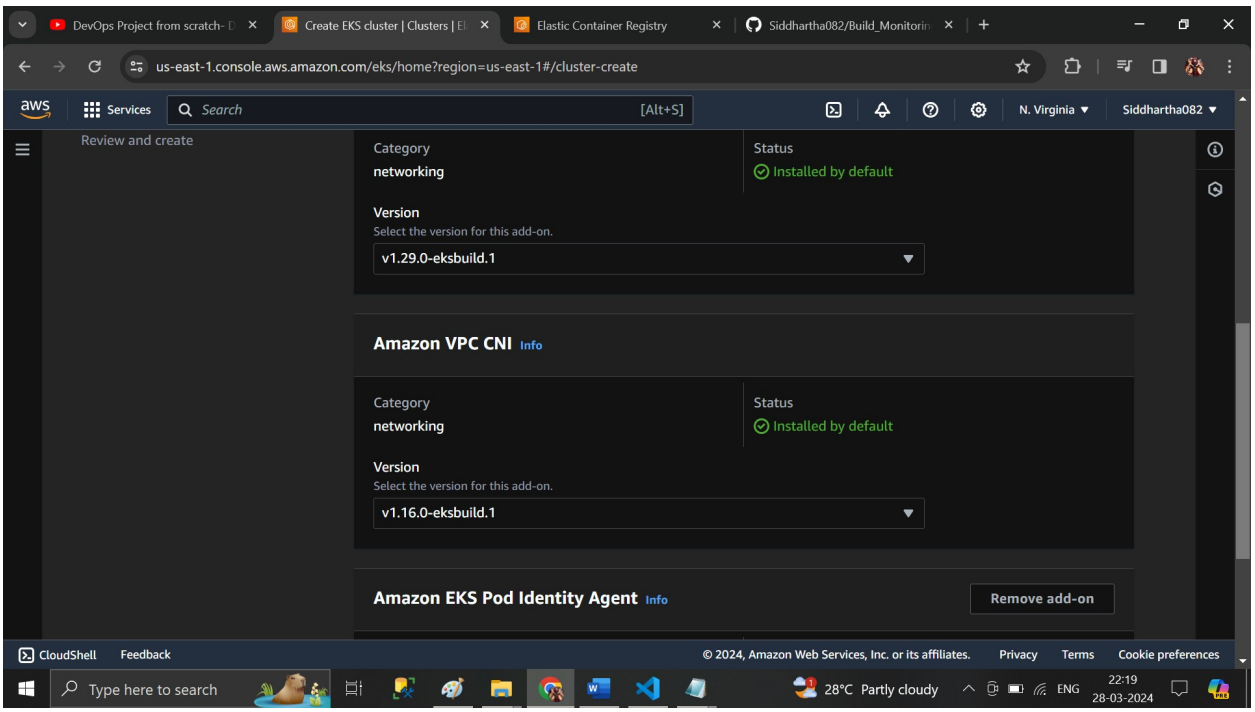
28-03-2024


DevOps Project from scratch- D
Create EKS cluster | Clusters | El
Elastic Container Registry
Siddhartha082/Build_Monitorin
us-east-1.console.aws.amazon.com/eks/home?region=us-east-1#/cluster-create
aws
Services
Search
[Alt+S]
N. Virginia
Siddhartha082
Review and create
Category
networking
Status
Installed by default
Version
Select the version for this add-on.
v1.29.0-eksbuild.1
Amazon VPC CNI Info
Category
networking
Status
Installed by default
Version
Select the version for this add-on.
