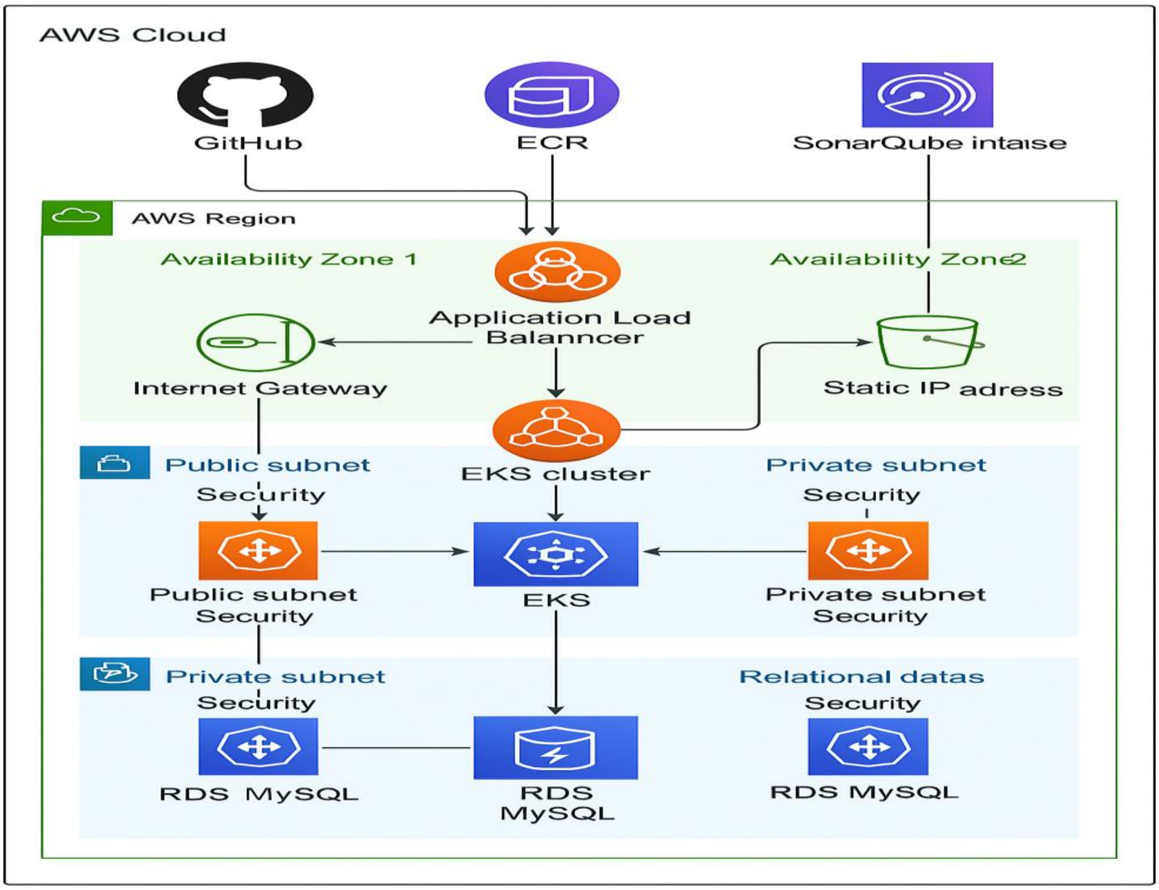
AWS CAPSTONE PROJECT

🛠️ 3-Tier Application Deployment and CI/CD Workflow

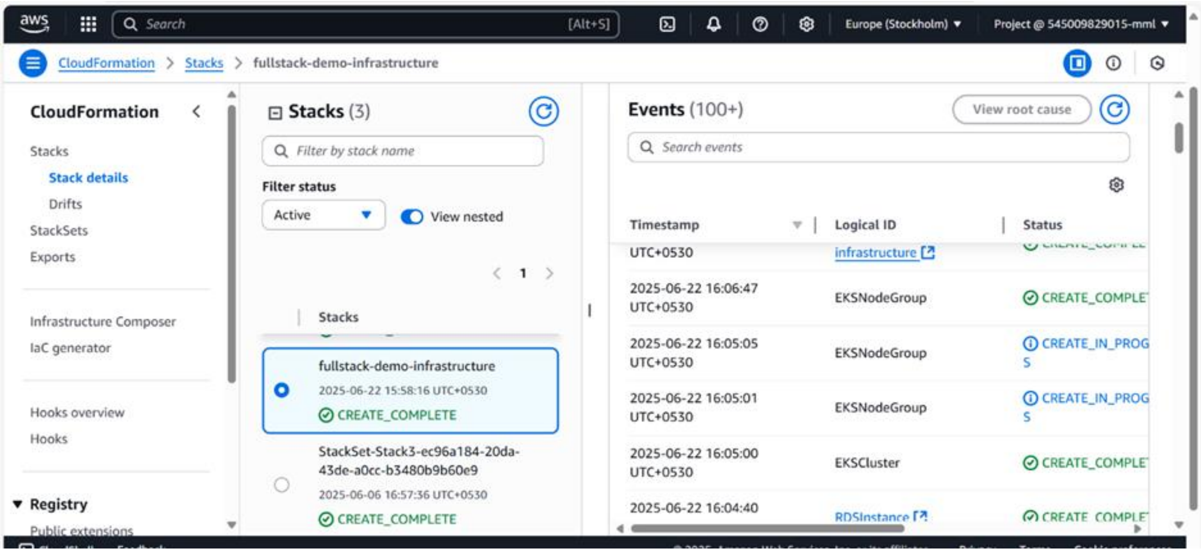
Architecture:



Step 1: Infrastructure Setup using CloudFormation

Region A: [us-east-1] Used **AWS CloudFormation** (CFT) to provision:

- VPC with public/private subnets
- EKS Cluster, Node Group
- RDS MySQL
- IAM roles, Security Groups, and NAT Gateway



fullstack-demo-infrastructure
2025-06-22 15:58:16 UTC+0530
CREATE_COMPLETE

StackSet-Stack3-ec96a184-20da-43de-a0cc-b3480b9b60e9
2025-06-06 16:57:36 UTC+0530
CREATE_COMPLETE

