Academy Lab Projects – Showcase

Lim Jun Wei, Ong Yi Xin, Chia Ming Yi

Building a Highly Available, Scalable Web Application

12 September 2025

Acknowledgement

Acknowledgement

We, the members of the project team, would like to express our sincere gratitude to all who have supported and guided us for achieving the completion of the BMIT3273 Cloud Computing course assignment. This project has offered a golden opportunity for us to obtain valuable knowledge and hands-on experience in designing and implementing cloud-based solutions using the Amazon Web Services (AWS).

Firstly, we would like to thank our lecturer, Mr. Low Choon Keat. He is also our practical class tutor as well. Under his continuous guidance and actively providing feedback, we are able to finish this project successfully within the stipulated time frame. He not only taught us theoretical knowledge in cloud concepts but also guided us to apply the knowledge in a practical environment. The clarity of instructions and the willingness to provide support when facing troublesome situations are very crucial for keeping our team on track and motivated.

We would also like to extend our gratitude to Tunku Abdul Rahman University of Management and Technology (TARUMT) for providing us with a supportive academic environment and the necessary resources. So, we are able to have a chance to learn theoretical concepts and technical skills about the cloud computing field. It also provides us with laboratory facilities and structured guidance of the BMIT3273 Cloud Computing course for fostering our foundation to explore the real-world cloud technologies. Without the academic support and opportunities provided by the university, this project would not have been possible.

We would also like to acknowledge AWS Academy for providing us an excellent learner lab environment and resources which enable us to deal with the hands-on tutorials. It provides us a platform for building, testing and deploying the required architecture. Without these resources, it will be hard for us to gain real-world exposure to tools such as EC2, RDS, Cloud9, Secrets Manager, Elastic Load Balancer and Auto Scaling Groups. These hands-on learning opportunities not only strengthened our technical skills but also gave us the insights for estimating cost, scalability and the best practices in cloud computing.

Moreover, we also wish to thank the collaborative effort within our team of 3 members who are Lim Jun Wei, Ong Yi Xin and Chia Ming Yi. Each member has contributed significant efforts in different phases of the project from planning and architectural design to the implementation, testing and documentation phases. All members collaboratively share their ideas, divide the tasks effectively and overcome the challenges together. Via the efficient collaboration, we are able to accomplish this assignment with a highly efficient and effective solution.

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Introduction

Introduction

- Cloud-based **Student Records Web Application**
- Solves performance issues during **peak admissions** (e.g. slow or unavailable legacy system)
- Designed with **AWS Well-Architected Framework**
  - High availability & scalability
  - Load balancing
  - Security
  - Cost efficiency
- Supports core functions: **view**, **add**, **delete** and **modify student records**
- Built using **AWS services**: EC2, RDS, VPC, Cloud9, Secrets Manager, ELB and Auto Scaling

Business Scenario Overview

Business Scenario Overview

- Problem & Opportunity
  - University's current web application is hosted on a single server → causes **downtime**, **slow response** and **scalability issues**
  - Users complain about **inconsistent availability** and **limited performance** during peak usage
  - Opportunity: Modernize the system using **cloud infrastructure** to achieve reliability, scalability and cost efficiency
- Users & Pain Points
  - **Students**: Difficulty accessing records when the system is overloaded
  - **Faculty**: Frustrated by data loss or slow updates
  - **IT Staff**: Struggle with manual server maintenance and lack of automation

Business Scenario Overview

- Solution Requirements
  - Deploy the application to **AWS Cloud**
  - Must be **highly available** (multi-AZ, load-balanced)
  - **Scalable**: Auto scaling for fluctuating traffic
  - **Secure**: VPC isolation, IAM roles, Secrets Manager
  - **Cost-efficient**: Optimized instance types and managed services (EC2 + RDS)

Solution Overview

Solution Overview

High-Level Description

- Cloud-based Student Management Web Application on AWS
- Web app hosted on EC2 with Load Balancer + Auto Scaling
- Database migrated to Amazon RDS (MySQL)
- Credentials secured with Secrets Manager
- Development via Cloud9 in dedicated VPC

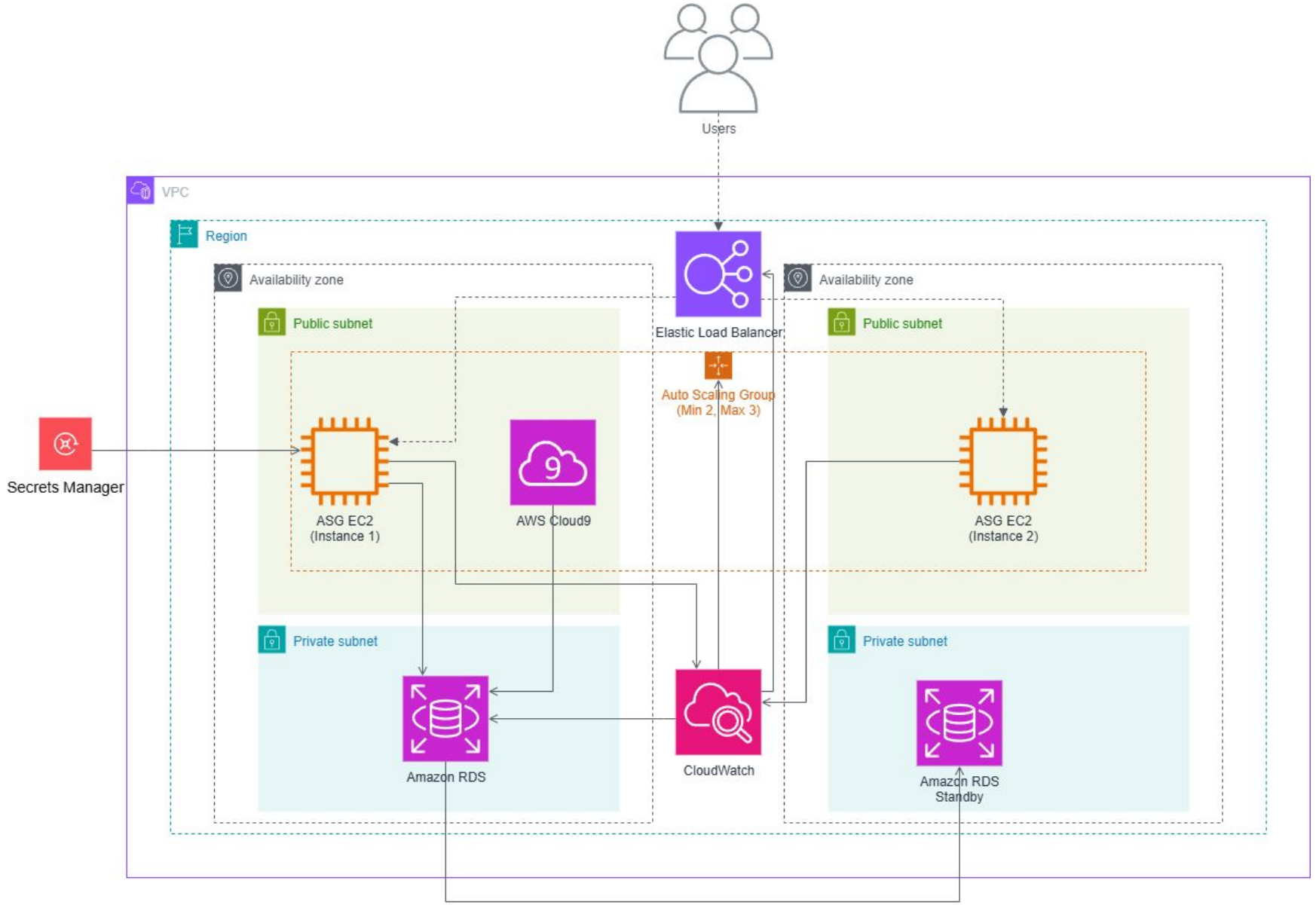
Design Considerations

- Reliability & Availability
  - ALB + Multi-AZ Auto Scaling
- Security
  - Private RDS subnets + Secrets Manager
- Cost Efficiency
  - Free-tier eligible services, t3.micro instances
- Performance Efficiency
  - RDS for managed DB + Auto Scaling for demand
- Operational Excellence
  - Cloud9 & IAM roles for easy development
- Trade-offs
  - Simplified setup (no NAT, small instance types) for cost

Use Cases

- Students
  - View, add, delete and update records
- Administrators
  - Secure data management, system monitoring
- Developers
  - Deploy & test using Cloud9
- Scalability
  - Auto Scaling responds to load testing

Architecture Diagram of the Solution



AWS Pricing Calculator

AWS Pricing Calculator

aws

Contact your AWS representative: Contact Sales

Export Date: 09/11/2025 **Language:** English

Estimate url

Estimate summary

Upfront cost	Monthly cost	Total 12 months cost
0.00 USD	109.89 USD	1,318.68 USD Includes upfront cost

Detailed Estimate

Name	Group	Region	Upfront cost	Monthly cost
Amazon EC2	-	US East (N. Virginia)	0.00 USD	7.59 USD

Status	-
Description:	ec2-university
Config summary	Tenancy (Shared Instances), Operating system (Linux), Workload (Consistent, Number of instances: 1), Advance EC2 instance (t3.micro), Pricing strategy (On-Demand Utilization: 100 %Utilized/Month), Enable monitoring (disabled), DT Inbound: Not selected (0 TB per month), DT Outbound: Not selected (0 TB per month), DT Intra-Region: (0 TB per month)

Name	Group	Region	Upfront cost	Monthly cost
Amazon EC2	-	US East (N. Virginia)	0.00 USD	7.59 USD

Status	-
Description:	ec2-webapphosting
Config summary	Tenancy (Shared Instances), Operating system (Linux), Workload (Consistent, Number of instances: 1), Advance EC2 instance (t3.micro), Pricing strategy (On-Demand Utilization: 100 %Utilized/Month), Enable monitoring (disabled), DT Inbound: Not selected (0 TB per month), DT Outbound: Not selected (0 TB per month), DT Intra-Region: (0 TB per month)

AWS Pricing Calculator

Name	Group	Region	Upfront cost	Monthly cost
Amazon EC2	-	US East (N. Virginia)	0.00 USD	15.18 USD
Status	-			
Description:	university-asg-ec2 (Auto Scaling Group)			
Config summary	Tenancy (Shared Instances), Operating system (Linux), Workload (Consistent, Number of instances: 2), Advance EC2 instance (t3.micro), Pricing strategy (On-Demand Utilization: 100 %Utilized/Month), Enable monitoring (disabled), DT Inbound: Not selected (0 TB per month), DT Outbound: Not selected (0 TB per month), DT Intra-Region: (0 TB per month)			

Name	Group	Region	Upfront cost	Monthly cost
Amazon EC2	-	US East (N. Virginia)	0.00 USD	7.59 USD
Status	-			
Description:	Cloud9			
Config summary	Tenancy (Shared Instances), Operating system (Linux), Workload (Consistent, Number of instances: 1), Advance EC2 instance (t3.micro), Pricing strategy (On-Demand Utilization: 100 %Utilized/Month), Enable monitoring (disabled), DT Inbound: Not selected (0 TB per month), DT Outbound: Not selected (0 TB per month), DT Intra-Region: (0 TB per month)			

Name	Group	Region	Upfront cost	Monthly cost
Amazon RDS for MySQL	-	US East (N. Virginia)	0.00 USD	54.13 USD
Status	-			
Description:	db-university			
Config summary	Storage amount (20 GB), Storage for each RDS instance (General Purpose SSD (gp2)), Nodes (1), Instance type (db.t4g.micro), Utilization (On-Demand only) (100 %Utilized/Month), Deployment option (Single-AZ), Pricing strategy (OnDemand)			

AWS Pricing Calculator

Name	Group	Region	Upfront cost	Monthly cost
Elastic Load Balancing	-	US East (N. Virginia)	0.00 USD	17.41 USD
Status	-			
Description:	alb-university			
Config summary	Number of Application Load Balancers (1)			

Name	Group	Region	Upfront cost	Monthly cost
AWS Secrets Manager	-	US East (N. Virginia)	0.00 USD	0.40 USD
Status	-			
Description:	Mydbsecret			
Config summary	Number of secrets (1), Average duration of each secret (30 days), Number of API calls (100 per month)			

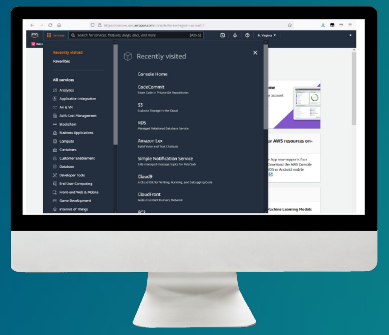
Name	Group	Region	Upfront cost	Monthly cost
Amazon CloudWatch	-	US East (N. Virginia)	0.00 USD	0.00 USD
Status	-			
Description:	CloudWatch			
Config summary	Number of Metrics (includes detailed and custom metrics) (0), GetMetricData: Number of metrics requested (100), GetMetricWidgetImage: Number of metrics requested (0), Number of other API requests (100), Number of vCPUs monitored by Database Insights (0 per hour), Number of Aurora Capacity Units (ACUs) monitored by Database Insights (0 per hour), Number of Aurora Capacity Units (ACUs) monitored by Database Insights (0 per hour)			

Acknowledgement

AWS Pricing Calculator provides only an estimate of your AWS fees and doesn't include any taxes that might apply. Your actual fees depend on a variety of factors, including your actual usage of AWS services. Learn more

Demo Link

Demo



- https://drive.google.com/file/d/1XGJqITl_NlIFOPVomMIE5URLoO4x2Uf2/view?usp=sharing

  (Lim Jun Wei: Screenshots of Resources Deployed)

- https://drive.google.com/file/d/12PED-_Fiv2mLImfQXZtgq47CVzLFb3YL/view?usp=drive_link

  (Ong Yi Xin: Snippet of Web Projects and Database Table, Fields and Records. Conclusion. Lesson Learned.)

