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| Digital Egypt Pioneers Initiative |
| Building a Highly Available Scalable Web Application |
| Project Report |
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| This document outlines the actions taken to fulfill the project requirements for a cloud-based architecture on AWS. It details the creation and configuration of resources, including compute, storage, networking, and security components, while adhering to best practices. This report serves as a summary of the work completed and the strategies employed to ensure scalability and cost-effectiveness. |

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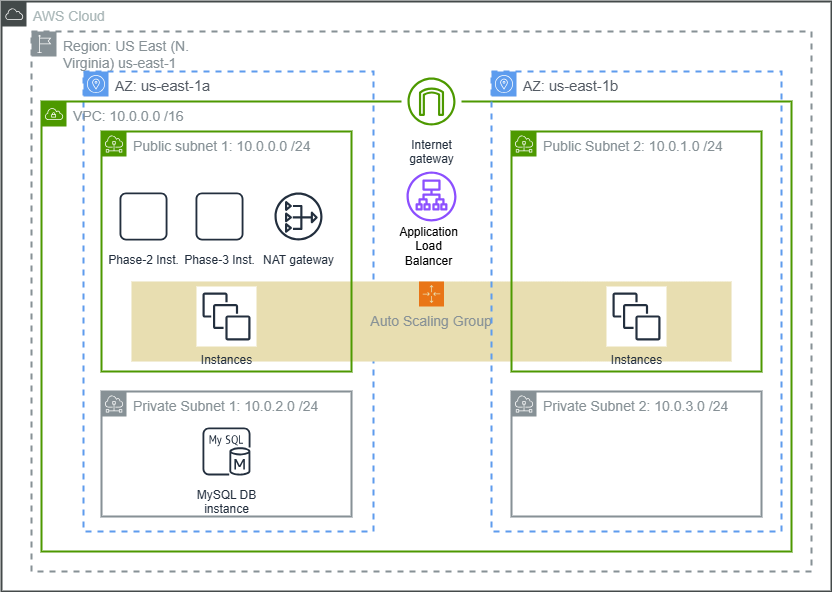
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# Architectural Diagram



# Resources

## 2.1 Region

US East (N. Virginia) us-east-1

## 2.2 VPC

Name tag – optional: **Web Lab VPC**

IPv4 CIDR: **10.0.0.0 /16**

**Enable DNS hostnames –Enabled**

### 2.2.1 subnets

#### 2.2.1.1 Subnet name: Public Subnet1

Availability Zone: **us-east-1a**

IPv4 subnet CIDR block: **10.0.0.0/24**

**Enable auto-assign public IPv4 address – Enabled**

#### 2.2.1.2 Subnet name: Public Subnet2

Availability Zone: **us-east-1b**

IPv4 subnet CIDR block: **10.0.1.0/24**

**Enable auto-assign public IPv4 address – Enabled**

#### 2.2.1.3 Subnet name: Private Subnet1

Availability Zone**: us-east-1a**

IPv4 subnet CIDR block: **10.0.2.0/24**

#### 2.2.1.3 Subnet name: Private Subnet2

Availability Zone: **us-east-1b**

IPv4 subnet CIDR block: **10.0.3.0/24**

### 2.2.2 Internet Gateway

Name: **Web Lab IGW**

### 2.2.3 NAT Gateway

Name:  **groupNATgateway**

VPC: [**Web Lab VPC**](https://us-east-1.console.aws.amazon.com/vpcconsole/home?region=us-east-1#vpcs:VpcId=vpc-0f2fb6389bfce8514)

Subnet: [**Public Subnet1**](https://us-east-1.console.aws.amazon.com/vpcconsole/home?region=us-east-1#subnets:SubnetId=subnet-0f94eb2638f76e1f0)