Timestamp	Logical ID	Status
UTC+0530	infrastructure	CREATE_COMPLE
2025-06-22 16:06:47 UTC+0530	EKSNodeGroup	CREATE_COMPLET
2025-06-22 16:05:05 UTC+0530	EKSNodeGroup	CREATE_IN_PROGS
2025-06-22 16:05:01 UTC+0530	EKSNodeGroup	CREATE_IN_PROGS
2025-06-22 16:05:00 UTC+0530	EKSCluster	CREATE_COMPLET
2025-06-22 16:04:40	RDSInstance	CREATE_COMPLET

Step 2: Using Codebuild to build frontend, backend and deployment files

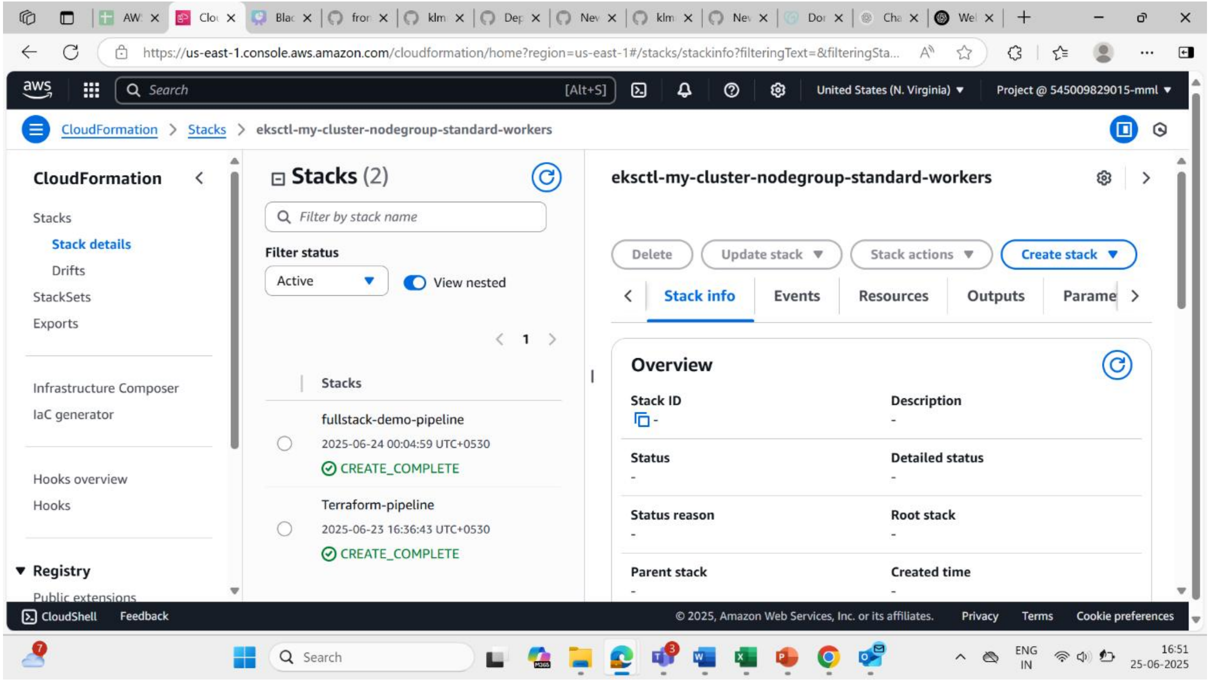
Step 3: Used Codepipeline to deploy to AWS EKS cluster

Step 4: The Application can we checked using Load Balancer

Step 5: Infrastructure Setup using Terraform (Multi-Region)

Region B: [ap-south-1] Recreated the same infrastructure using **Terraform**, including:

- Modular VPC, EKS, RDS setup
- Workspaces and remote backend



https://us-east-1.console.aws.amazon.com/cloudformation/home?region=us-east-1#/stacks/stackinfo?filteringText=&filteringSta...

CloudFormation > Stacks > eksctl-my-cluster-nodegroup-standard-workers

CloudFormation

- Stacks
  - Stack details
  - Drifts
- StackSets
- Exports
- Infrastructure Composer
- IaC generator
- Hooks overview
- Hooks
- Registry
  - Public extensions

Stacks (2)

Filter by stack name

Filter status: Active ● View nested

Stacks

○ fullstack-demo-pipeline
2025-06-24 00:04:59 UTC+0530
✓ CREATE_COMPLETE

○ Terraform-pipeline
2025-06-23 16:36:43 UTC+0530
✓ CREATE_COMPLETE

eksctl-my-cluster-nodegroup-standard-workers

Delete | Update stack | Stack actions | Create stack

Stack info | Events | Resources | Outputs | Parame

Overview

Stack ID -	Description -
Status -	Detailed status -
Status reason -	Root stack -
Parent stack -	Created time -

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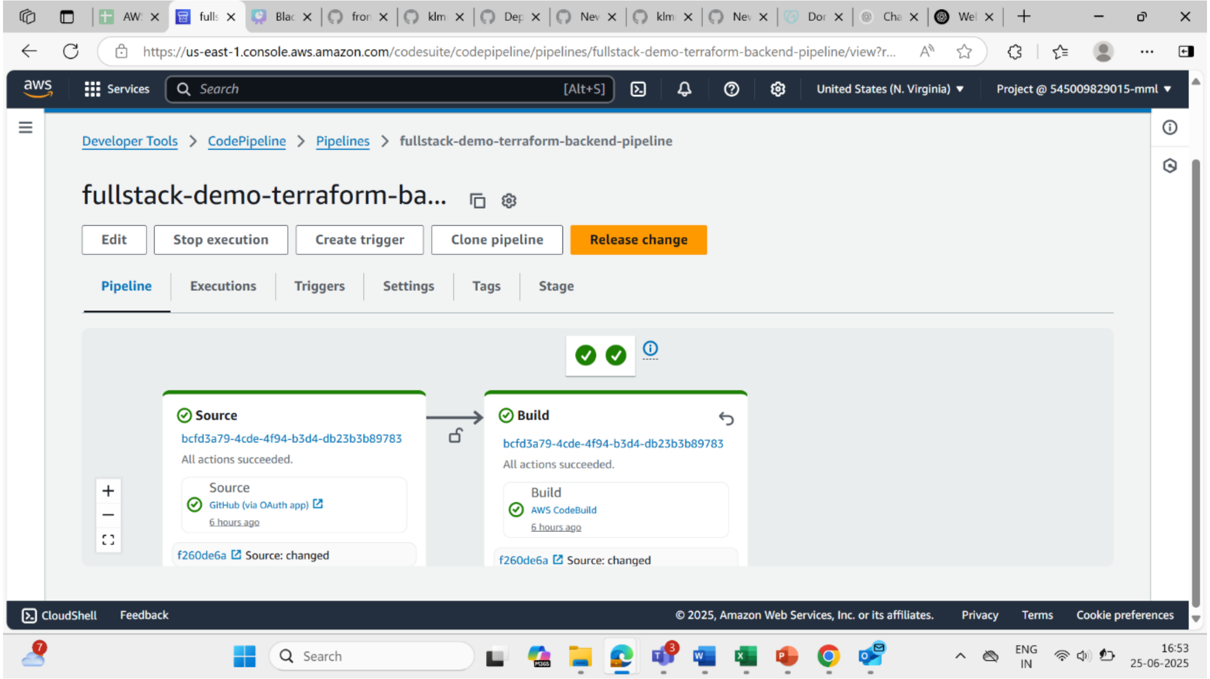
16:51 25-06-2025