v1.16.0-eksbuild.1
Amazon EKS Pod Identity Agent Info
Remove add-on
CloudShell
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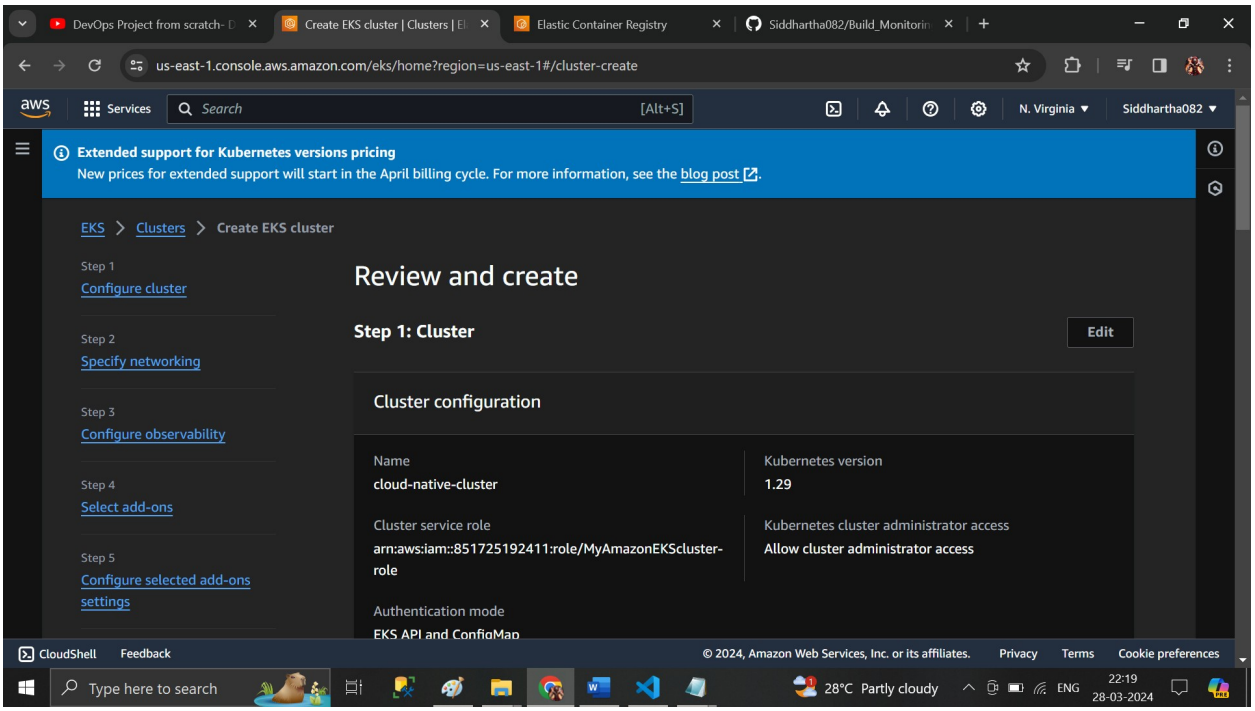
DevOps Project from scratch- D
Create EKS cluster | Clusters | El
Elastic Container Registry
Siddhartha082/Build_Monitorin
us-east-1.console.aws.amazon.com/eks/home?region=us-east-1#/cluster-create
Services
Search
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Extended support for Kubernetes versions pricing
New prices for extended support will start in the April billing cycle. For more information, see the blog post.
EKS > Clusters > Create EKS cluster