### 2.2.4 Route Tables

#### 2.2.4.1 Private Route Table

Name: **Private Route Table**

**Routes to: locally within the VPC, and into NAT gateway**

**Associated with: Private Subnet1, Private Subnet2**

#### 2.2.4.2 Public Route Table

Name – optional: **Web Lab Public RT**

Routes to: **Web Lab IGW**

Associated with: **Public Subnet1, Public Subnet2**

### 2.2.5 Security Groups

#### 2.2.5.1 Security group name: Web APP SG

Description: **Allows HTTP and SSH traffic to web servers,**

**Also, allows HTTPS traffic from LoadBalancer security group**

#### 2.2.5.2 Security group name: DB SG

Description: **Permits access to DB from web APP SG and LoadBalancer SG**

#### 2.2.5.3 Security group name: LoadBalancer SG

Description: **Permits web access to load balancers**

## 2.3 EC2

### 2.3.1 Instance Name: Phase2Inst

AMI: **Ubuntu Server 24.04 LTS (HVM)**

Instance Type: **t2.micro**

Key Pair: **Vockey**

VPC: **Web Lab VPC**

Subnet: **Public Subnet1**

Security Group: **Web APP SG**

IAM Instance Profile: **LabInstanceProfile**

User Data: **UserdataScript-phase-2.sh**

### 2.3.2 Instance Name: Phase3Inst

AMI: **Ubuntu Server 24.04 LTS (HVM)**

Instance Type: **t2.micro**

Key Pair: **Vockey**

VPC: **Web Lab VPC**

Subnet: **Public Subnet1**

Security Group: **Web APP SG**

IAM Instance Profile: **LabInstanceProfile**

User Data: **UserdataScript-phase-3.sh**

### 2.3.3 Load Balancer name: WEB-APP-LB

VPC: **Web Lab VPC**

Subnets: **Public Subnet1 (us-east-1a), Public Subnet2 (us-east-1b)**

Security Group: **LoadBalancer SG**

Target Group: **Web-App-Targets**

### 2.3.3 Target Group name: AutoScTargets

Load Balancer: **AutoScLB**

### 2.3.5 Launch Template name: Web-App-LT

Template version description: **To launch Web Instances**

AMI: **Web App AMI**

Instance Type: **t2.micro**

Key pair name: **Vockey**

Security group: **AutoSc Web App SG**

IAM instance profile: **LabInstanceProfile**

Detailed CloudWatch monitoring: **Enabled**

### 2.3.6 Auto Scaling Group name: Web-APP-ASG

Launch template: **Web-App-LT**

VPC: **Web Lab VPC**

Subnets: **Private Subnet1, Private Subnet2**

Load balancer: **WEB-APP-LB**

Desired Capacity: **2**

2.3.6.1 Tags

Key: **Name** | Value: **Web-App-Targets**

## 2.4. RDS

### 2.4.1 DB Subnet Group

Name: **db subnet group**

Description: **For future DB expansions**

VPC: **Web Lab VPC**

Subnets: **Private Subnet1, Private Subnet2**

### 2.4.1 DB Instance

Engine type: **MySQL**

Availability and durability: **Single DB instance**

DB instance identifier: **web-lab-db**

Master username: **admin**

Master password: **1234567890**

DB instance class: **Burstable – db.t3.small**

Allocated storage: **20 GiB**

Storage Auto Scaling: **Disabled**

Virtual private cloud (VPC): **Web Lab VPC**

DB subnet group: **db subnet group**

VPC security group (firewall): **DB SG**

Availability Zone: **us-east-1a**

Enhanced Monitoring: **Disabled**

Endpoint: **web-lab-db.c8h3lo7lvpy8.us-east-1.rds.amazonaws.com**

## 2.5 AWS Cloud9

Name: **Phase2 Inst Env**

Description – optional: **To apply scripts through Phase2 Instance**

User: **Ubuntu**

# Modified Scripts

## 3.1 Script-1

aws secretsmanager create-secret \

--name Mydbsecret \

--description "Database secret for web app" \

--secret-string "{\"user\":\"**nodeapp** \",\"password\":\"**student12**\",\"host\":\" **web-lab-db.c8h3lo7lvpy8.us-east-1.rds.amazonaws.com** \",\"db\":\"**STUDENTS**\"}"

## 3.2 Script-3

mysqldump -h **10.0.0.98** -u nodeapp -p --databases STUDENTS > data.sql

Password: **student12**

mysql -h **web-lab-db.c8h3lo7lvpy8.us-east-1.rds.amazonaws.com** -u **nodeapp** -p STUDENTS < data.sql