Step 6a: Used Codepipeline to deploy frontend-deployment to AWS EKS cluster



https://us-east-1.console.aws.amazon.com/codesuite/codepipeline/pipelines/fullstack-demo-terraform-backend-pipeline/view?r...

Developer Tools > CodePipeline > Pipelines > fullstack-demo-terraform-backend-pipeline

fullstack-demo-terraform-ba...

Edit | Stop execution | Create trigger | Clone pipeline | Release change

Pipeline | Executions | Triggers | Settings | Tags | Stage

✓ Source
bcfd3a79-4cde-4f94-b3d4-db23b3b89783
All actions succeeded.
Source
✓ GitHub (via OAuth app)
6 hours ago
f260de6a Source: changed

✓ Build
bcfd3a79-4cde-4f94-b3d4-db23b3b89783
All actions succeeded.
Build
✓ AWS CodeBuild
6 hours ago
f260de6a Source: changed

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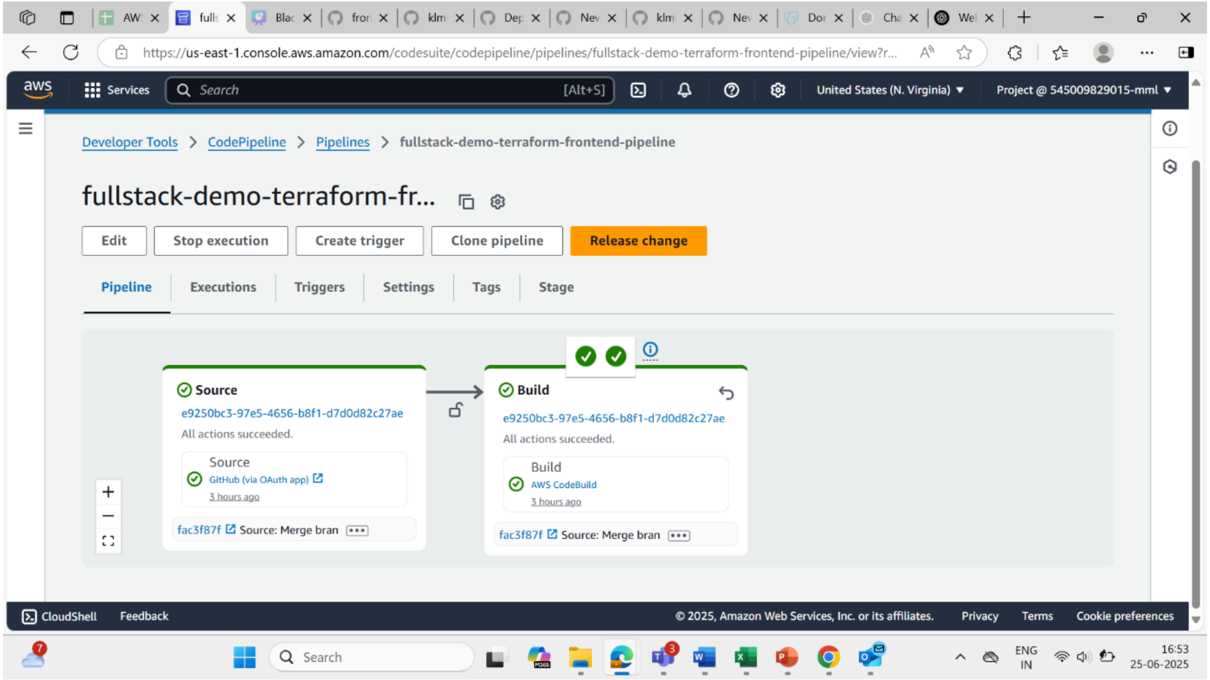
16:53 25-06-2025

Step 6b: Used Codepipeline to deploy backend-deployment to AWS EKS cluster


https://us-east-1.console.aws.amazon.com/codesuite/codepipeline/pipelines/fullstack-demo-terraform-frontend-pipeline/view?r...
Services
Search [Alt+S]
United States (N. Virginia)
Project @ 545009829015-mml
Developer Tools > CodePipeline > Pipelines > fullstack-demo-terraform-frontend-pipeline
fullstack-demo-terraform-fr...
Edit
Stop execution
Create trigger
Clone pipeline
Release change
Pipeline
Executions
Triggers
Settings
Tags
Stage
Source
e9250bc3-97e5-4656-b8f1-d7d0d82c27ae
All actions succeeded.
Source
GitHub (via OAuth app)
3 hours ago
fac3f87f Source: Merge bran
Build
e9250bc3-97e5-4656-b8f1-d7d0d82c27ae
All actions succeeded.
Build
AWS CodeBuild
3 hours ago
fac3f87f Source: Merge bran
CloudShell
Feedback
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Privacy
Terms
Cookie preferences
16:53
25-06-2025

Step 7: Application Build using AWS CodeBuild

Configured **CodeBuild** to pull code from GitHub.