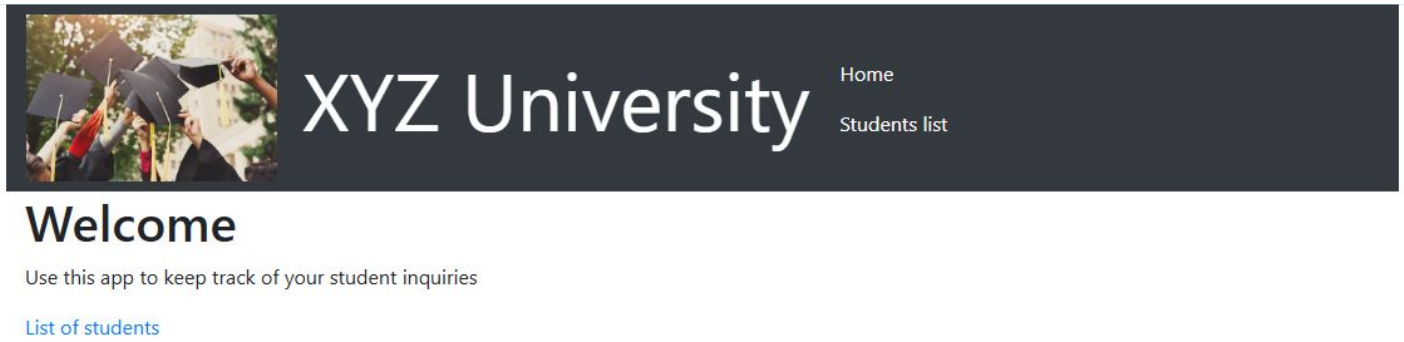
- https://drive.google.com/file/d/1QEmC_yz9xMKaHzmVGdDxKUy6TG01wI0C/view?usp=drive_link

  (Chia Ming Yi: Introduction, Business Scenario Overview, Solution Overview, Architecture Diagram, AWS Pricing Calculator.)

Web Page URL

Web Page URL

alb-university-29584847.us-east-1.elb.amazonaws.com



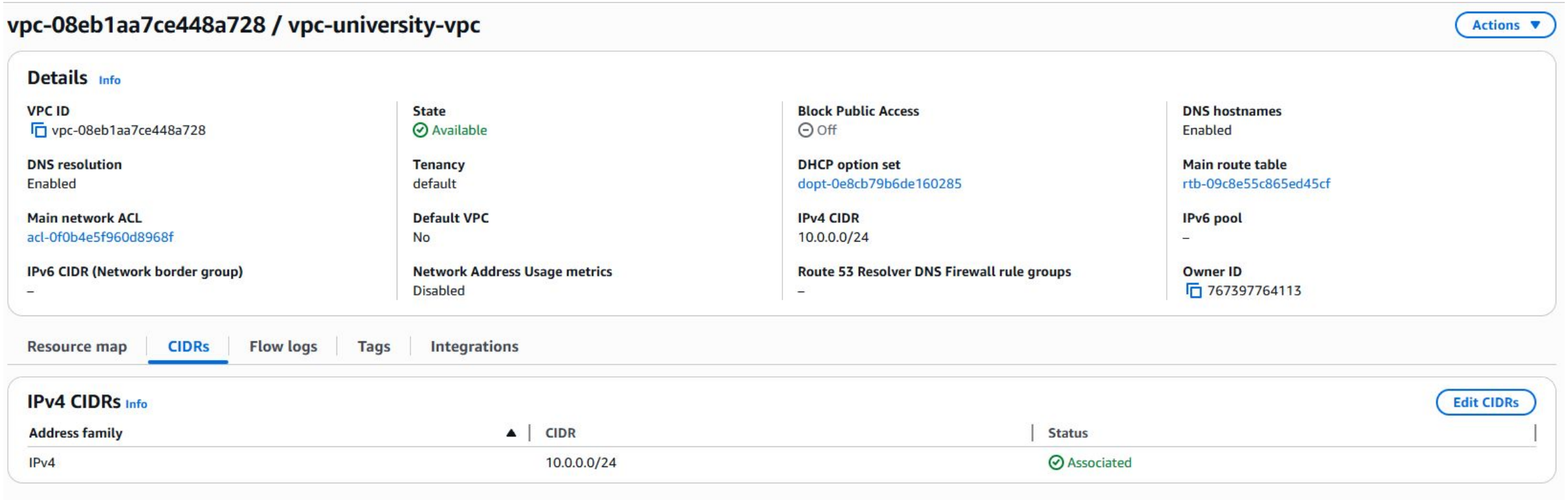
Screenshot of Resources Deployed

Amazon Virtual Private Cloud (VPC)

- Provides secure network isolation for web + database layers
- CIDR Block: 10.0.0.0/24
- Subnets (2 public & 2 private):
  - vpc-university-subnet-private1-us-east-1a (10.0.0.64/27)
  - vpc-university-subnet-private2-us-east-1b (10.0.0.96/27)
  - vpc-university-subnet-public1-us-east-1a (10.0.0.0/27)
  - vpc-university-subnet-public2-us-east-1b (10.0.0.32/27)
- Availability Zones:
  - us-east-1a
  - us-east-1b

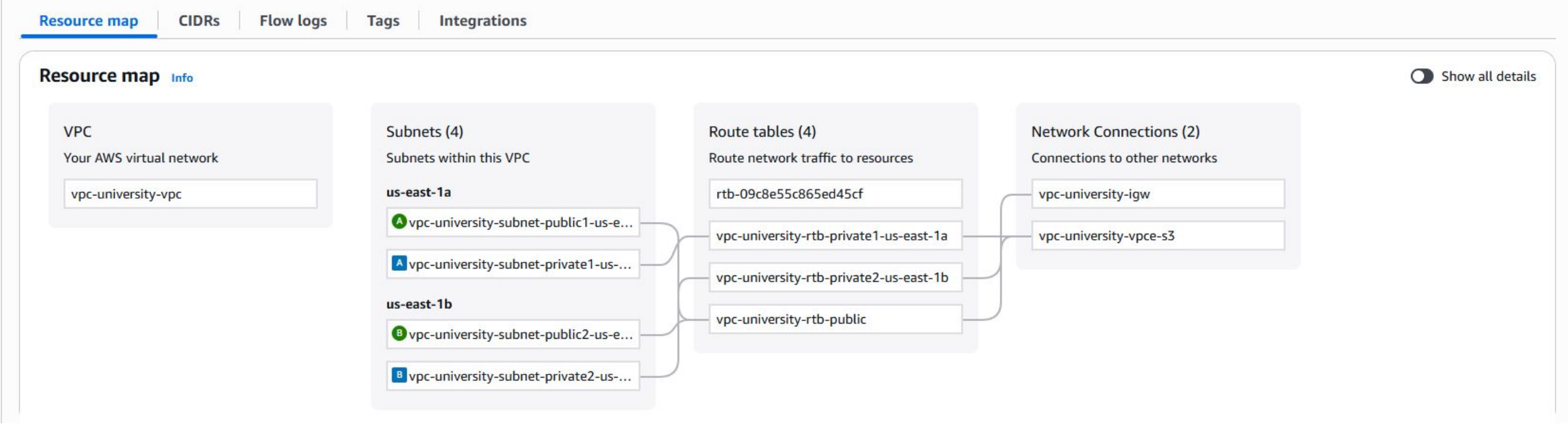
Amazon Virtual Private Cloud (VPC)

VPCs: Details & CIDRs



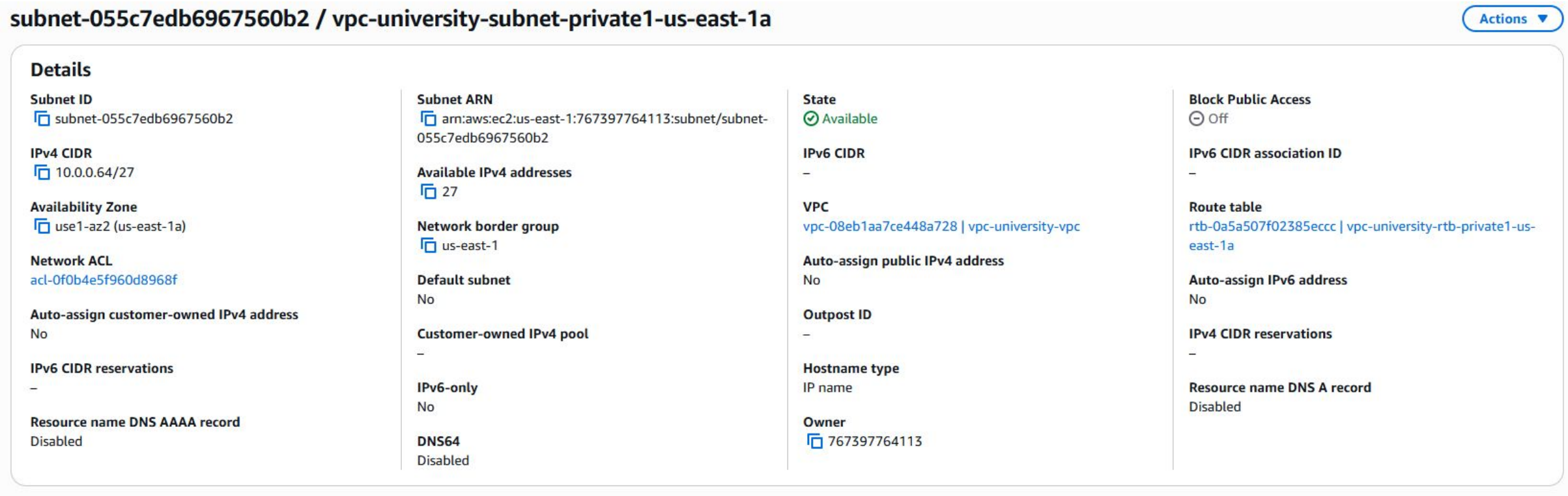
Amazon Virtual Private Cloud (VPC)

VPCs: Resource Map



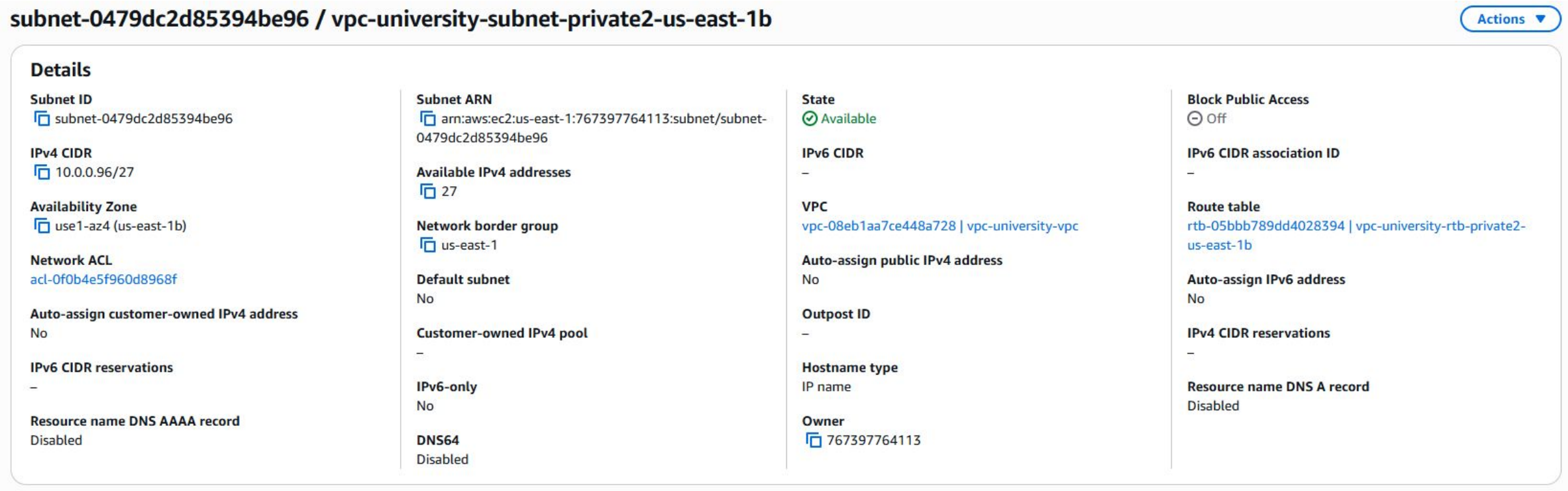
Amazon Virtual Private Cloud (VPC)

Subnets: vpc-university-subnet-private1-us-east-1a



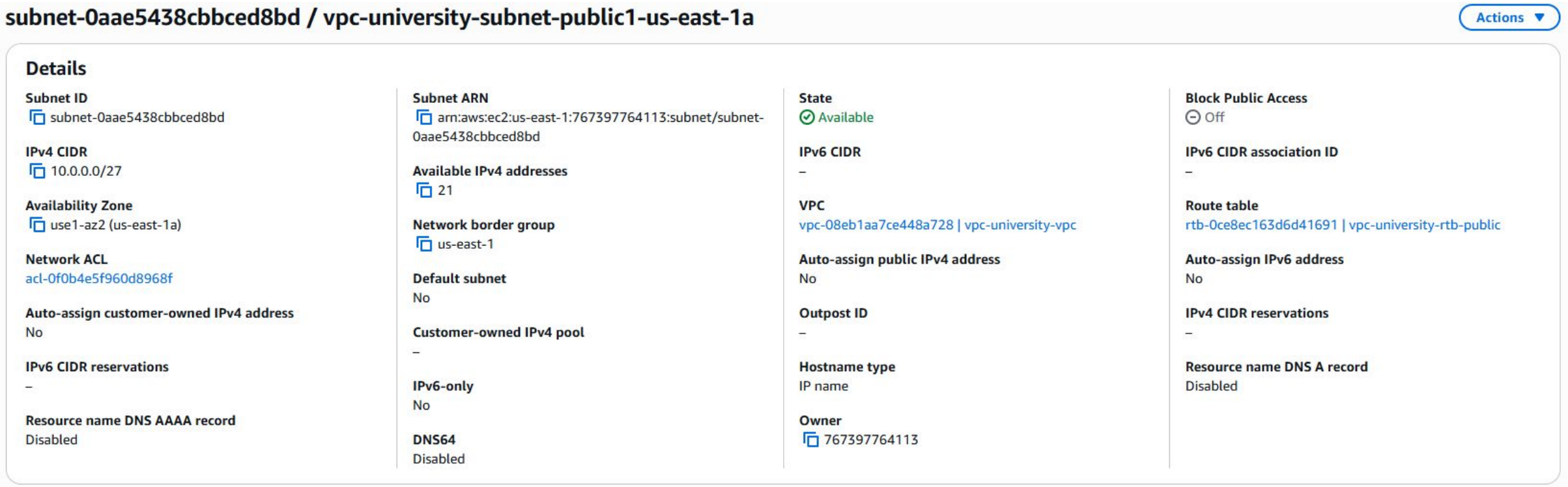
Amazon Virtual Private Cloud (VPC)