## 3.2 Script-2

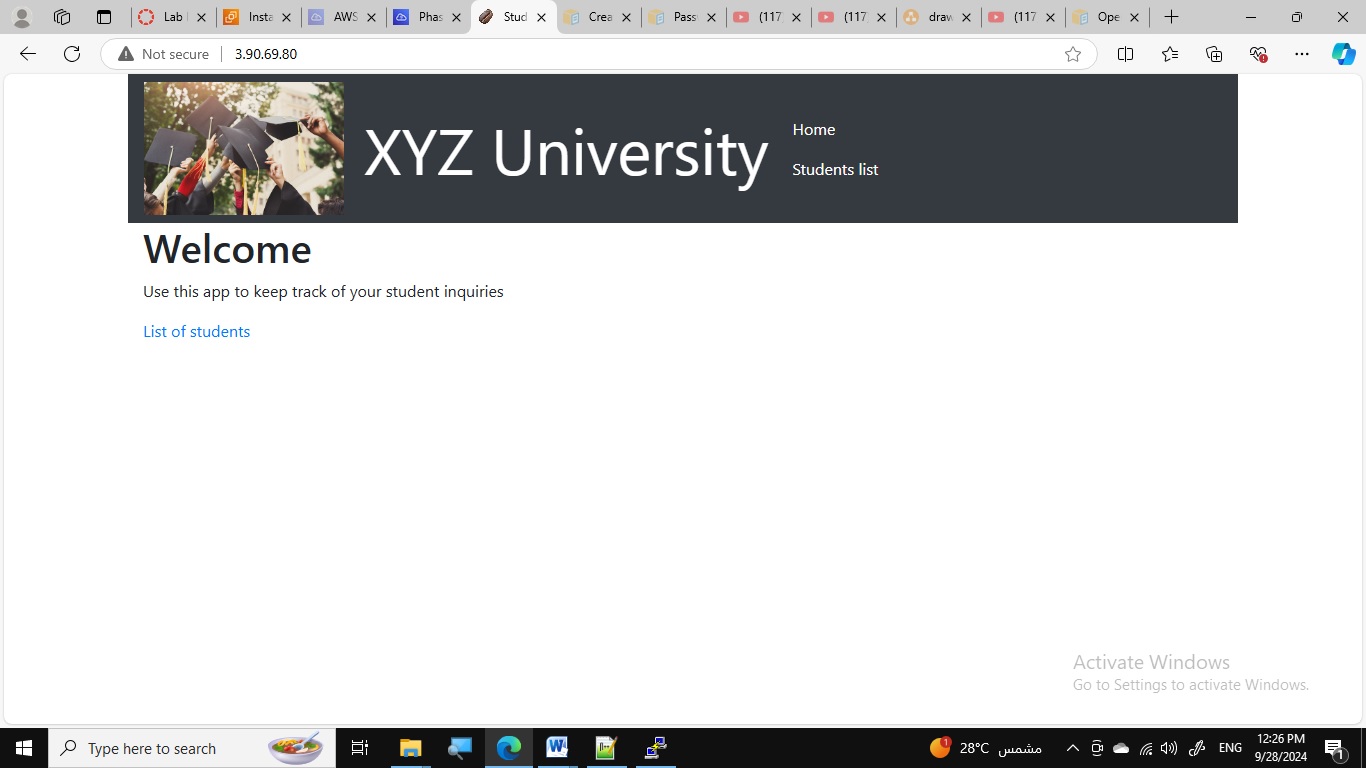
mysqldump -h **10.0.0.98** -u nodeapp -p --databases STUDENTS > data.sql