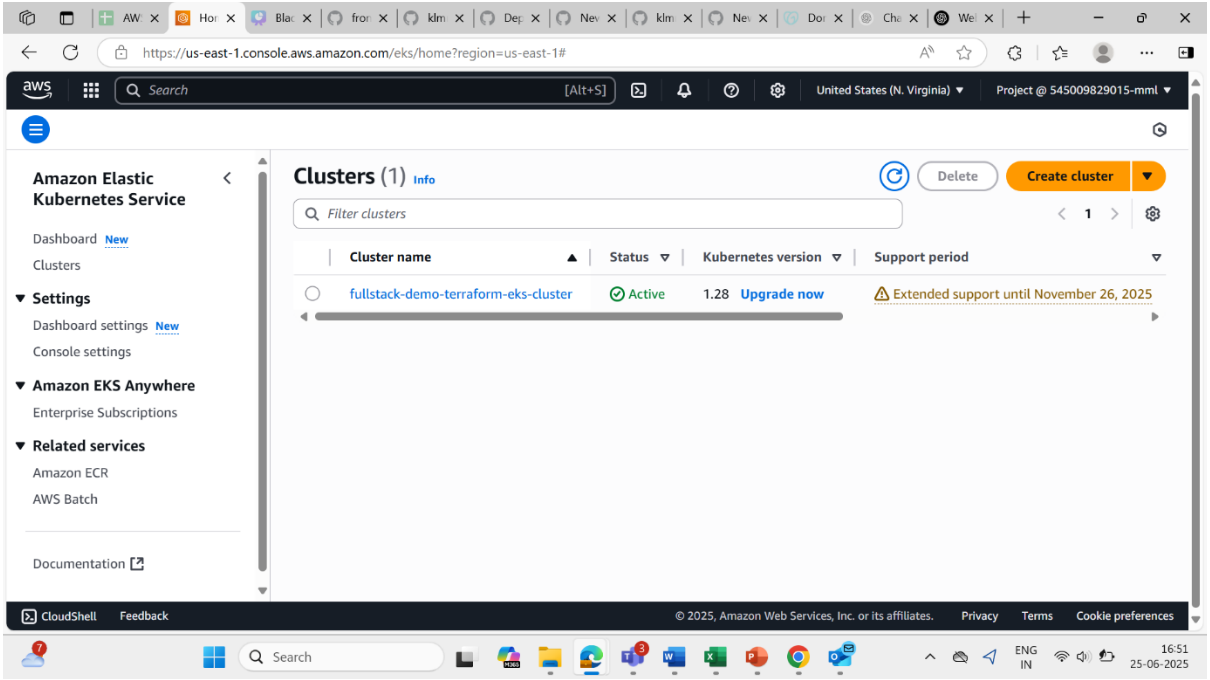
Used buildspec.yml to:

- Install dependencies
- Run unit tests
- Run SonarQube code quality checks for frontend and backend
- Build Docker images
- Push images to **Amazon ECR**

Step 8: Deployment to Amazon EKS

Deployed frontend and backend microservices to EKS using:

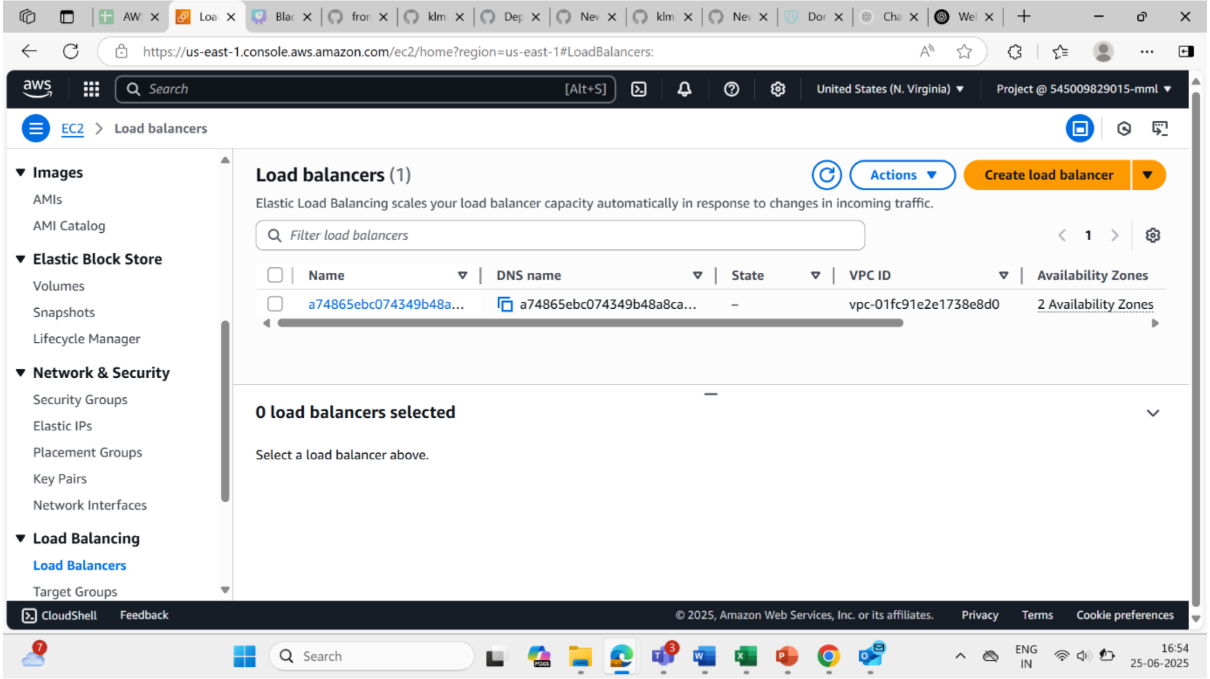
- Kubernetes manifests (Deployment, Service)
- Used Secrets for DB credentials
- Backend connected to RDS using ClusterIp
- Service exposed frontend via ALB



Clusters (1) Info

Cluster name	Status	Kubernetes version	Support period
fullstack-demo-terraform-eks-cluster	Active	1.28 Upgrade now	Extended support until November 26, 2025

Step 9: The Application can we checked using Load Balancer



Load balancers (1)

Elastic Load Balancing scales your load balancer capacity automatically in response to changes in incoming traffic.

Name	DNS name	State	VPC ID	Availability Zones
a74865ebc074349b48a...	a74865ebc074349b48a8ca...	–	vpc-01fc91e2e1738e8d0	2 Availability Zones

0 load balancers selected

Select a load balancer above.