Subnets: vpc-university-subnet-private2-us-east-1b



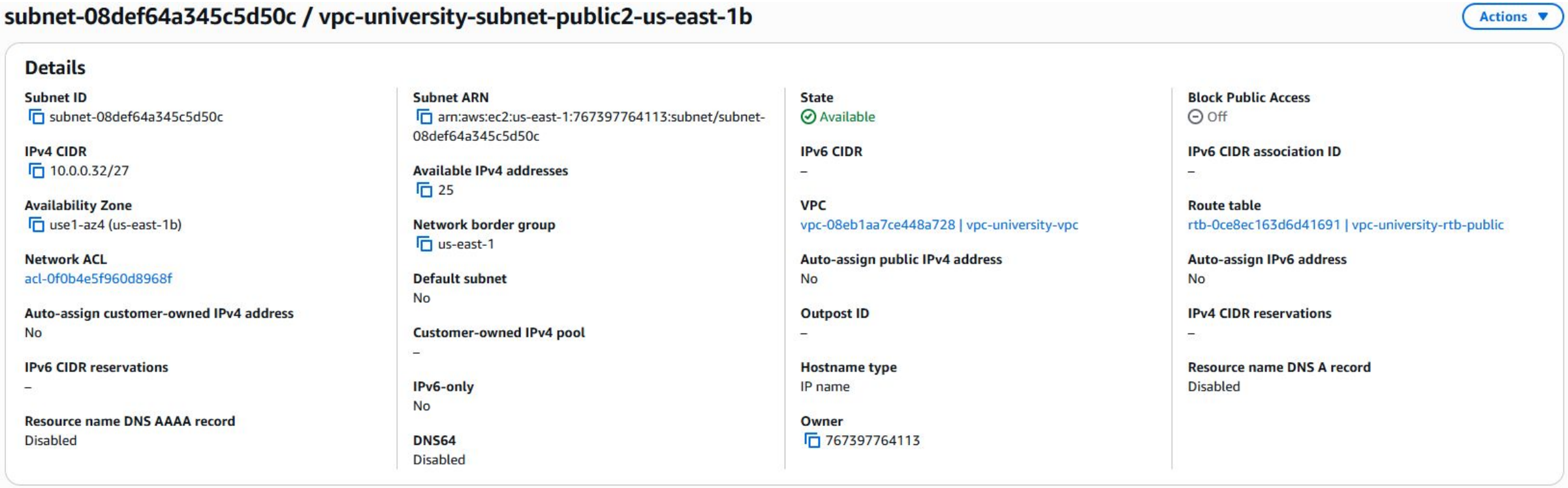
Amazon Virtual Private Cloud (VPC)

Subnets: vpc-university-subnet-public1-us-east-1a



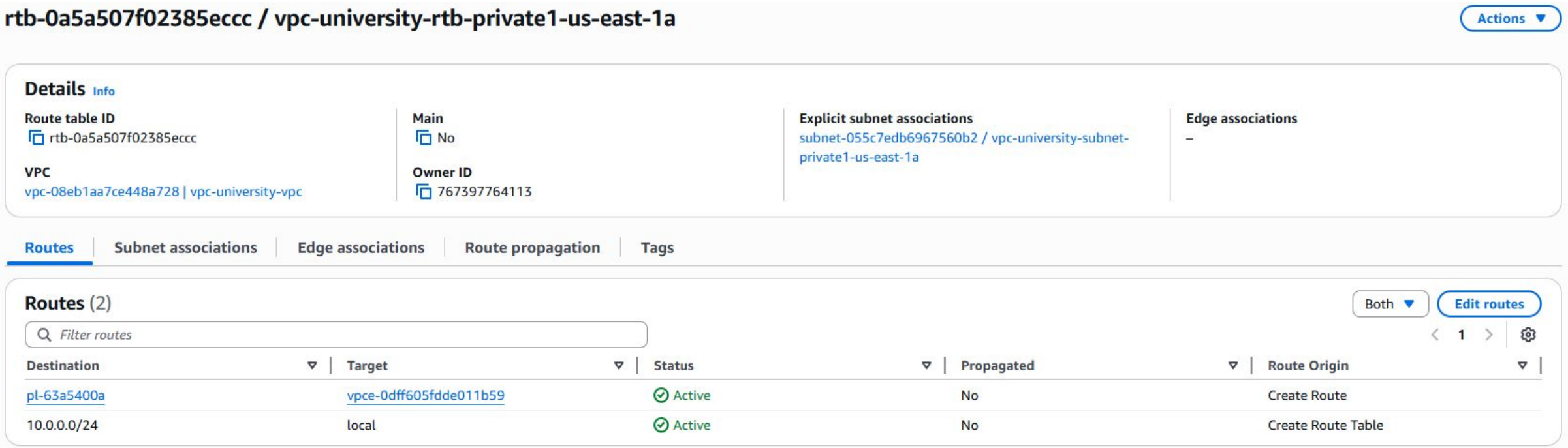
Amazon Virtual Private Cloud (VPC)

Subnets: vpc-university-subnet-public2-us-east-1b



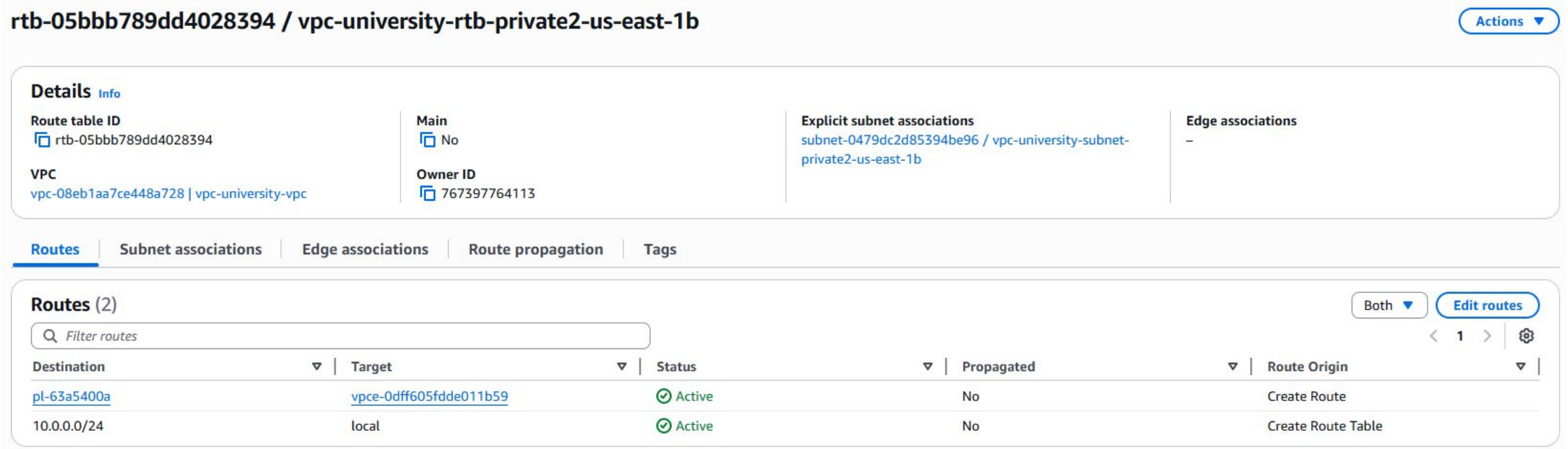
Amazon Virtual Private Cloud (VPC)

Route Tables: vpc-university-rtb-private1-us-east-1a



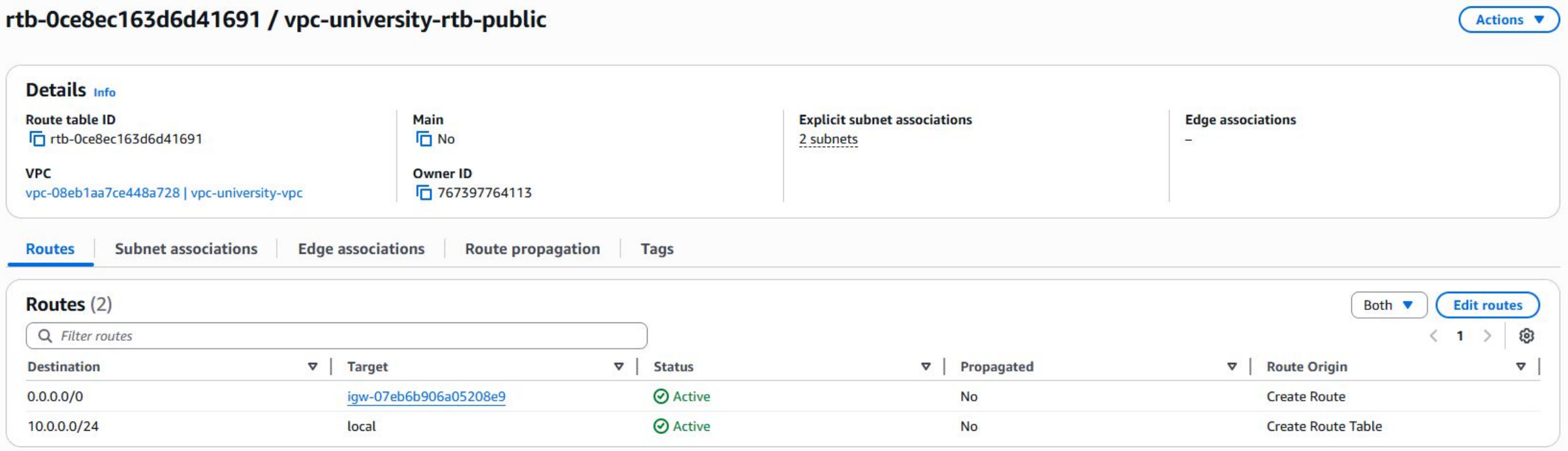
Amazon Virtual Private Cloud (VPC)

Route Tables: vpc-university-rtb-private2-us-east-1b



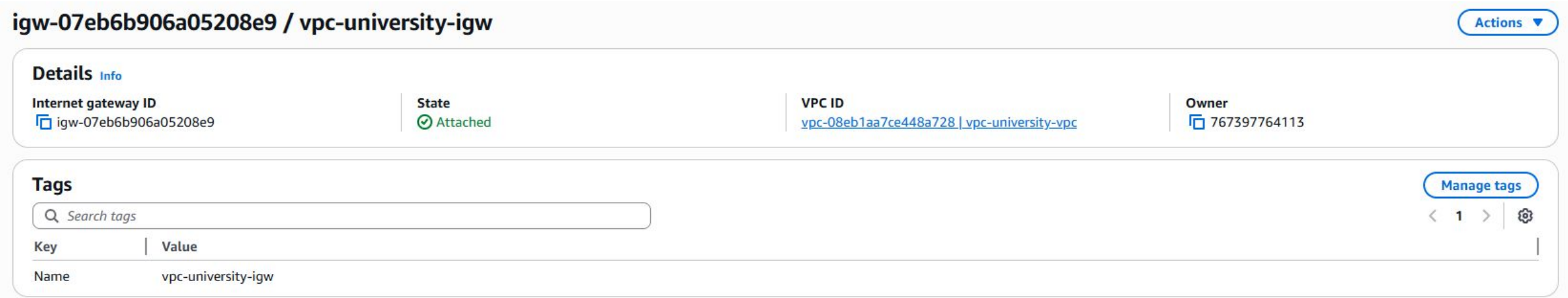
Amazon Virtual Private Cloud (VPC)

Route Tables: vpc-university-rtb-public



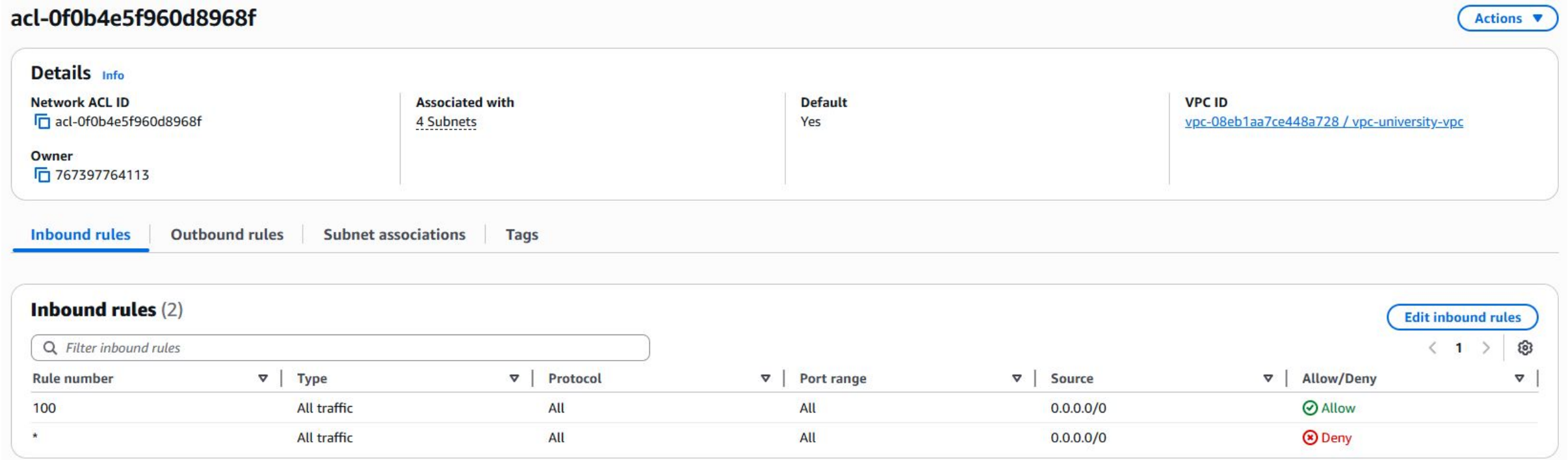
Amazon Virtual Private Cloud (VPC)