Password: **student12**

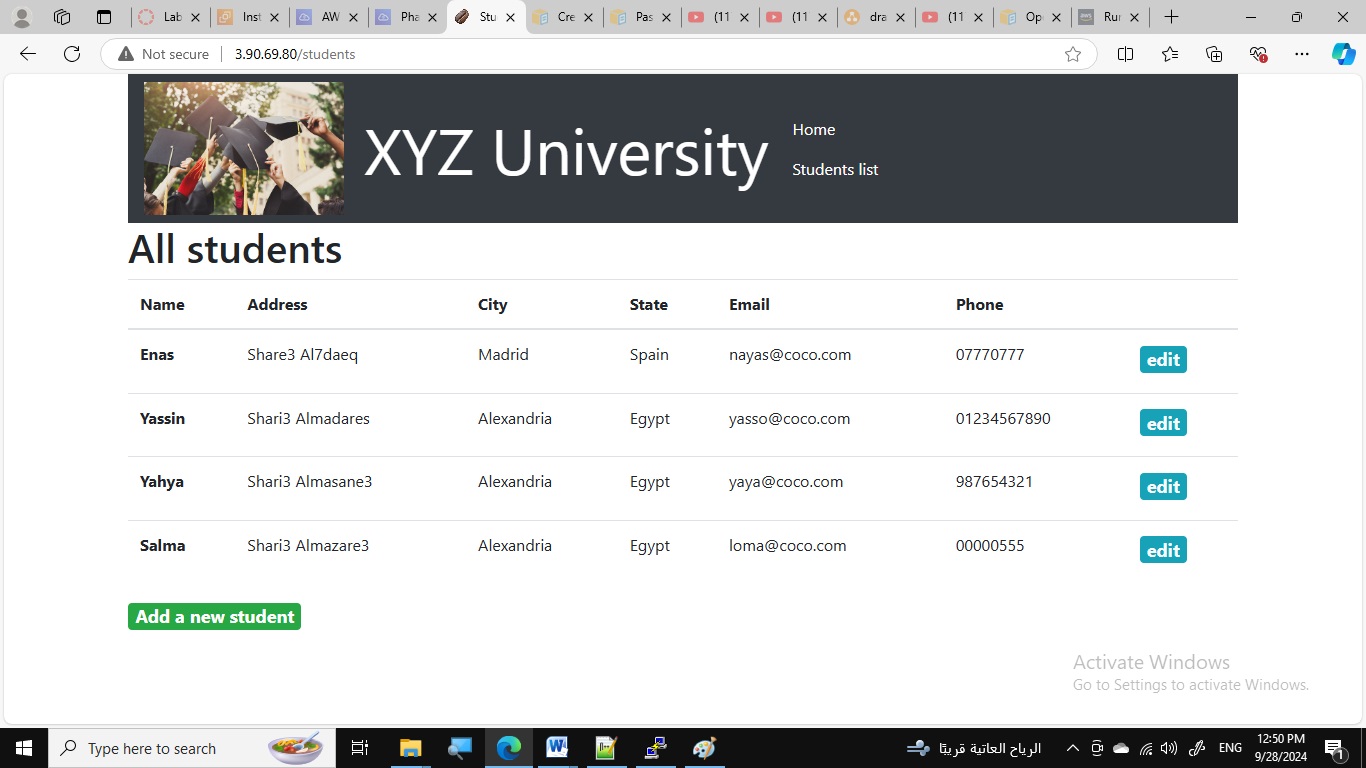
mysql -h **web-lab-db.c8h3lo7lvpy8.us-east-1.rds.amazonaws.com** -u **nodeapp** -p STUDENTS < data.sql