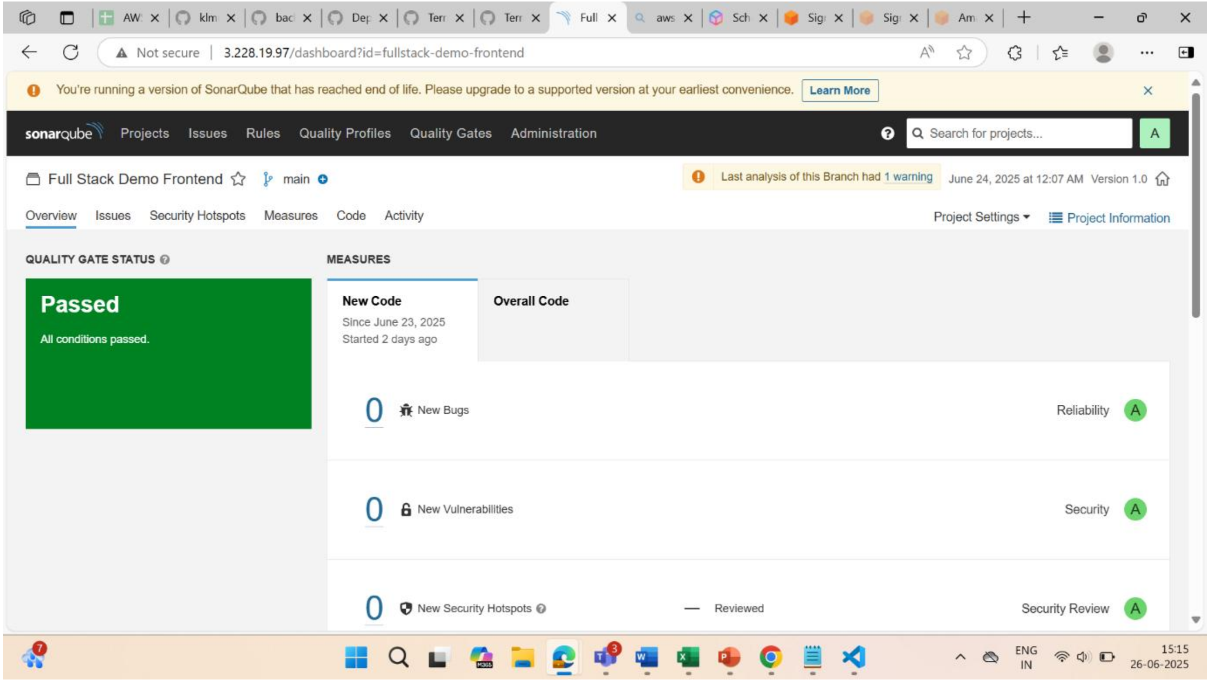
Step 10: Domain Setup using Amazon Route 53

Created a hosted zone and registered domain in **Route 53**

Created an **A record** pointing to the ALB

Step 11: Code Quality Analysis with SonarQube

Integrated SonarQube in CodeBuild pipelines for both frontend and backend



Not secure | 3.228.19.97/dashboard?id=fullstack-demo-frontend

You're running a version of SonarQube that has reached end of life. Please upgrade to a supported version at your earliest convenience. Learn More

Full Stack Demo Frontend main

Last analysis of this Branch had 1 warning June 24, 2025 at 12:07 AM Version 1.0

QUALITY GATE STATUS

Passed

All conditions passed.

MEASURES

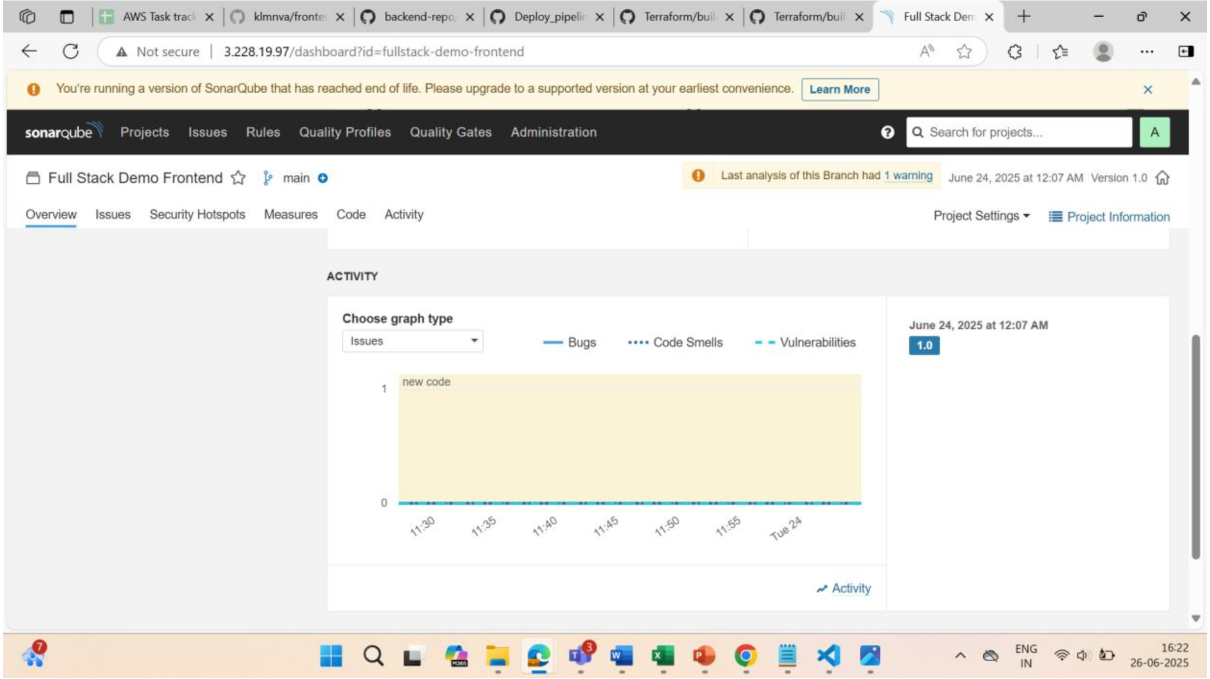
New Code Since June 23, 2025 Started 2 days ago

Overall Code

0 New Bugs — Reliability A

0 New Vulnerabilities — Security A

0 New Security Hotspots — Reviewed — Security Review A



Not secure | 3.228.19.97/dashboard?id=fullstack-demo-frontend

You're running a version of SonarQube that has reached end of life. Please upgrade to a supported version at your earliest convenience. Learn More