Internet Gateways



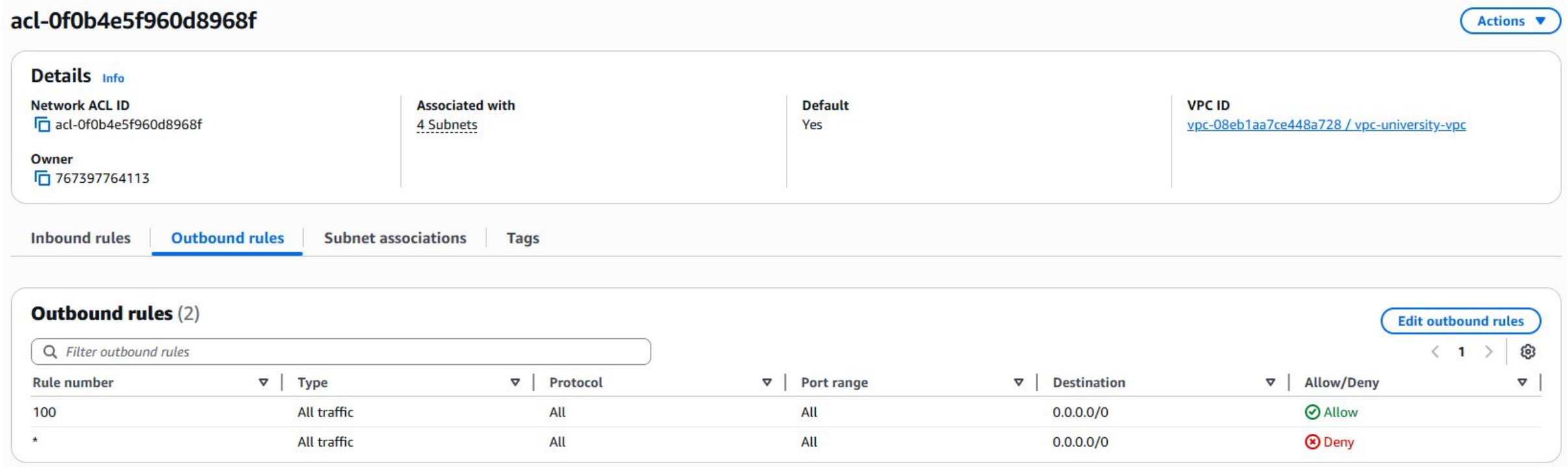
Amazon Virtual Private Cloud (VPC)

Network ACLs: Inbound Rules



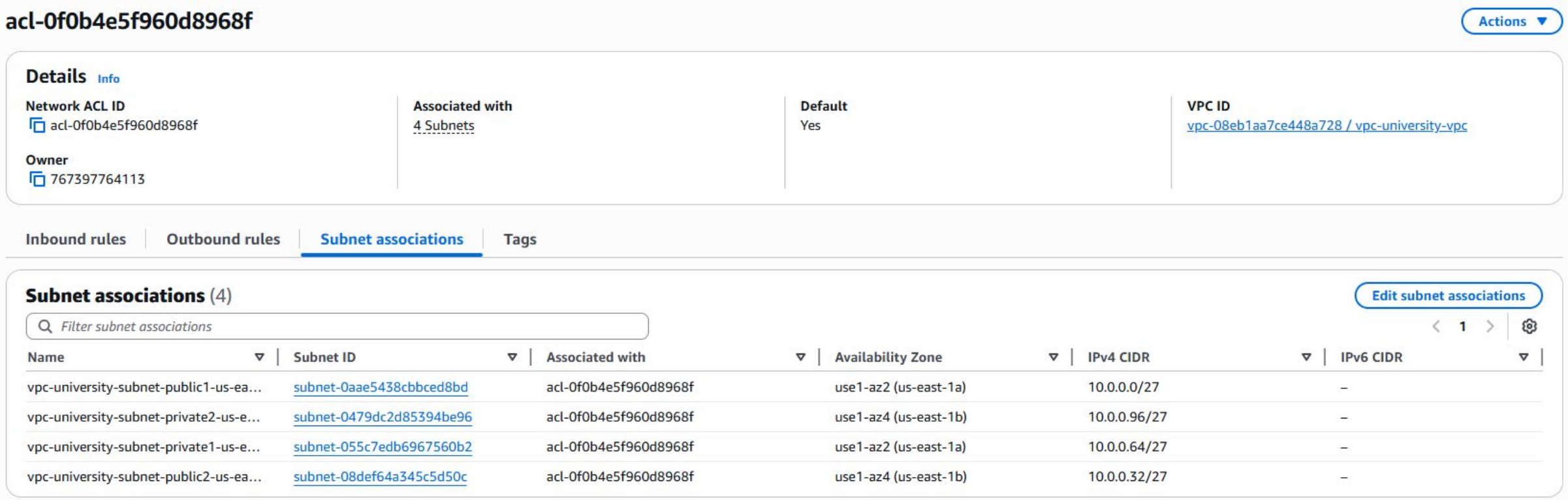
Amazon Virtual Private Cloud (VPC)

Network ACLs: Outbound Rules



Amazon Virtual Private Cloud (VPC)

Network ACLs: Subnet Associations

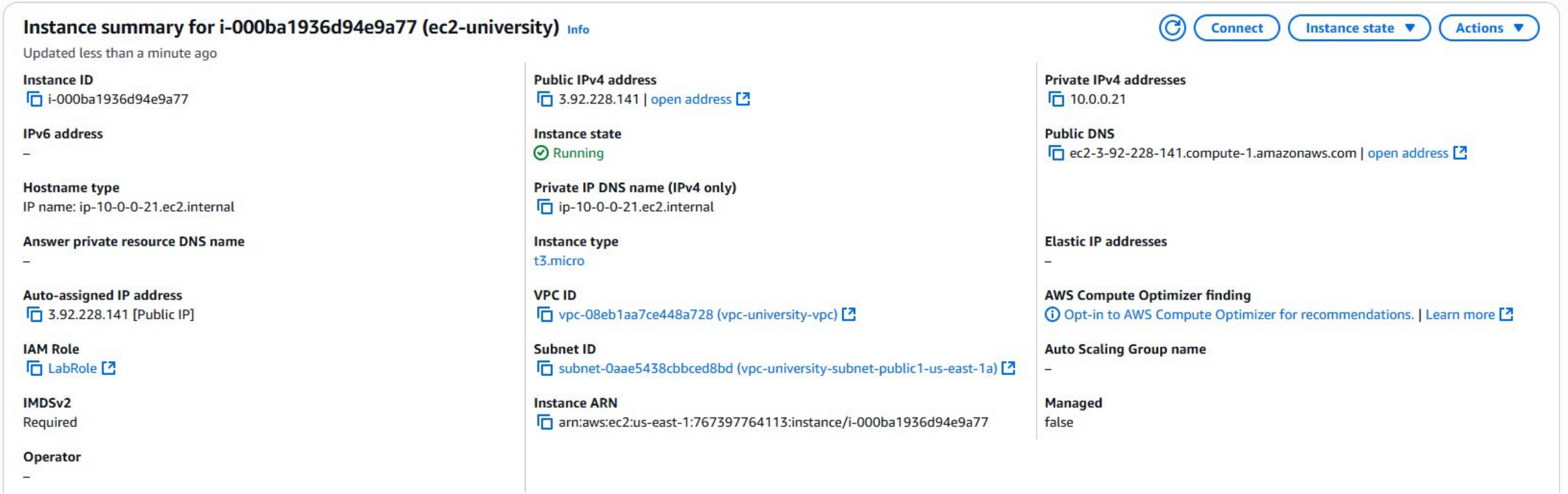


Amazon Elastic Compute Cloud (EC2)

- ec2-university
  - Initial deployment for web app & database testing
  - AMI: Ubuntu
  - Type: t3.micro
- ec2-webapphosting
  - Production web server hosting the application
  - Connected to Application Load Balancer (ALB)
- university-asg-ec2
  - Auto scaled EC2 instances for high availability
  - Managed by Launch Template: lt-university
  - Min: 2, Desired: 2, Max: 3 instances

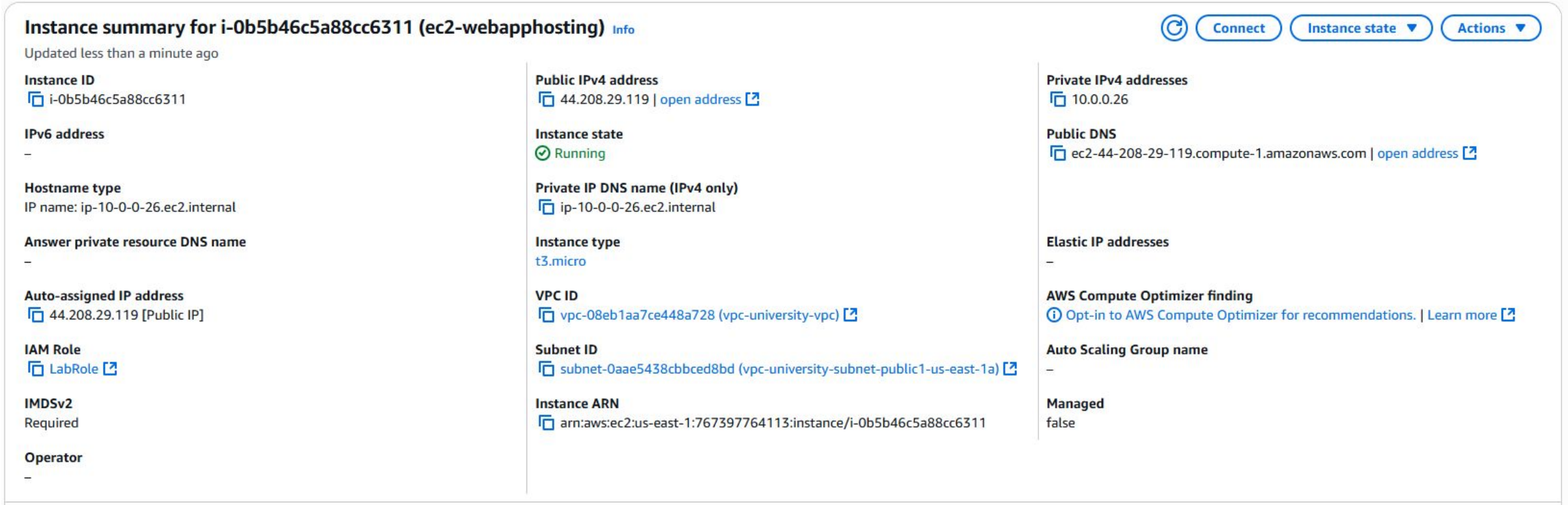
Amazon Elastic Compute Cloud (EC2)

ec2-university



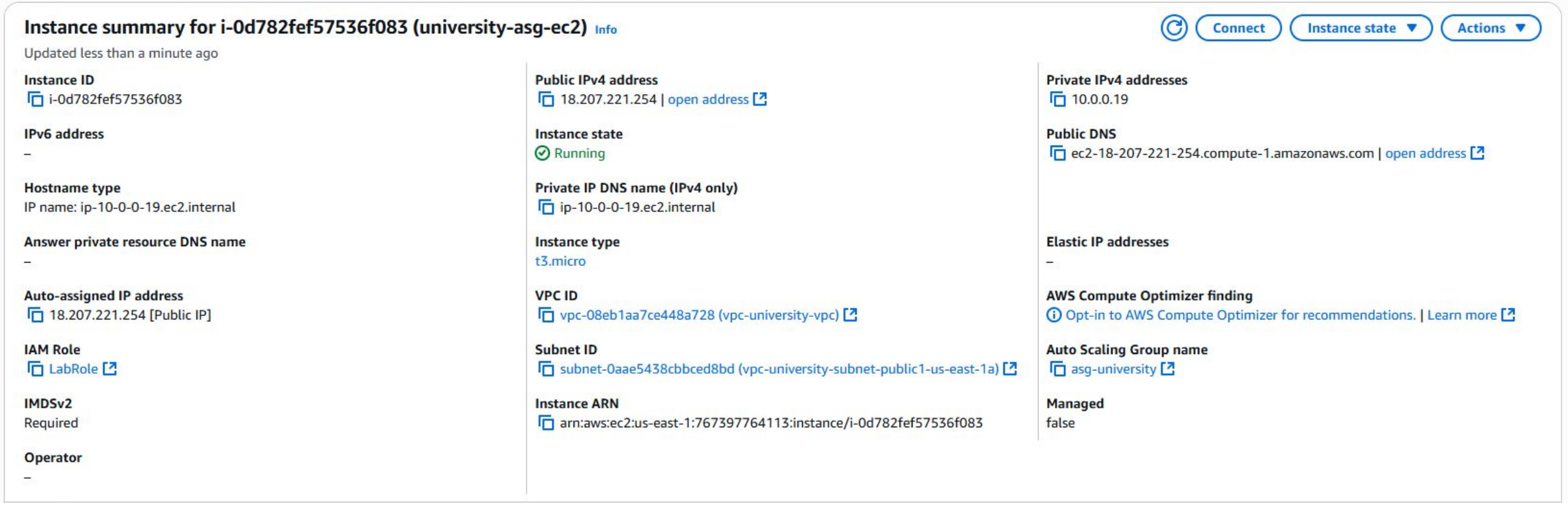
Amazon Elastic Compute Cloud (EC2)

ec2-webapphosting



Amazon Elastic Compute Cloud (EC2)

university-asg-ec2

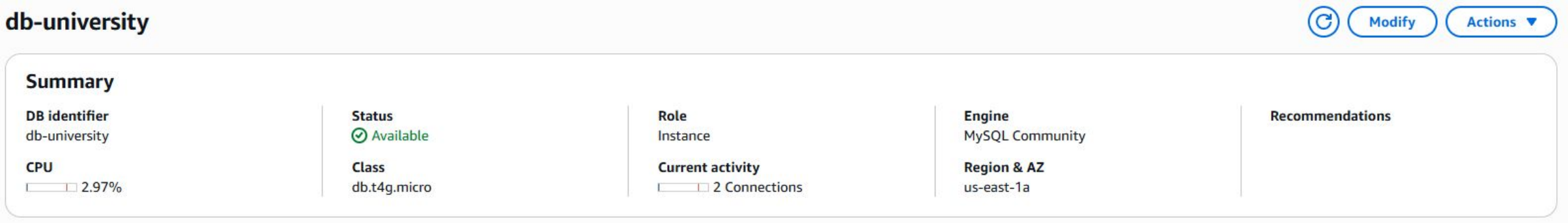


Amazon Relational Database Service (RDS)