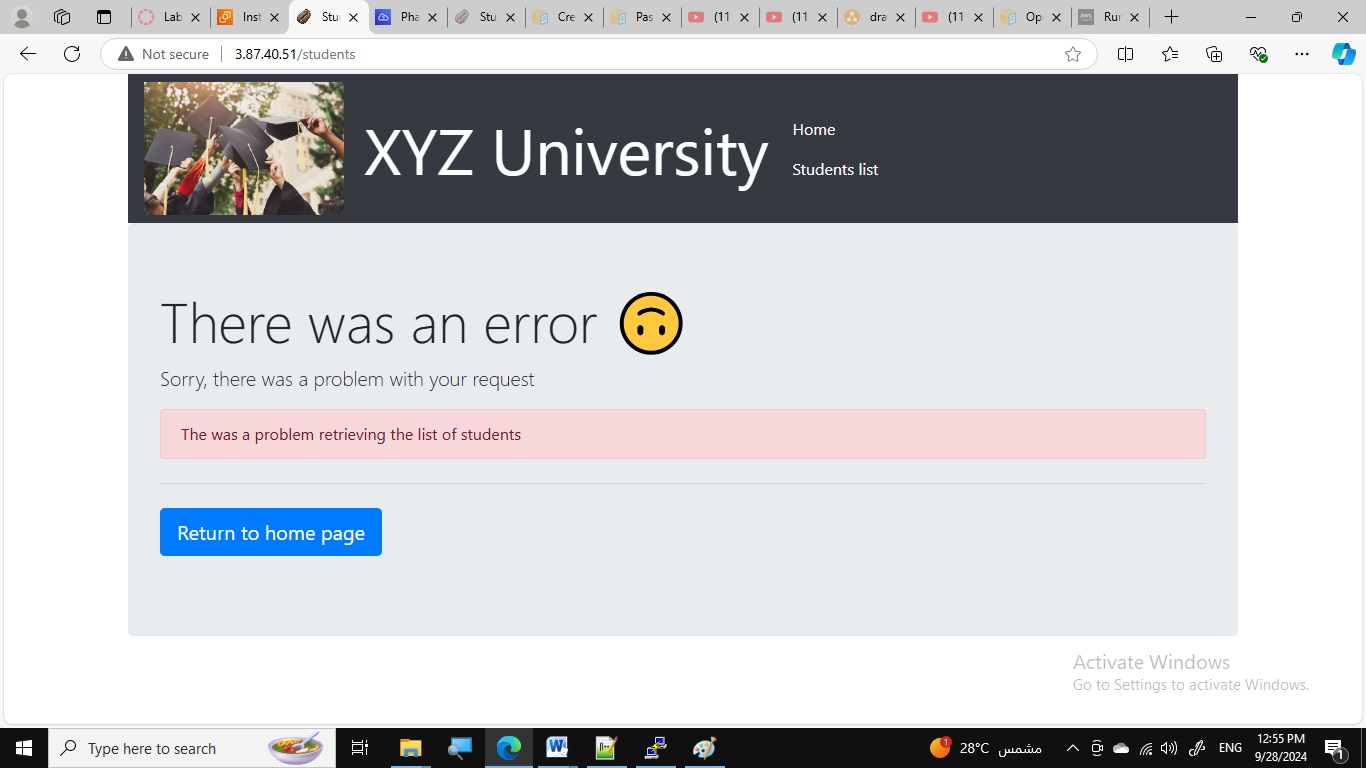
# Action

## 4.1 Phase-2 and Phase-3 Instances launched



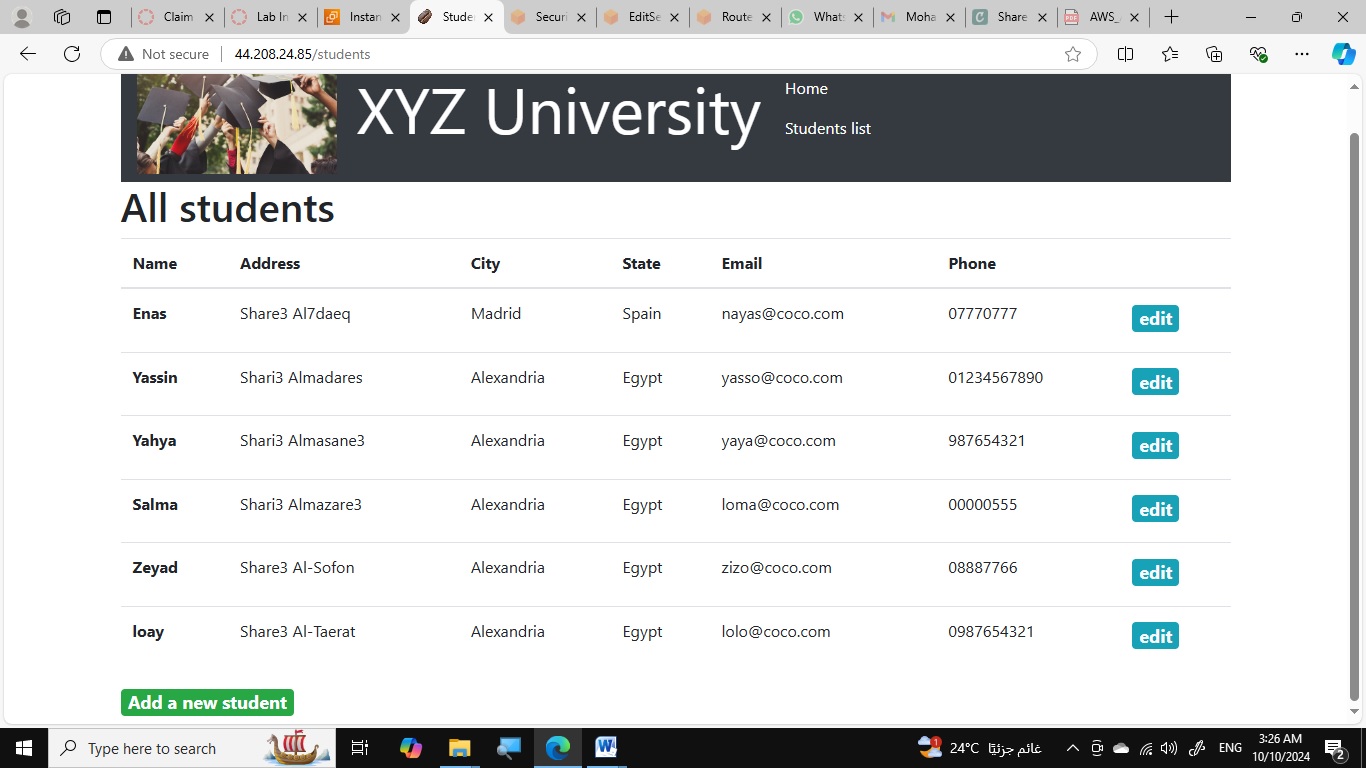
Local database was running on Phase-2 Instance while Phase-3 instance couldn’t display students list