Full Stack Demo Frontend main

Last analysis of this Branch had 1 warning June 24, 2025 at 12:07 AM Version 1.0

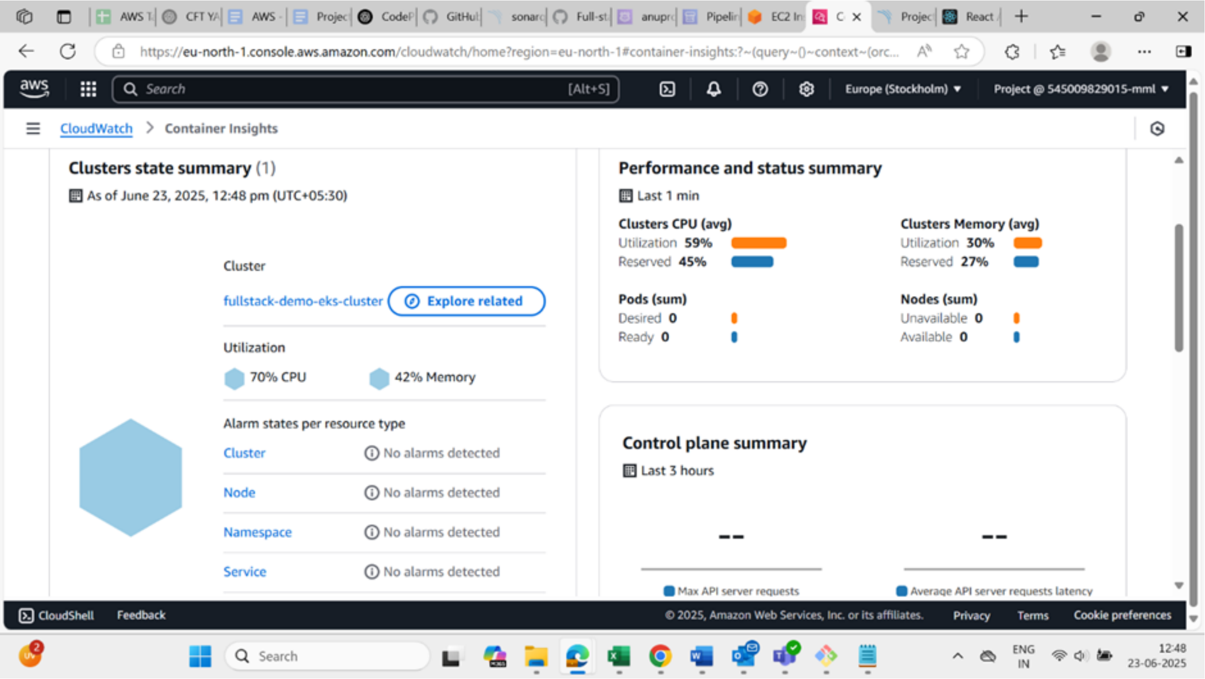
ACTIVITY

Choose graph type: Issues

June 24, 2025 at 12:07 AM 1.0

Step 12: Monitoring with Amazon CloudWatch

- Enabled **Container Insights** on EKS cluster
- Collected pod logs and metrics
- Configured CloudWatch Alarms for CPU/Memory threshold breaches
- Dashboards created for real-time EKS cluster monitoring



CloudWatch > Container Insights

Clusters state summary (1)

As of June 23, 2025, 12:48 pm (UTC+05:30)

Cluster

fullstack-demo-eks-cluster

Utilization

70% CPU

42% Memory

Alarm states per resource type

Cluster	No alarms detected
Node	No alarms detected
Namespace	No alarms detected
Service	No alarms detected

Performance and status summary

Last 1 min

Clusters CPU (avg)
Utilization 59%
Reserved 45%

Clusters Memory (avg)
Utilization 30%
Reserved 27%

Pods (sum)
Desired 0
Ready 0

Nodes (sum)
Unavailable 0
Available 0

Control plane summary

Last 3 hours

https://eu-north-1.console.aws.amazon.com/cloudwatch/home?region=eu-north-1#container-insights:?~(query~()~context~(orc...
Europe (Stockholm)
Project @ 545009829015-mml
Explore related
--
--
Max API server requests
Average API server requests latency
CloudShell
Feedback
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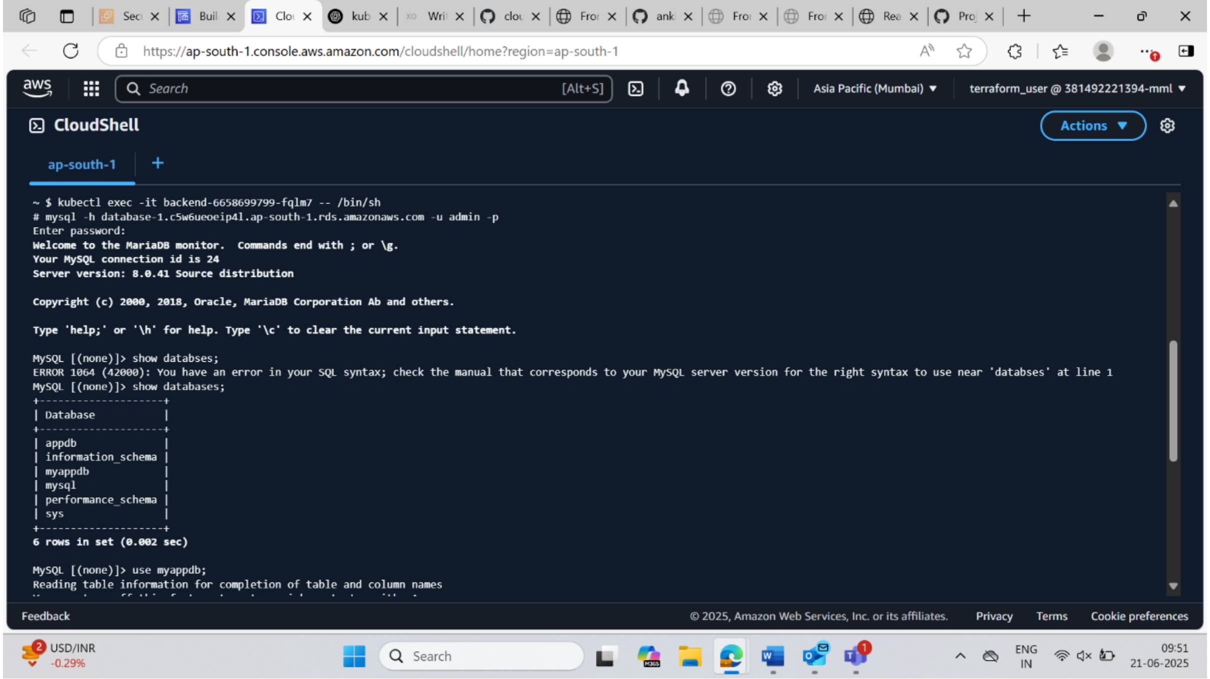
Privacy
Terms
Cookie preferences
12:48
23-06-2025