Step 1
Configure cluster
Step 2
Specify networking
Step 3
Configure observability
Step 4
Select add-ons
Step 5
Configure selected add-ons settings
Review and create
Step 1: Cluster
Edit
Cluster configuration
Name
cloud-native-cluster
Kubernetes version
1.29
Cluster service role
arn:aws:iam::851725192411:role/MyAmazonEKScluster-role
Kubernetes cluster administrator access
Allow cluster administrator access
Authentication mode
EKS API and ConfigMap
CloudShell
Feedback
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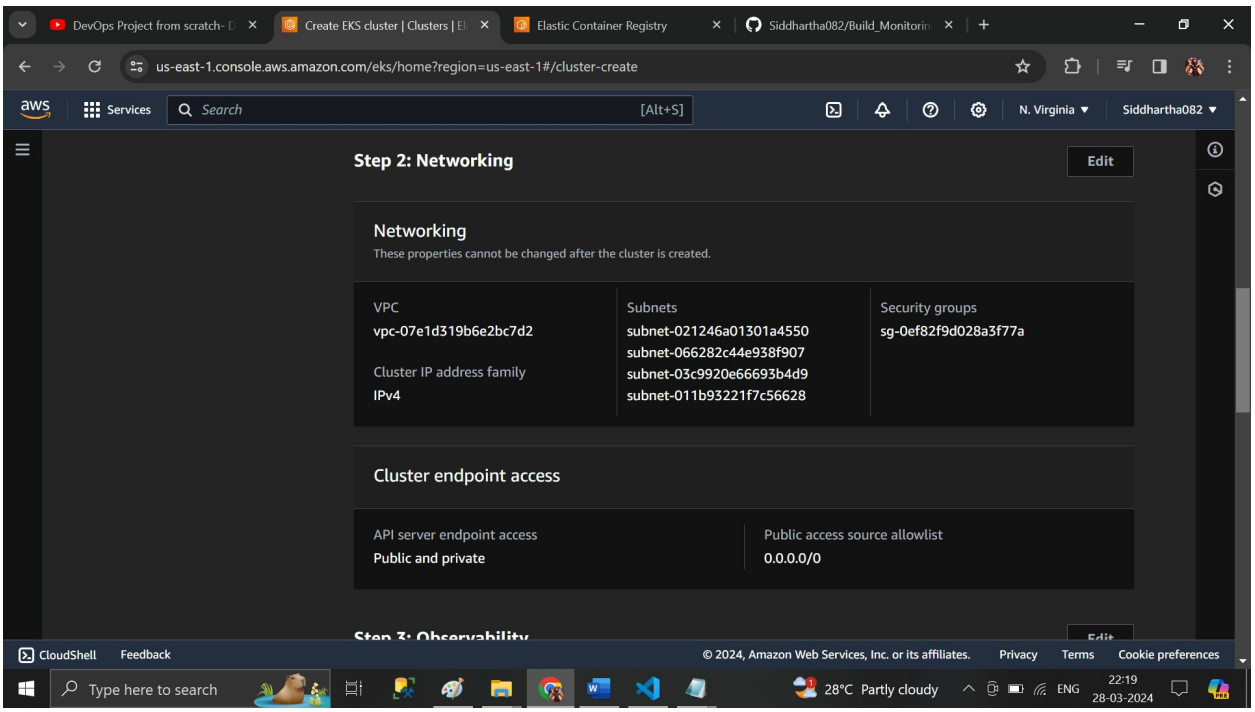
22:19
28-03-2024


DevOps Project from scratch- D