- DB Instance: db-university
- Engine: MySQL 9.0.39 (Free Tier)
- Subnet Group: dbsubnetgrp-university (private subnets across 2 AZs)
- Security: Secured with dbaccess SG (only web app & Cloud9 can connect)
- Database Name: STUDENTS
- Purpose: Stores and manages student records reliably
- Credentials: Stored in AWS Secrets Manager

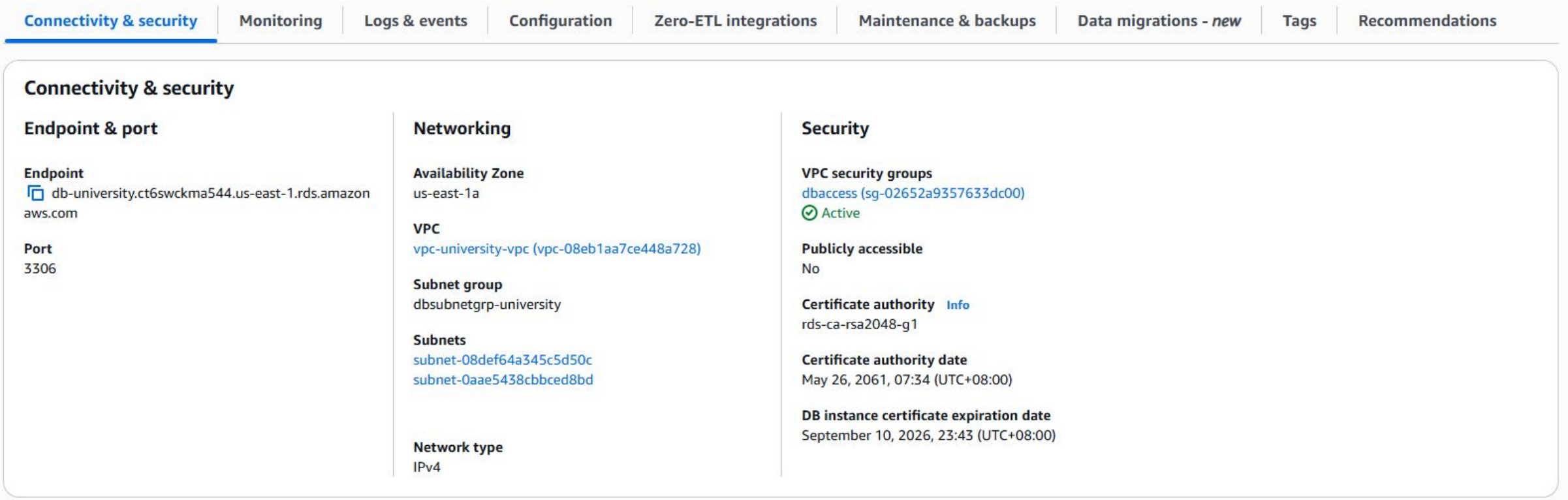
Amazon Relational Database Service (RDS)

db-university



Amazon Relational Database Service (RDS)

db-university: Connectivity & Security

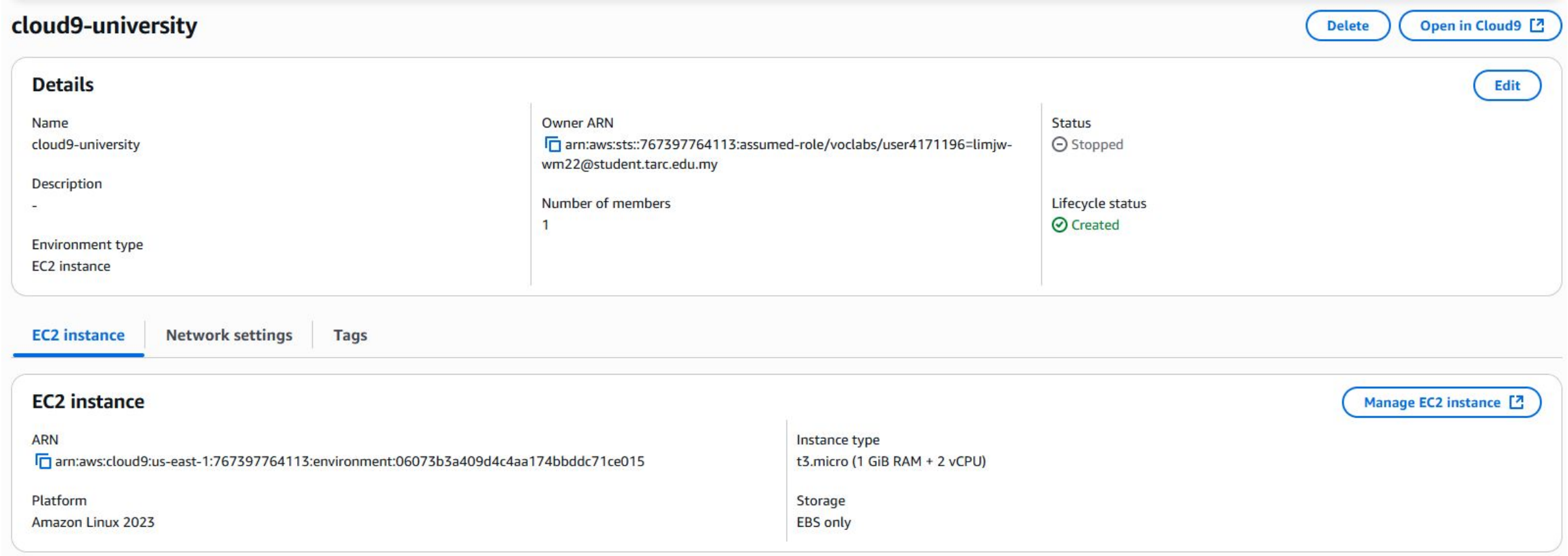


AWS Cloud9

- Environment Name: cloud9-university
- Instance Type: t3.micro
- Networking: Connected via SSH in VPC public subnet
- Purpose:
  - Run CLI commands & deployment scripts
  - Created Secrets, migrated DB, performed load tests

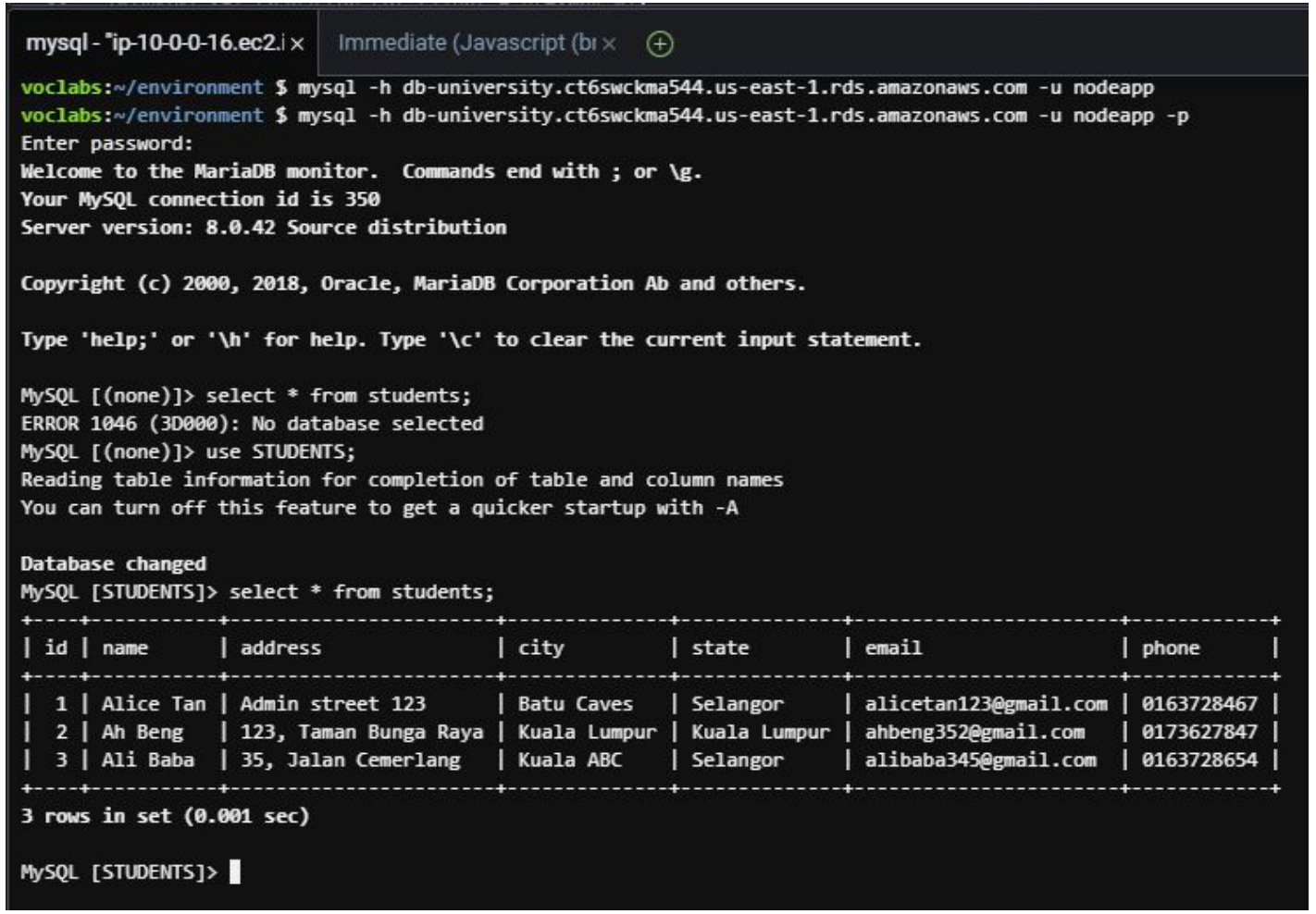
AWS Cloud9

cloud9-university



AWS Cloud9

cloud9-university (terminal access database)

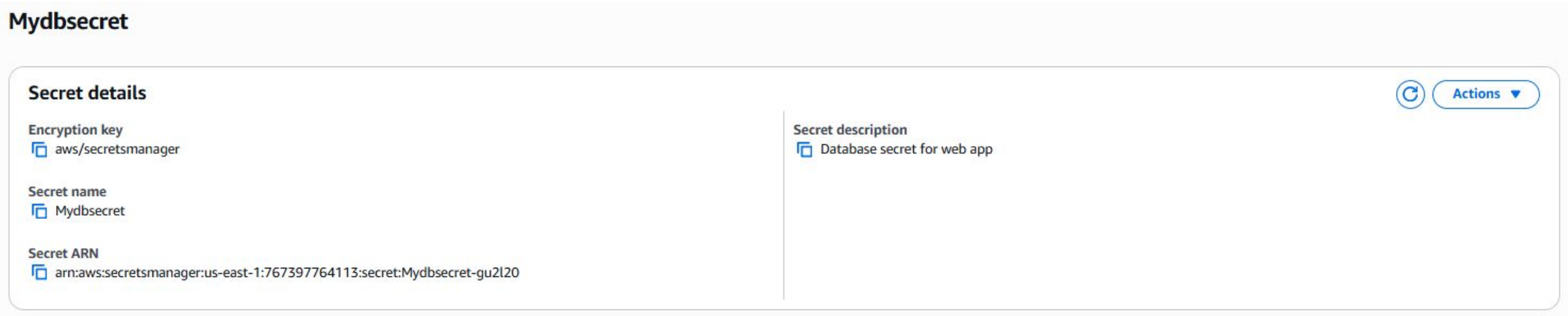


AWS Secrets Manager

- Secret Name: Mydbsecret
- Stored Info: DB username, password, RDS endpoint
- Integration: Web application fetches DB credentials securely
- Advantage: Eliminated hardcoding sensitive info in web app

AWS Secrets Manager

Mydbsecret



AWS Secrets Manager

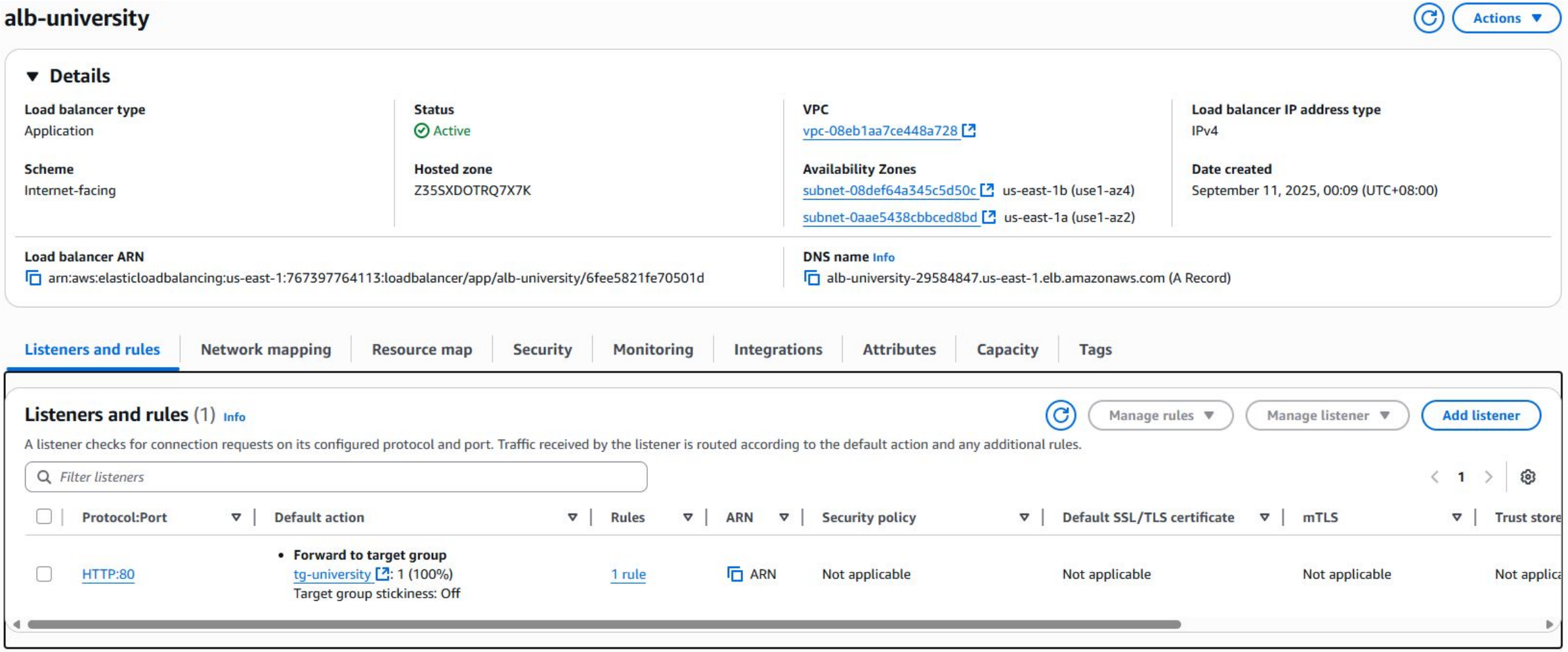
Mydbsecret: Secret Value

Elastic Load Balancing (Application Load Balancer)