Step 13: The Data of uses can be accessed using following commands



```
~ $ kubectl exec -it backend-6658699799-fqlm7 -- /bin/sh
# mysql -h database-1.c5w6ueoeip4l.ap-south-1.rds.amazonaws.com -u admin -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MySQL connection id is 24
Server version: 8.0.41 Source distribution

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MySQL [(none)]> show databses;
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near 'databses' at line 1
MySQL [(none)]> show databases;
+--------------------+
| Database           |
+--------------------+
| appdb              |
| information_schema |
| myappdb            |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
6 rows in set (0.002 sec)

MySQL [(none)]> use myappdb;
Reading table information for completion of table and column names
```

https://ap-south-1.console.aws.amazon.com/cloudshell/home?region=ap-south-1
Asia Pacific (Mumbai)
terraform_user @ 381492221394-mml
CloudShell
Actions
ap-south-1
Feedback
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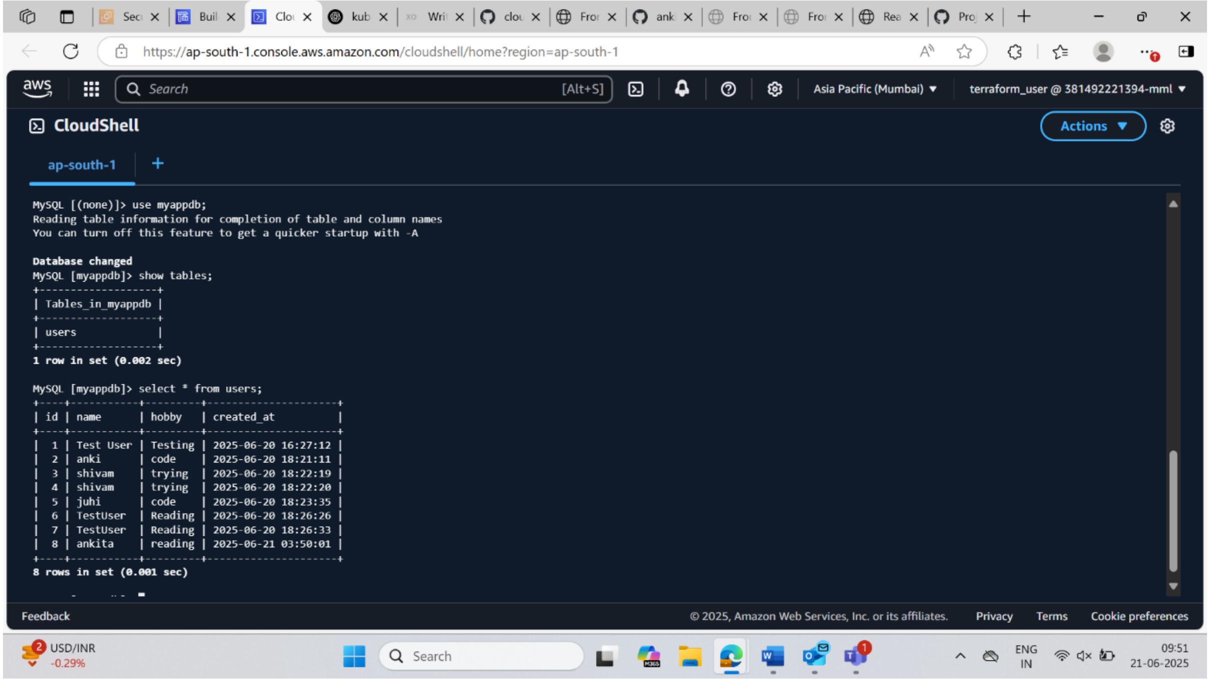
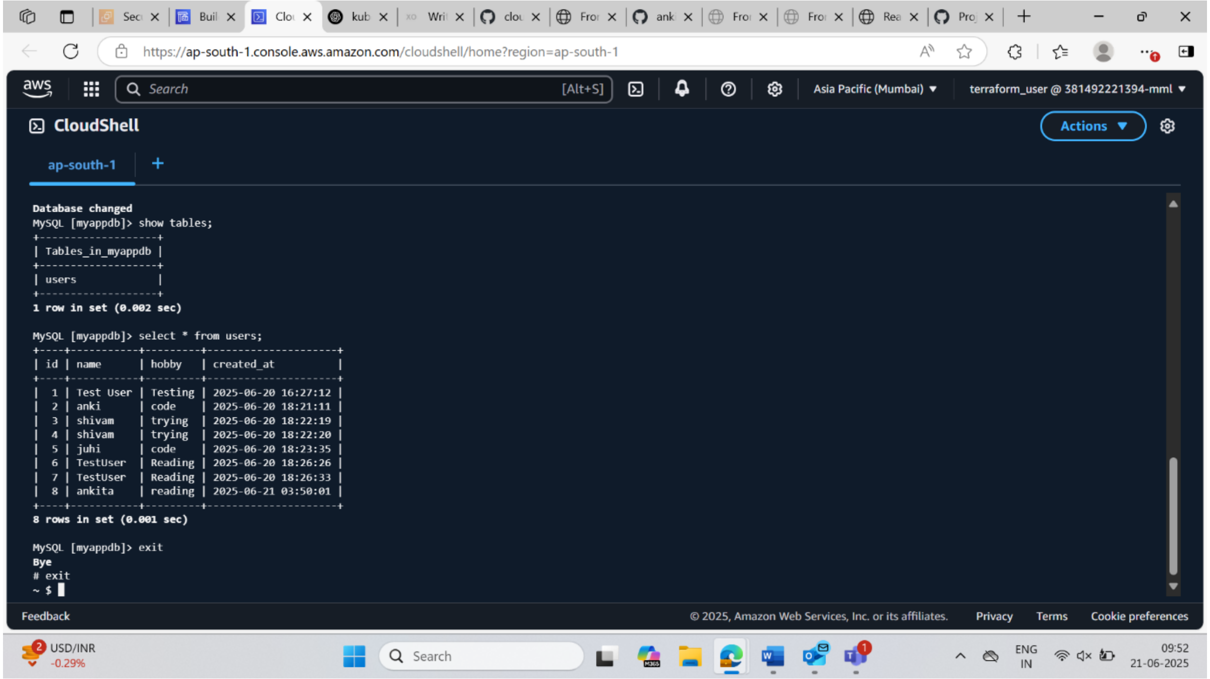
Terms
Cookie preferences
USD/INR
-0.29%
09:51
21-06-2025