Create EKS cluster | Clusters | El
Elastic Container Registry
Siddhartha082/Build_Monitorin
us-east-1.console.aws.amazon.com/eks/home?region=us-east-1#/cluster-create
Services
Search
[Alt+S]
N. Virginia
Siddhartha082
Step 2: Networking
Edit
Networking
These properties cannot be changed after the cluster is created.
VPC
vpc-07e1d319b6e2bc7d2
Subnets
subnet-021246a01301a4550
subnet-066282c44e938f907
subnet-03c9920e66693b4d9
subnet-011b93221f7c56628
Security groups
sg-0ef82f9d028a3f77a
Cluster IP address family
IPv4
Cluster endpoint access
API server endpoint access
Public and private
Public access source allowlist
0.0.0.0/0
Step 3: Observability
Edit
CloudShell
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22:19
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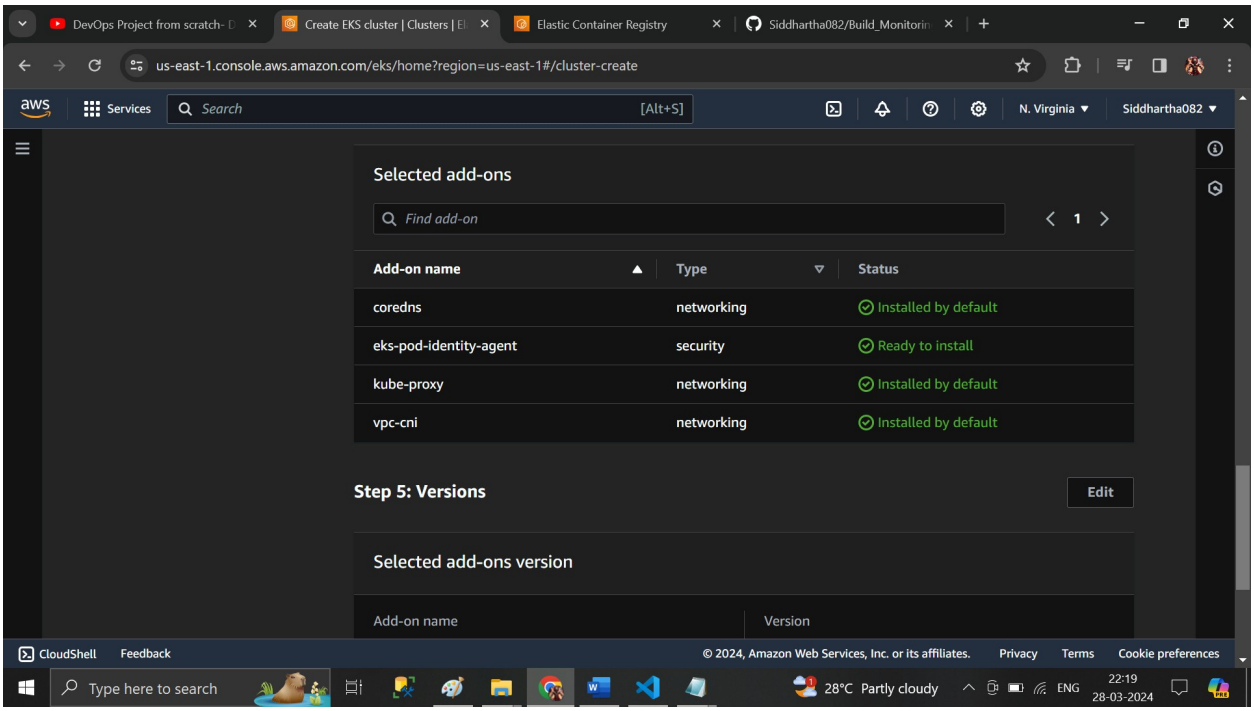
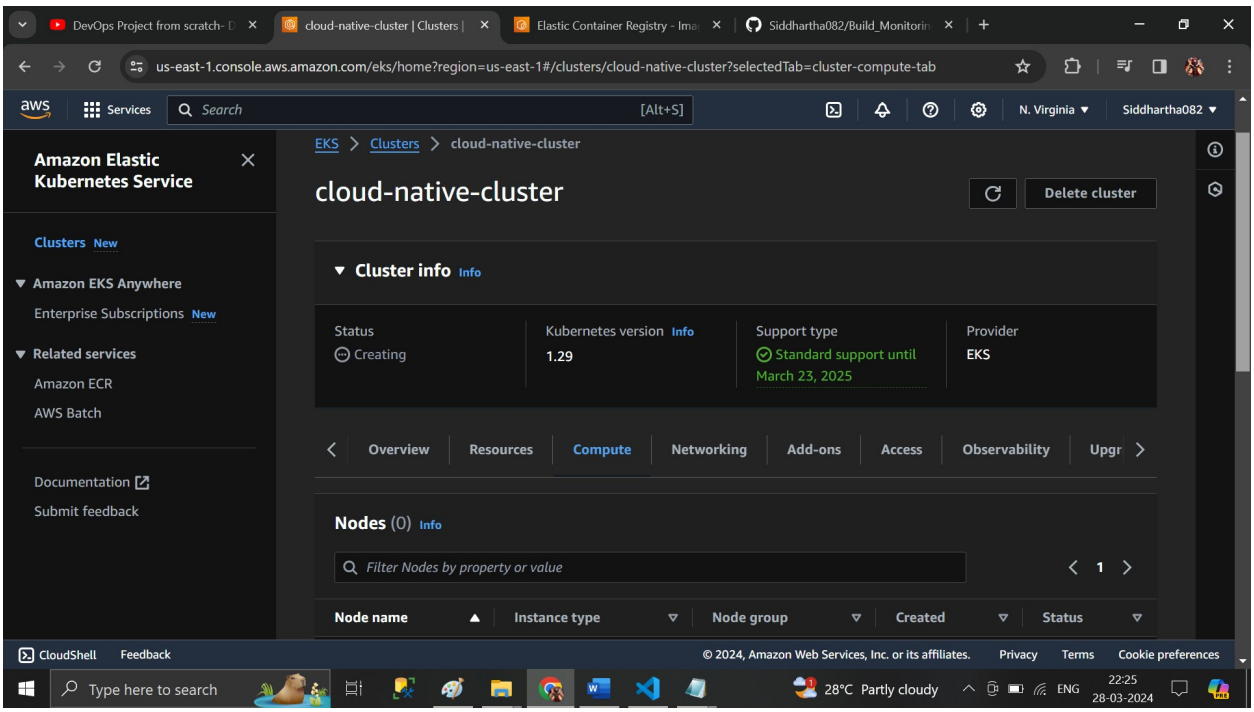
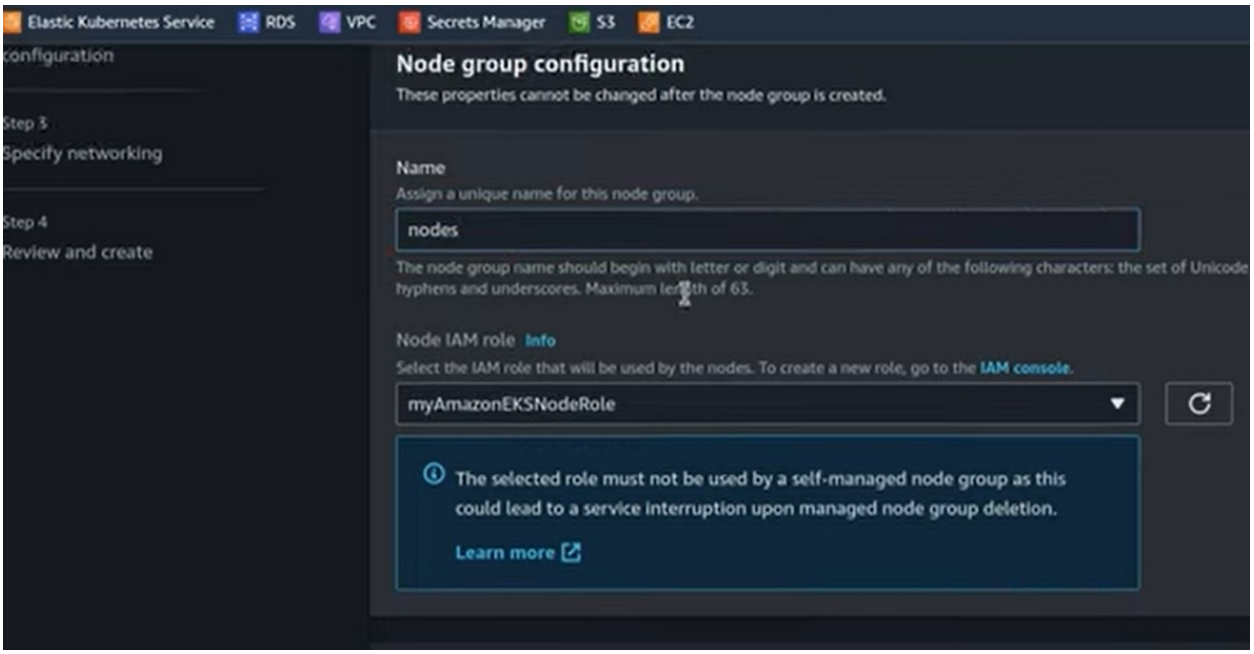
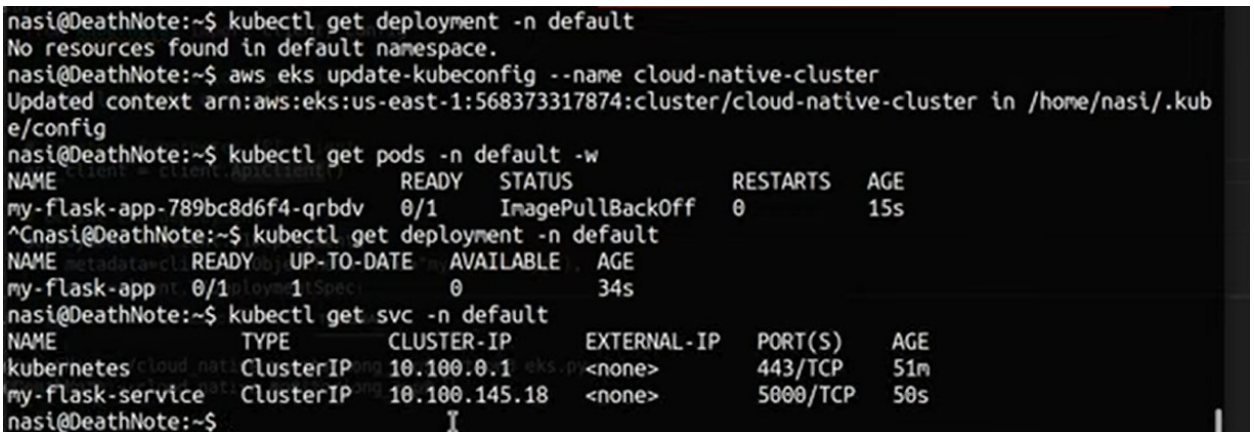




Click on compute – node Group

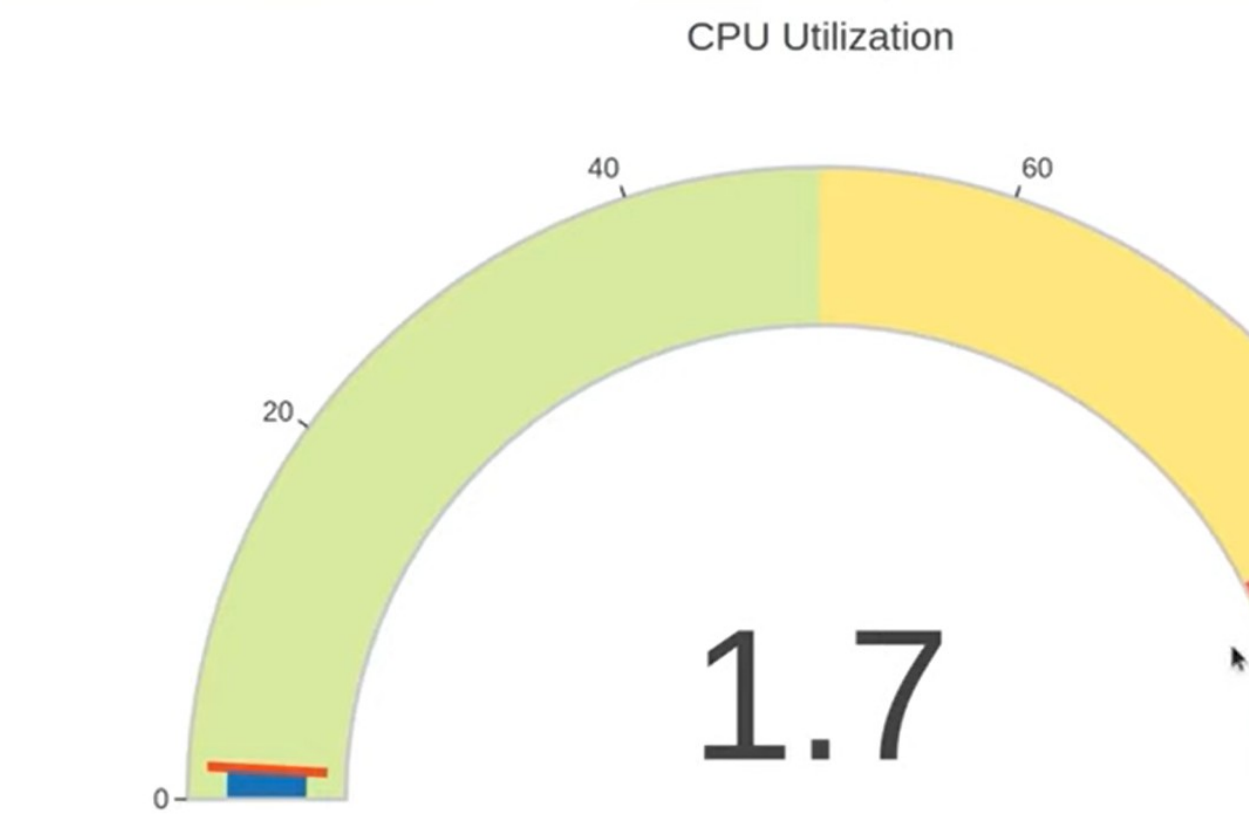


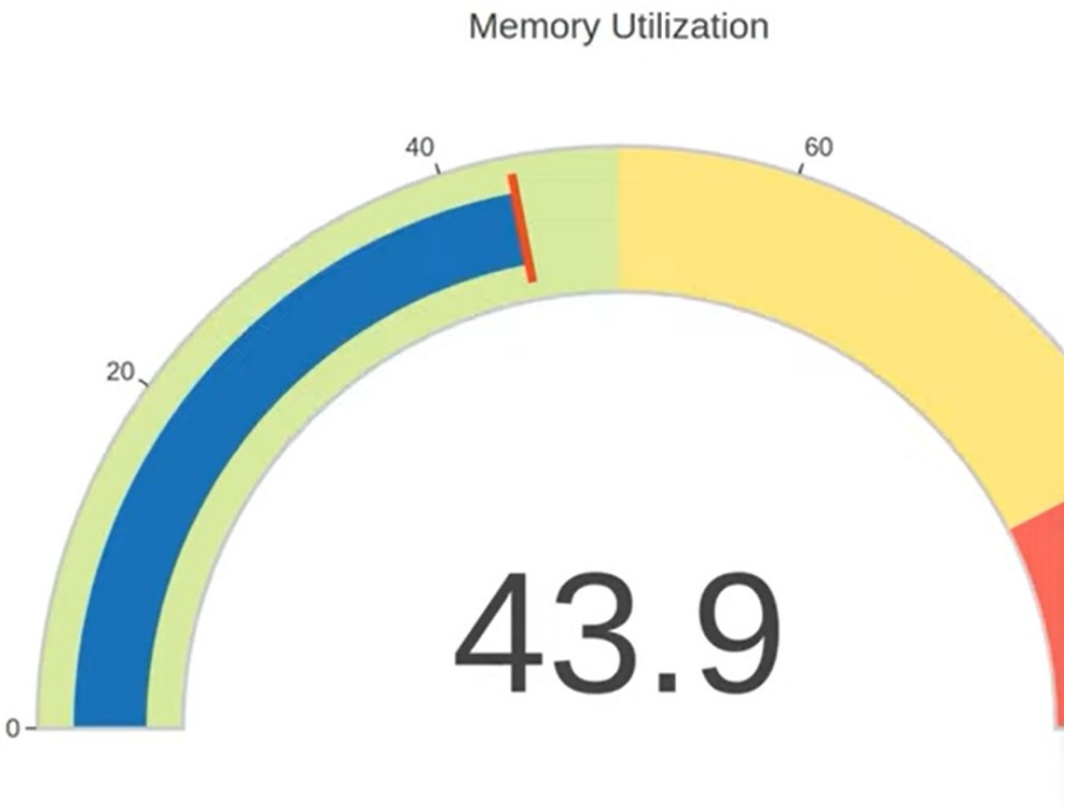
Service + Deployment- Kubernetes



Check port Working on Kubernetes – Connected to Outside World –

```
nasi@DeathNote:~$ kubectl get deployment -n default