- Name: alb-university
- Type: Application Load Balancer (ALB)
- Target Group: tg-university
- Mappings: Public subnets in 2 AZs
- Security: Linked with Security Group "SGuniversity"
- DNS Endpoint: Used by users to access the web application
- Purposes:
  - Distributes traffic across multiple web servers
  - Ensures fault tolerance & better performance

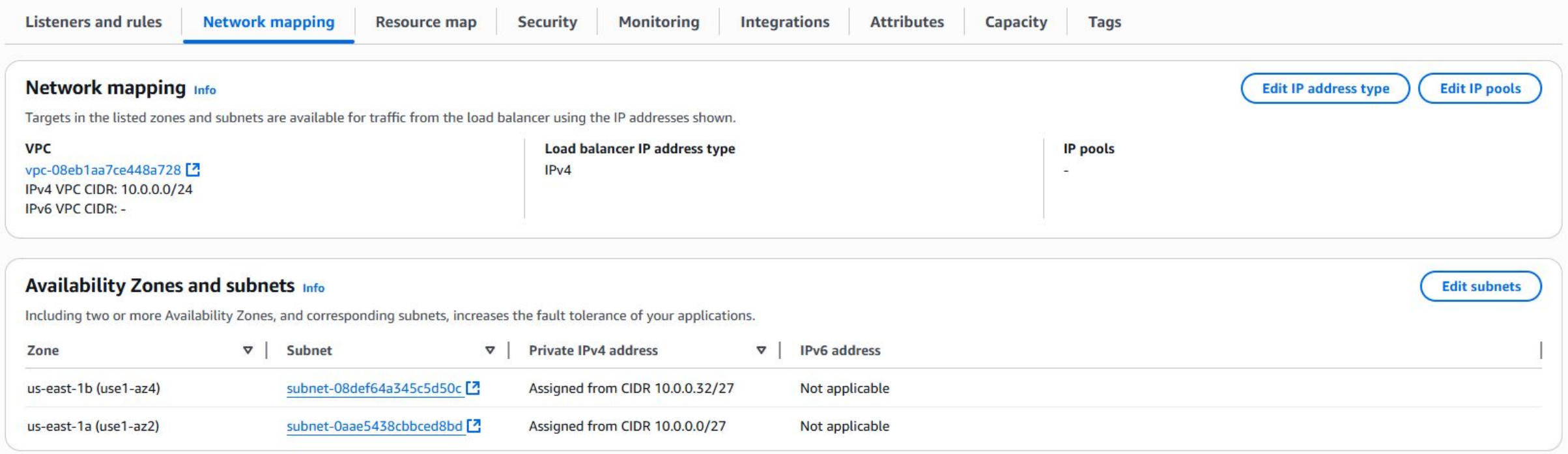
Elastic Load Balancing (Application Load Balancer)

alb-university



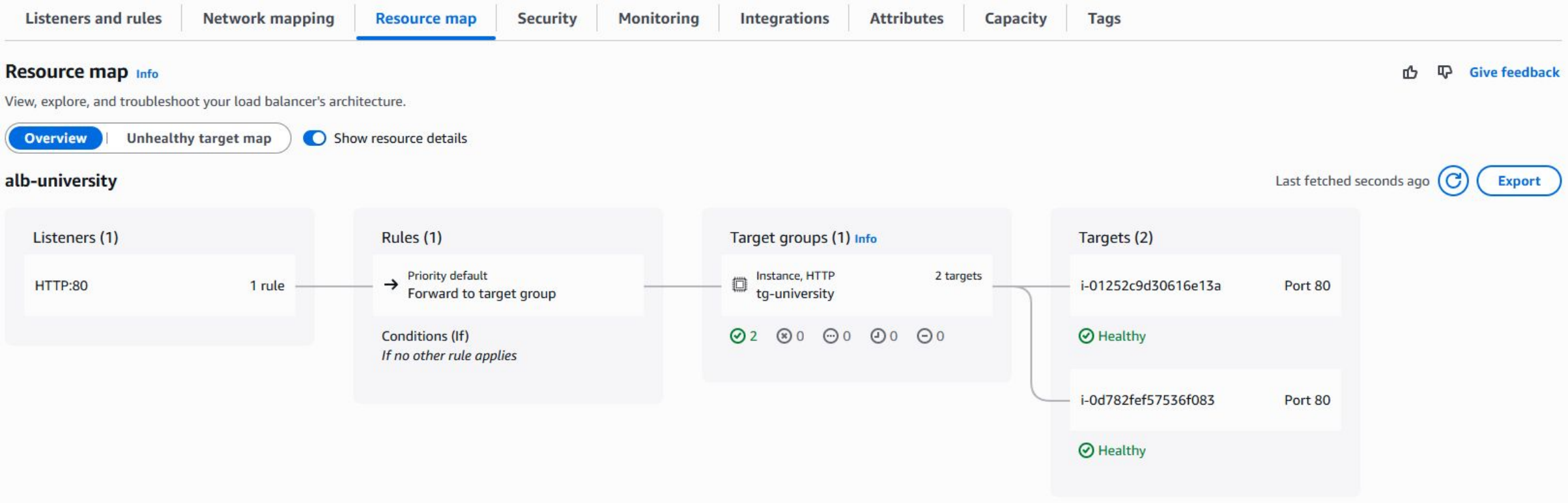
Elastic Load Balancing (Application Load Balancer)

alb-university: Network Mapping



Elastic Load Balancing (Application Load Balancer)

alb-university: Resource Map

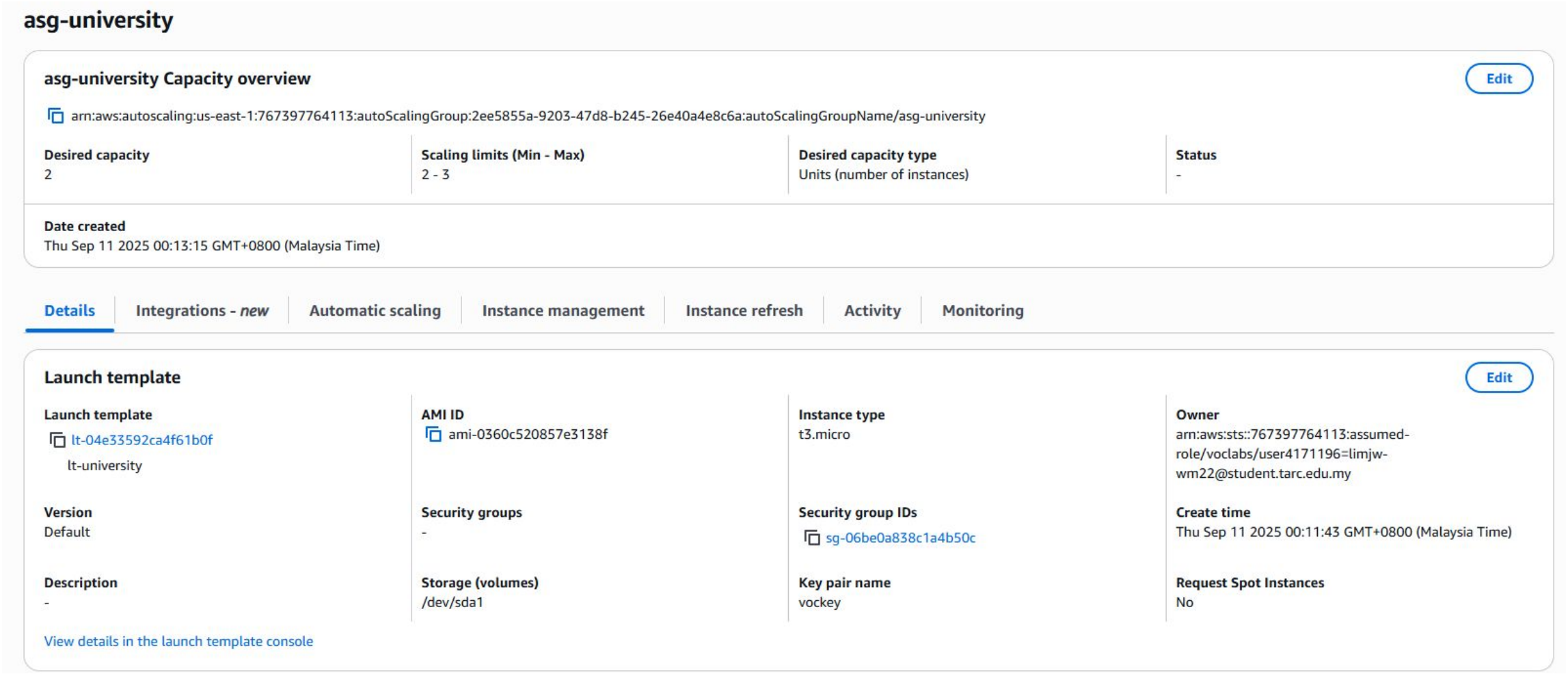


Amazon EC2 Auto Scaling

- Usage: Added S3 Gateway Endpoint for compliance
- Storage: Minimal (1 GB, low request volume)
- Minimum Instances: 2
- Maximum Instances: 3
- Desired Capacity: 2
- Scaling Metric Type: Average CPU Utilization
- Target Value: 50%
- Purpose:
  - Automatically scales based on load and health checks
  - Reflects real-world architecture design (even if not actively storing files)