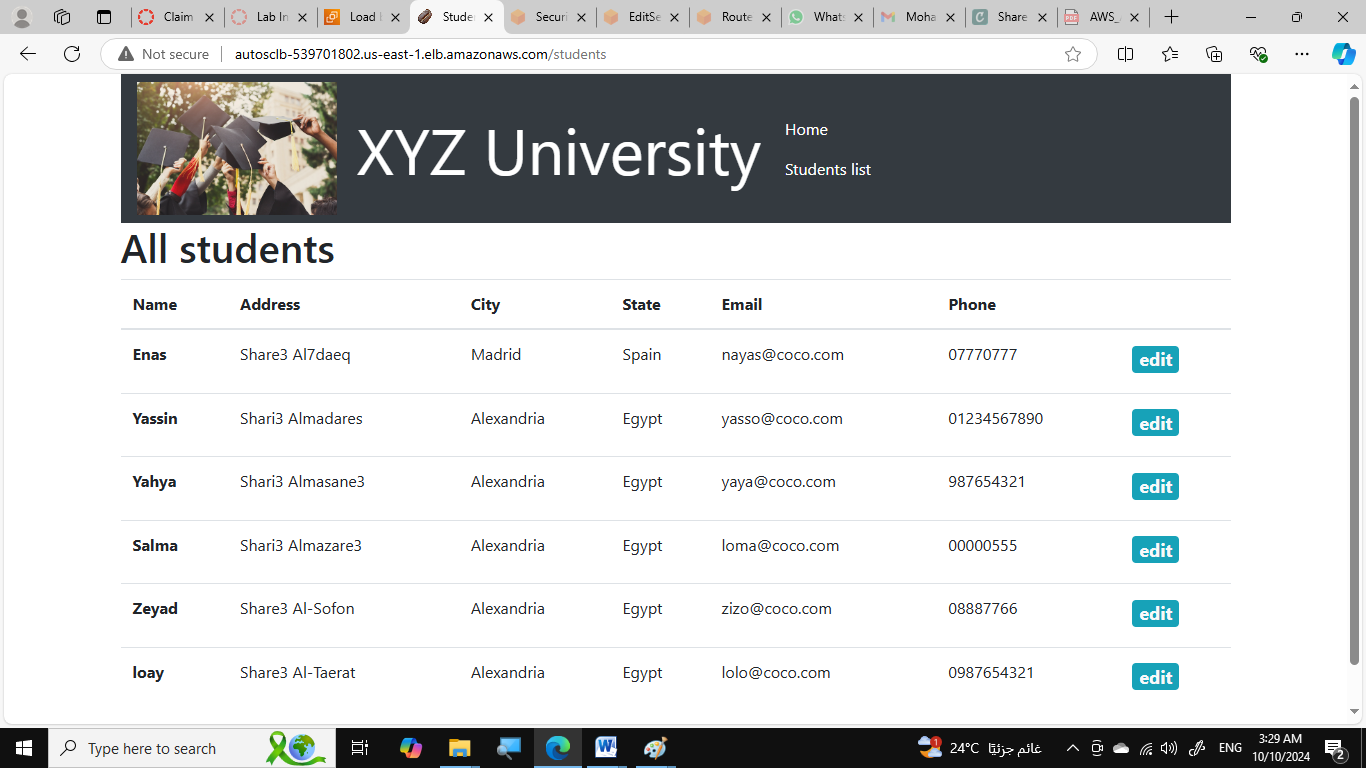
## 4.2. RDS instance created

Data migrated into new RDS instance and Phase-3 instance was able to connect to the new database