NAME           READY   UP-TO-DATE   AVAILABLE   AGE
my-flask-app   0/1     1            0           2m28s
nasi@DeathNote:~$ kubectl edit deployment my-flask-app -n default
deployment.apps/my-flask-app edited
nasi@DeathNote:~$ kubectl get pods -n default -w
NAME                            READY   STATUS              RESTARTS   AGE
my-flask-app-789bc8d6f4-qrbdv   0/1     ImagePullBackOff    0          3m44s
my-flask-app-7cbbff6ddc-mhvqx   0/1     ContainerCreating   0          7s
my-flask-app-7cbbff6ddc-mhvqx   1/1     Running             0          13s
my-flask-app-789bc8d6f4-qrbdv   0/1     Terminating         0          3m50s
my-flask-app-789bc8d6f4-qrbdv   0/1     Terminating         0          3m50s
my-flask-app-789bc8d6f4-qrbdv   0/1     Terminating         0          3m51s
my-flask-app-789bc8d6f4-qrbdv   0/1     Terminating         0          3m51s
^Cnasi@DeathNote:~$ kubectl get svc -n default
NAME               TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)    AGE
kubernetes         ClusterIP   10.100.0.1      <none>        443/TCP    55m
my-flask-service   ClusterIP   10.100.145.18   <none>        5000/TCP   4m6s
nasi@DeathNote:~$ kubectl port-forward svc/my-flask-service -p 5000:5000_
```




Memory Utilization
0
20
40
60
43.9