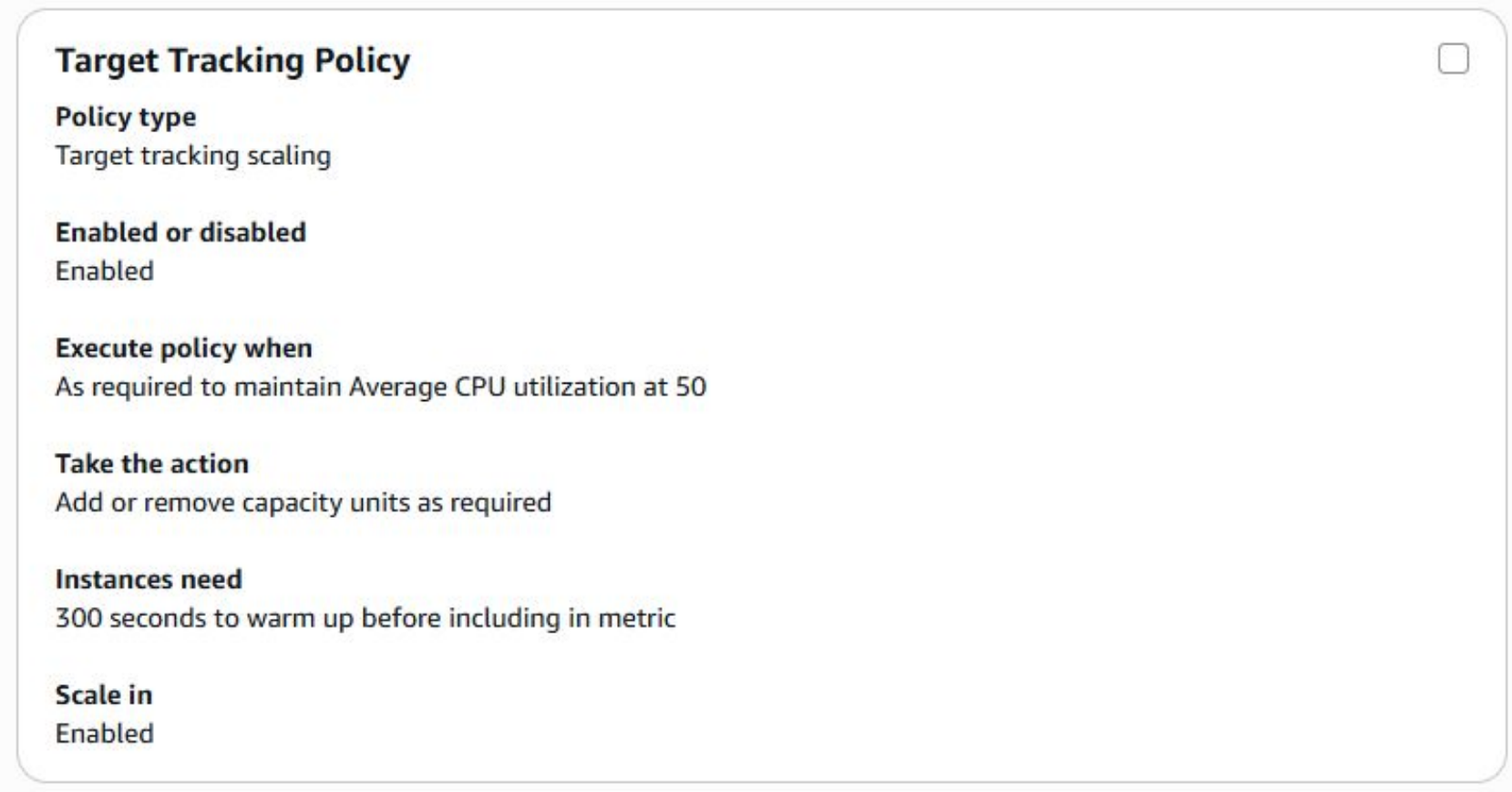
Amazon EC2 Auto Scaling

asg-university



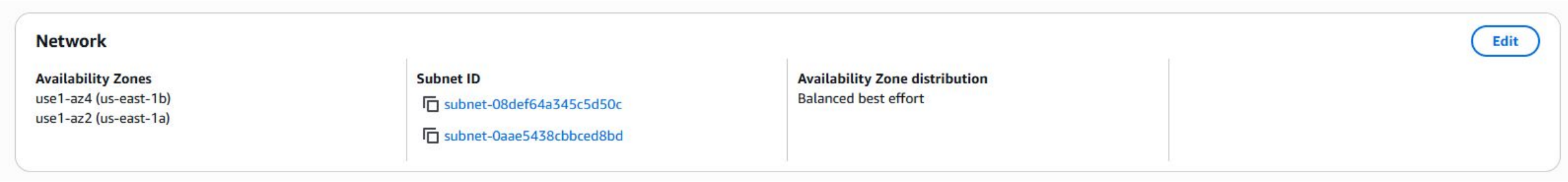
Amazon EC2 Auto Scaling

asg-university: Target Tracking Policy



Amazon EC2 Auto Scaling

asg-university: Network



CloudWatch

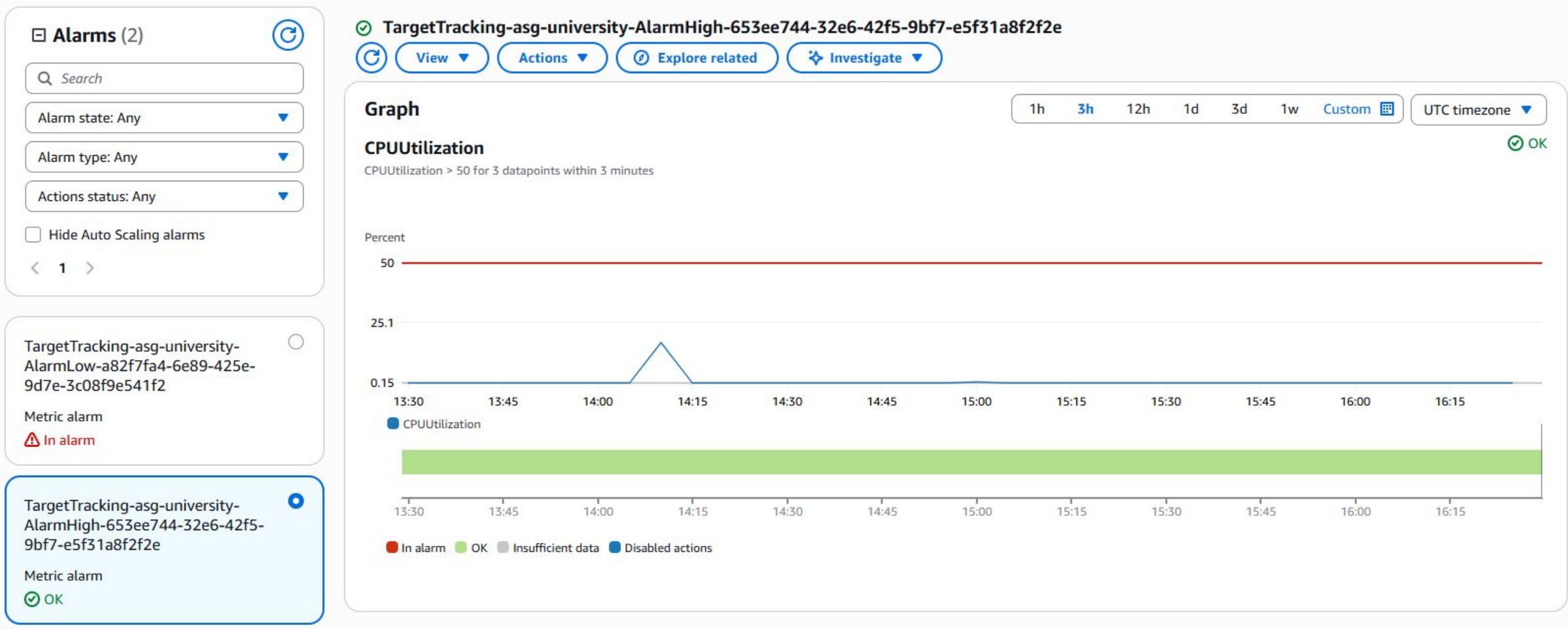
- Monitors average CPU utilization across Auto Scaling group
- Triggers scale out/in events based on Target Tracking Policy
- Ensures application can handle peak load while minimizing cost

CloudWatch

TargetTracking-asg-university-AlarmLow

CloudWatch

TargetTracking-asg-university-AlarmHigh

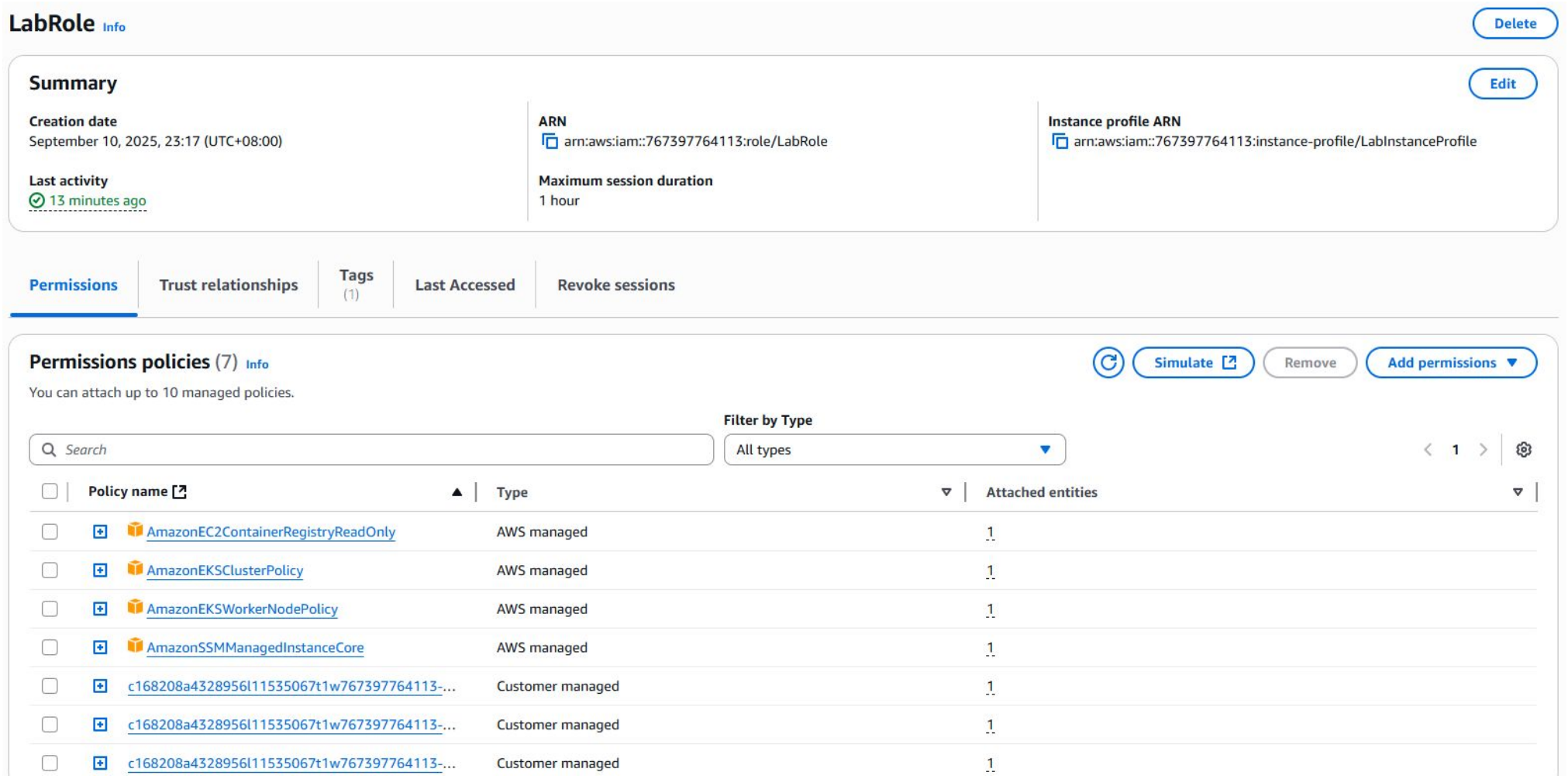


Identity and Access Management (IAM)

- Role: LabRole (attached via LabInstanceProfile)
- Permissions:
  - EC2 → access Secrets Manager
  - Cloud9 → deploy resources, run scripts
- Security Groups:
  - SGuniversity: Allowed HTTP (80) + MySQL (3306 from Cloud9 SG)
  - dbaccess: Allowed only EC2 + Cloud9 access to RDS

Identity and Access Management (IAM)

LabRole



Snippet of Web Page(s) and Database Table, Field and Records

Scenario 1: Add Student

Initial Student List (Web Page)

XYZ University

Home

Students list

All students

Name	Address	City	State	Email	Phone	
Alice Tan	Admin street 123	Batu Caves	Selangor	alicetan123@gmail.com	0163728467	edit
Ah Beng	123, Taman Bunga Raya	Kuala Lumpur	Kuala Lumpur	ahbeng352@gmail.com	0173627847	edit
Ali Baba	35, Jalan Cemerlang	Kuala ABC	Selangor	alibaba345@gmail.com	0163728654	edit

Add a new student

Scenario 1: Add Student

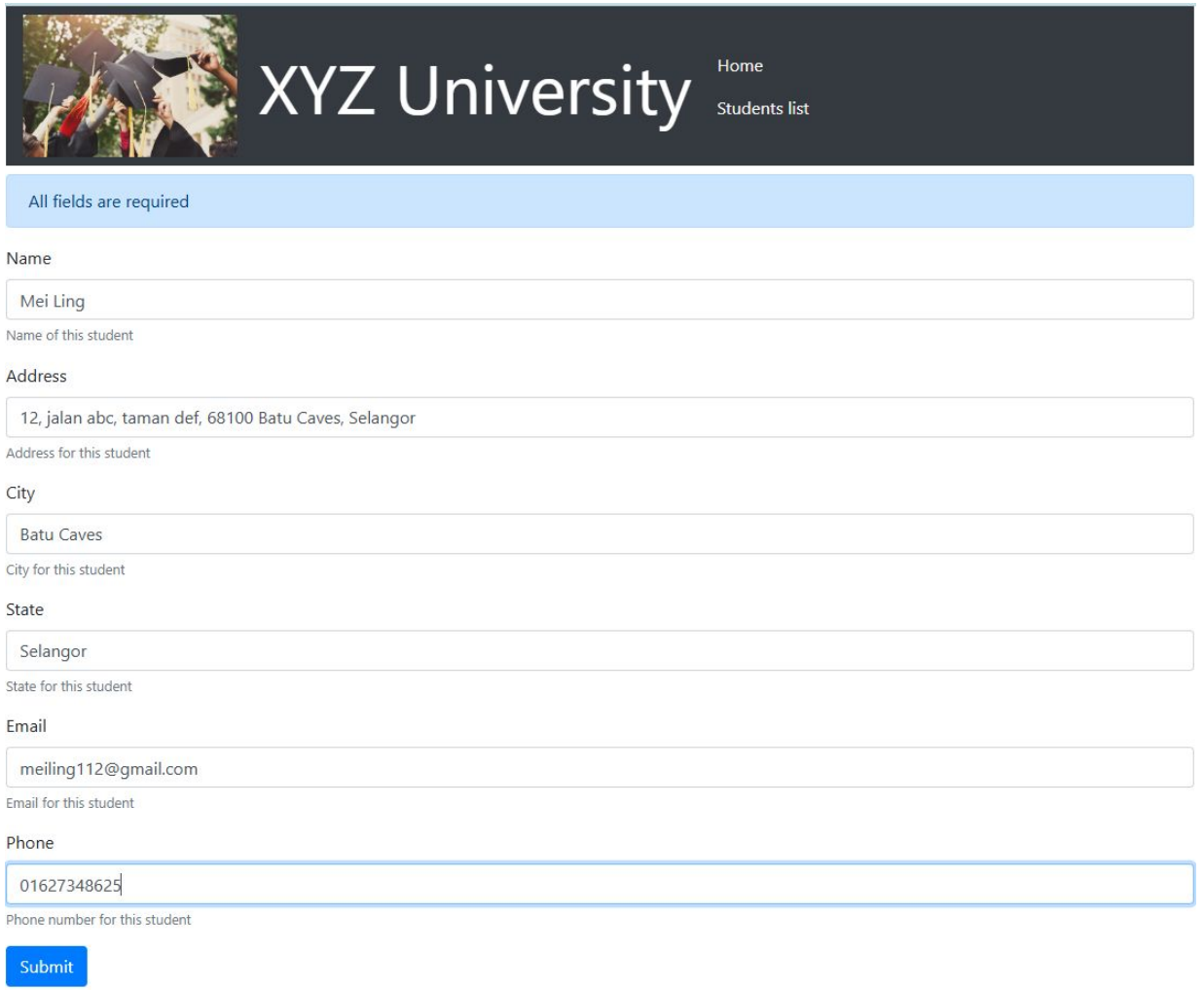
Initial Student List (Cloud9)

```
MySQL [STUDENTS]> select * from students;
+----+-----------+-----------------------+-------------+-------------+-----------------------+------------+
| id | name      | address               | city        | state       | email                 | phone      |
+----+-----------+-----------------------+-------------+-------------+-----------------------+------------+
|  1 | Alice Tan | Admin street 123      | Batu Caves  | Selangor    | alicetan123@gmail.com | 0163728467 |
|  2 | Ah Beng   | 123, Taman Bunga Raya | Kuala Lumpur | Kuala Lumpur | ahbeng352@gmail.com   | 0173627847 |
|  3 | Ali Baba  | 35, Jalan Cemerlang   | Kuala ABC   | Selangor    | alibaba345@gmail.com  | 0163728654 |
+----+-----------+-----------------------+-------------+-------------+-----------------------+------------+
3 rows in set (0.001 sec)

MySQL [STUDENTS]>
```

Scenario 1: Add Student

Adding New Student (Mei Ling)



Scenario 1: Add Student

Result (Web Page)

XYZ University

Home

Students list

All students

Name	Address	City	State	Email	Phone	
Alice Tan	Admin street 123	Batu Caves	Selangor	alicetan123@gmail.com	0163728467	edit
Ah Beng	123, Taman Bunga Raya	Kuala Lumpur	Kuala Lumpur	ahbeng352@gmail.com	0173627847	edit
Ali Baba	35, Jalan Cemerlang	Kuala ABC	Selangor	alibaba345@gmail.com	0163728654	edit
Mei Ling	12, jalan abc, taman def, 68100 Batu Caves, Selangor	Batu Caves	Selangor	meiling112@gmail.com	01627348625	edit