https://ap-south-1.console.aws.amazon.com/cloudshell/home?region=ap-south-1
CloudShell
ap-south-1
Actions
Asia Pacific (Mumbai)
terraform_user @ 381492221394-mml

```
MySQL [(none)]> use myappdb;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
MySQL [myappdb]> show tables;
+-----------------+
| Tables_in_myappdb |
+-----------------+
| users             |
+-----------------+
1 row in set (0.002 sec)

MySQL [myappdb]> select * from users;
+----+-----------+---------+---------------------+
| id | name      | hobby   | created_at          |
+----+-----------+---------+---------------------+
|  1 | Test User | Testing | 2025-06-20 16:27:12 |
|  2 | anki      | code    | 2025-06-20 18:21:11 |
|  3 | shivam    | trying  | 2025-06-20 18:22:19 |
|  4 | shivam    | trying  | 2025-06-20 18:22:20 |
|  5 | juhi      | code    | 2025-06-20 18:23:35 |
|  6 | TestUser  | Reading | 2025-06-20 18:26:26 |
|  7 | TestUser  | Reading | 2025-06-20 18:26:33 |
|  8 | ankita    | reading | 2025-06-21 03:50:01 |
+----+-----------+---------+---------------------+
8 rows in set (0.001 sec)
```

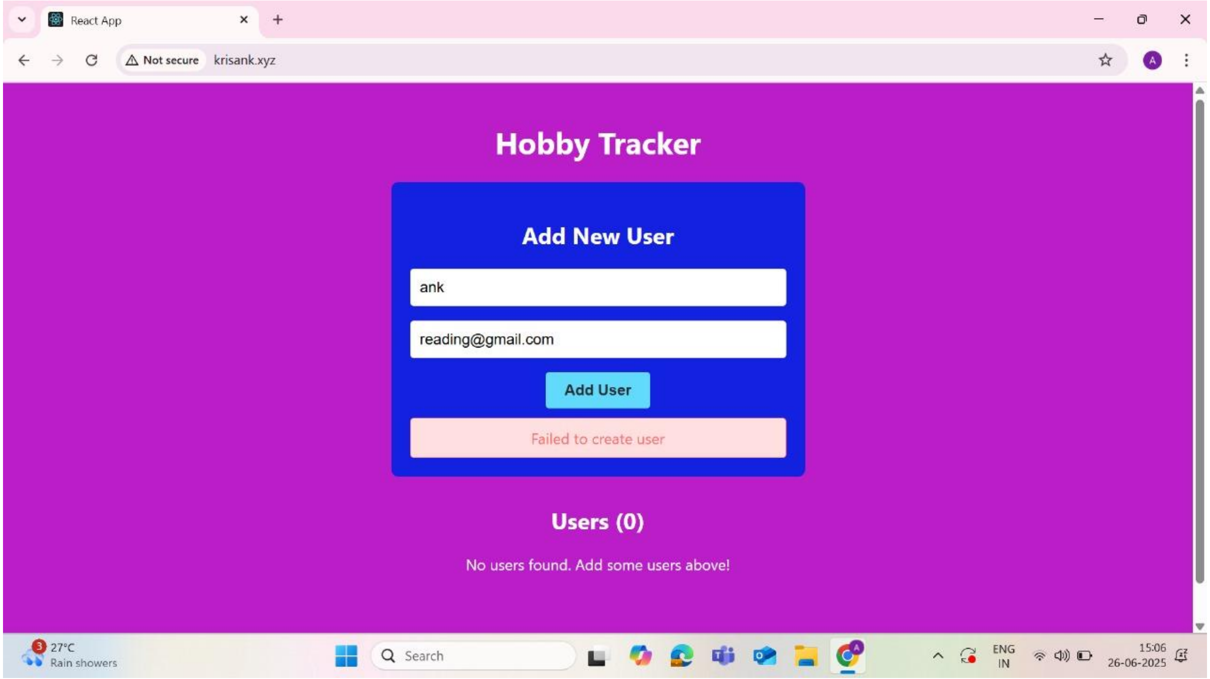

https://ap-south-1.console.aws.amazon.com/cloudshell/home?region=ap-south-1
CloudShell
ap-south-1
Actions
Asia Pacific (Mumbai)
terraform_user @ 381492221394-mml

```
Database changed
MySQL [myappdb]> show tables;
+-----------------+
| Tables_in_myappdb |
+-----------------+
| users             |
+-----------------+
1 row in set (0.002 sec)

MySQL [myappdb]> select * from users;
+----+-----------+---------+---------------------+
| id | name      | hobby   | created_at          |
+----+-----------+---------+---------------------+
|  1 | Test User | Testing | 2025-06-20 16:27:12 |
|  2 | anki      | code    | 2025-06-20 18:21:11 |
|  3 | shivam    | trying  | 2025-06-20 18:22:19 |
|  4 | shivam    | trying  | 2025-06-20 18:22:20 |
|  5 | juhi      | code    | 2025-06-20 18:23:35 |
|  6 | TestUser  | Reading | 2025-06-20 18:26:26 |
|  7 | TestUser  | Reading | 2025-06-20 18:26:33 |
|  8 | ankita    | reading | 2025-06-21 03:50:01 |
+----+-----------+---------+---------------------+
8 rows in set (0.001 sec)

MySQL [myappdb]> exit
Bye
# exit
~ $
```

Output:



Hobby Tracker

Add New User

ank

reading@gmail.com

Failed to create user

Users (0)

No users found. Add some users above!

Github Repo:
https://github.com/ankitamohanty1509/aws_capstone_project.git