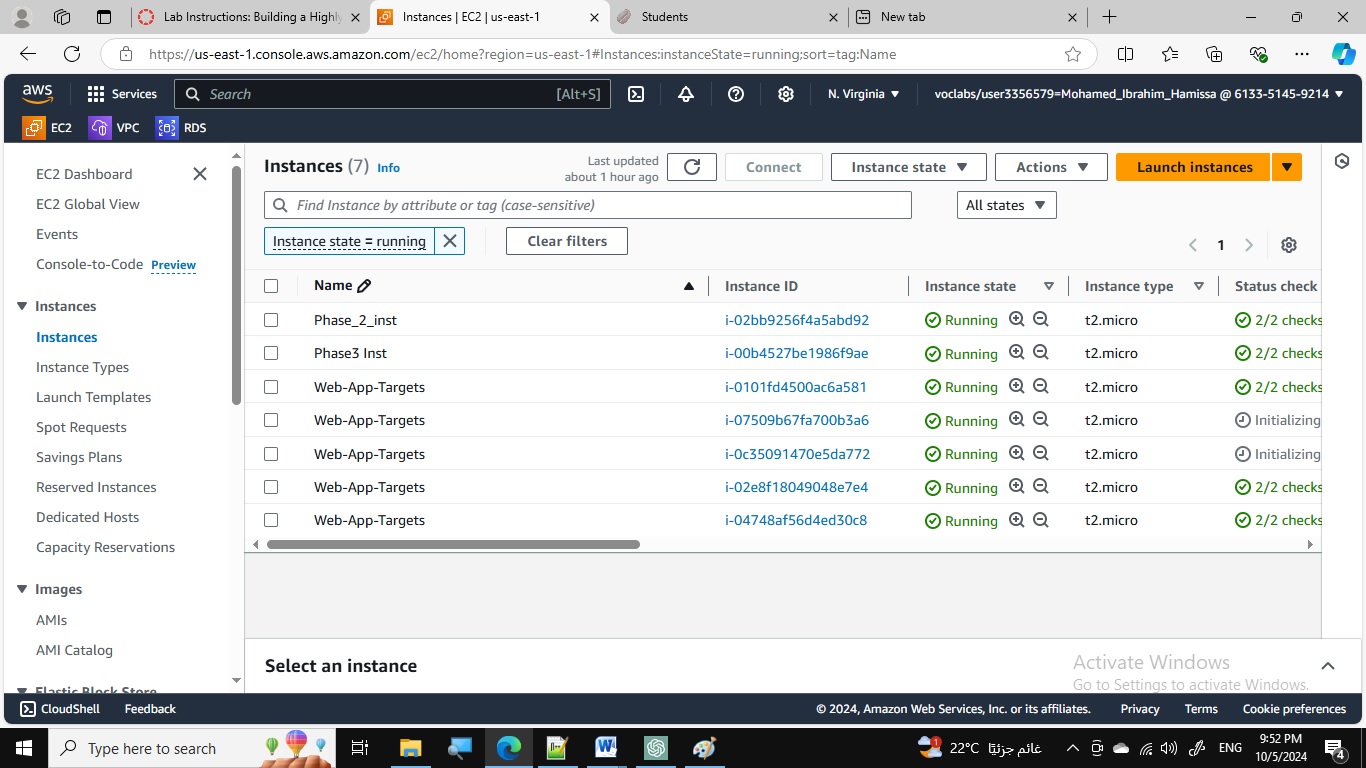


## 4.3 Launch template, load balancer, auto scaling group were created

Web app was successfully accessed using load balancer’s DNS name



## 4.4 loading test was performed



# Certificate