Add a new student

Scenario 1: Add Student

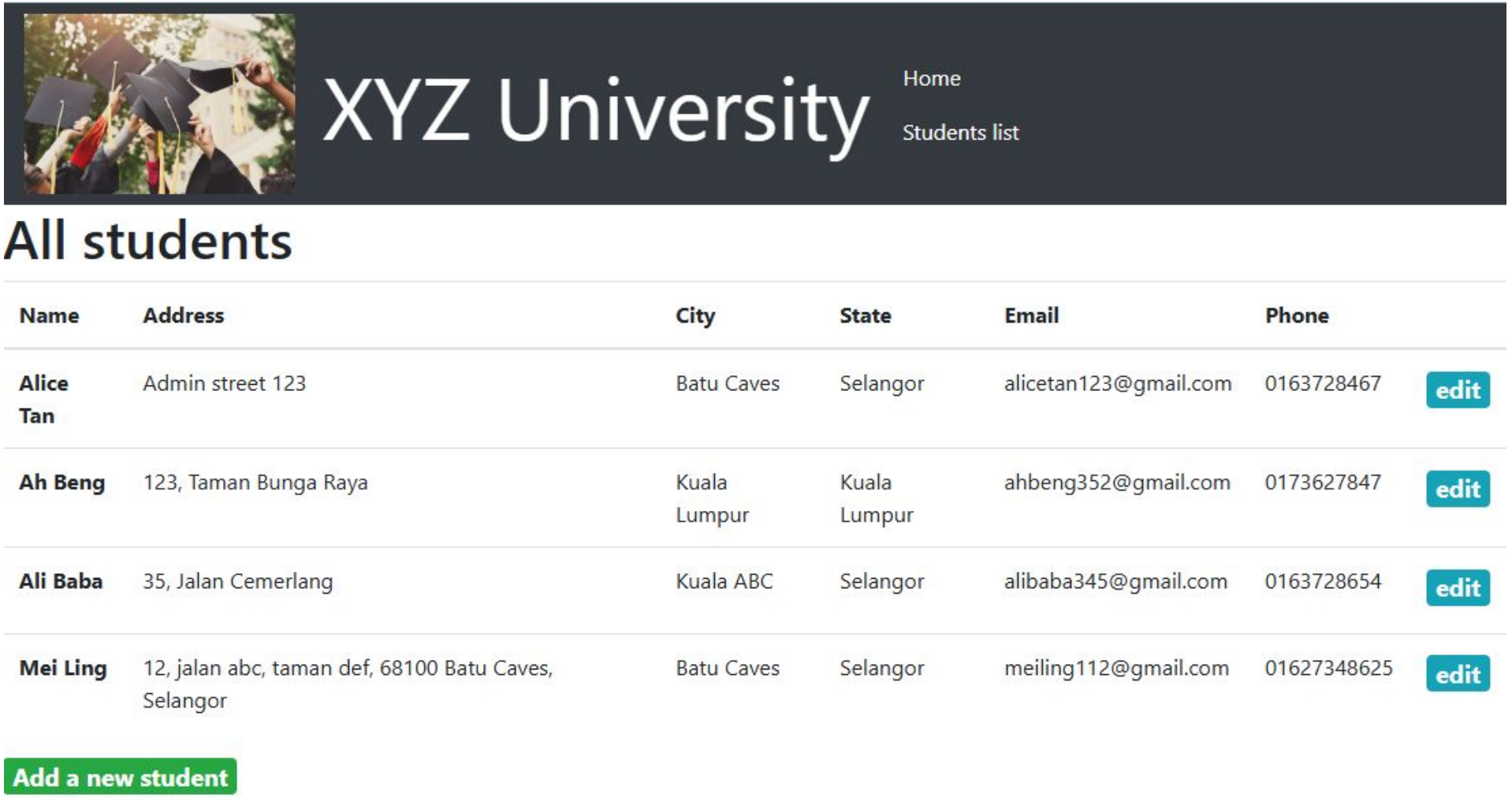
Result (Cloud9)

```
MySQL [STUDENTS]> select * from students;
+----+-----------+-----------------------------------------------------+-------------+-------------+----------------------+-------------+
| id | name      | address                                             | city        | state       | email                | phone       |
+----+-----------+-----------------------------------------------------+-------------+-------------+----------------------+-------------+
|  1 | Alice Tan | Admin street 123                                    | Batu Caves  | Selangor    | alicetan123@gmail.com | 0163728467  |
|  2 | Ah Beng   | 123, Taman Bunga Raya                               | Kuala Lumpur | Kuala Lumpur | ahbeng352@gmail.com  | 0173627847  |
|  3 | Ali Baba  | 35, Jalan Cemerlang                                 | Kuala ABC   | Selangor    | alibaba345@gmail.com | 0163728654  |
|  5 | Mei Ling  | 12, jalan abc, taman def, 68100 Batu Caves, Selangor | Batu Caves  | Selangor    | meiling112@gmail.com | 01627348625 |
+----+-----------+-----------------------------------------------------+-------------+-------------+----------------------+-------------+
4 rows in set (0.001 sec)

MySQL [STUDENTS]>
```

Scenario 2: Modify Student

Initial Student List (Web Page)



Scenario 2: Modify Student

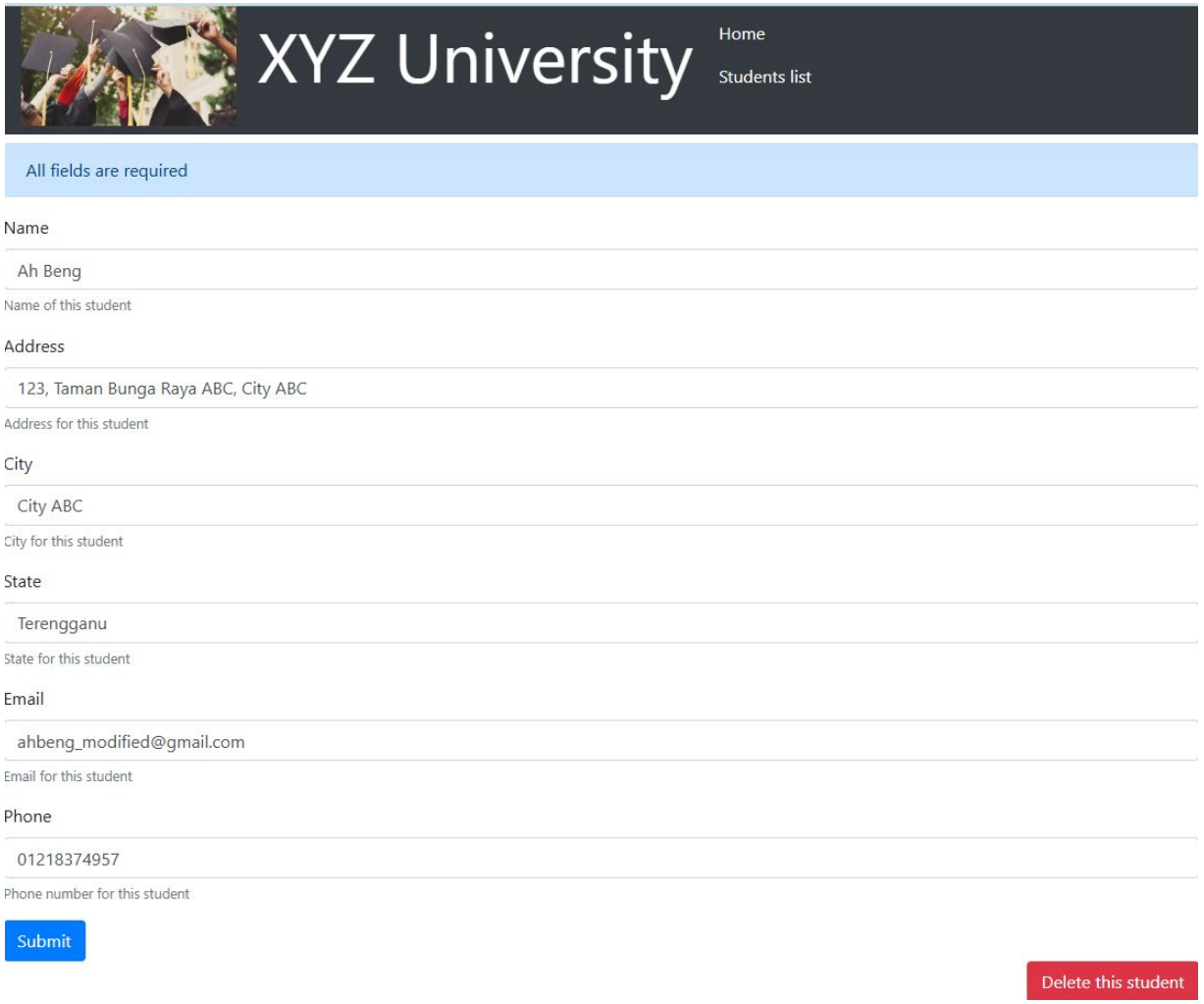
Initial Student List (Cloud9)

```
MySQL [STUDENTS]> select * from students;
+----+-----------+-----------------------------------------------------+-------------+-------------+----------------------+-------------+
| id | name      | address                                             | city        | state       | email                | phone       |
+----+-----------+-----------------------------------------------------+-------------+-------------+----------------------+-------------+
|  1 | Alice Tan | Admin street 123                                    | Batu Caves  | Selangor    | alicetan123@gmail.com | 0163728467  |
|  2 | Ah Beng   | 123, Taman Bunga Raya                               | Kuala Lumpur | Kuala Lumpur | ahbeng352@gmail.com  | 0173627847  |
|  3 | Ali Baba  | 35, Jalan Cemerlang                                 | Kuala ABC   | Selangor    | alibaba345@gmail.com | 0163728654  |
|  5 | Mei Ling  | 12, jalan abc, taman def, 68100 Batu Caves, Selangor | Batu Caves  | Selangor    | meiling112@gmail.com | 01627348625 |
+----+-----------+-----------------------------------------------------+-------------+-------------+----------------------+-------------+
4 rows in set (0.001 sec)

MySQL [STUDENTS]>
```

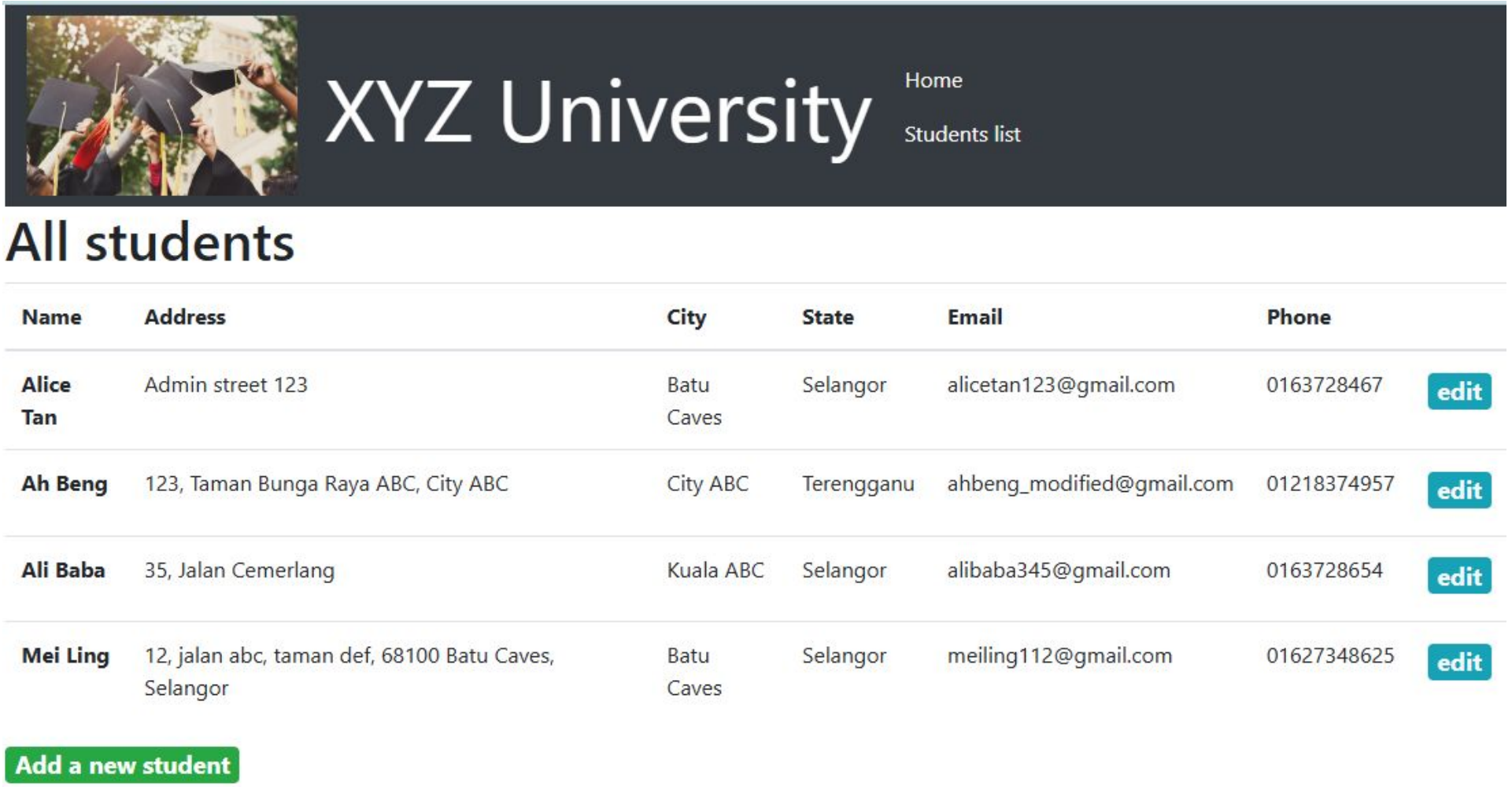
Scenario 2: Modify Student

Modifying Student (Ah Beng) Information



Scenario 2: Modify Student

Result (Web Page)



Scenario 2: Modify Student

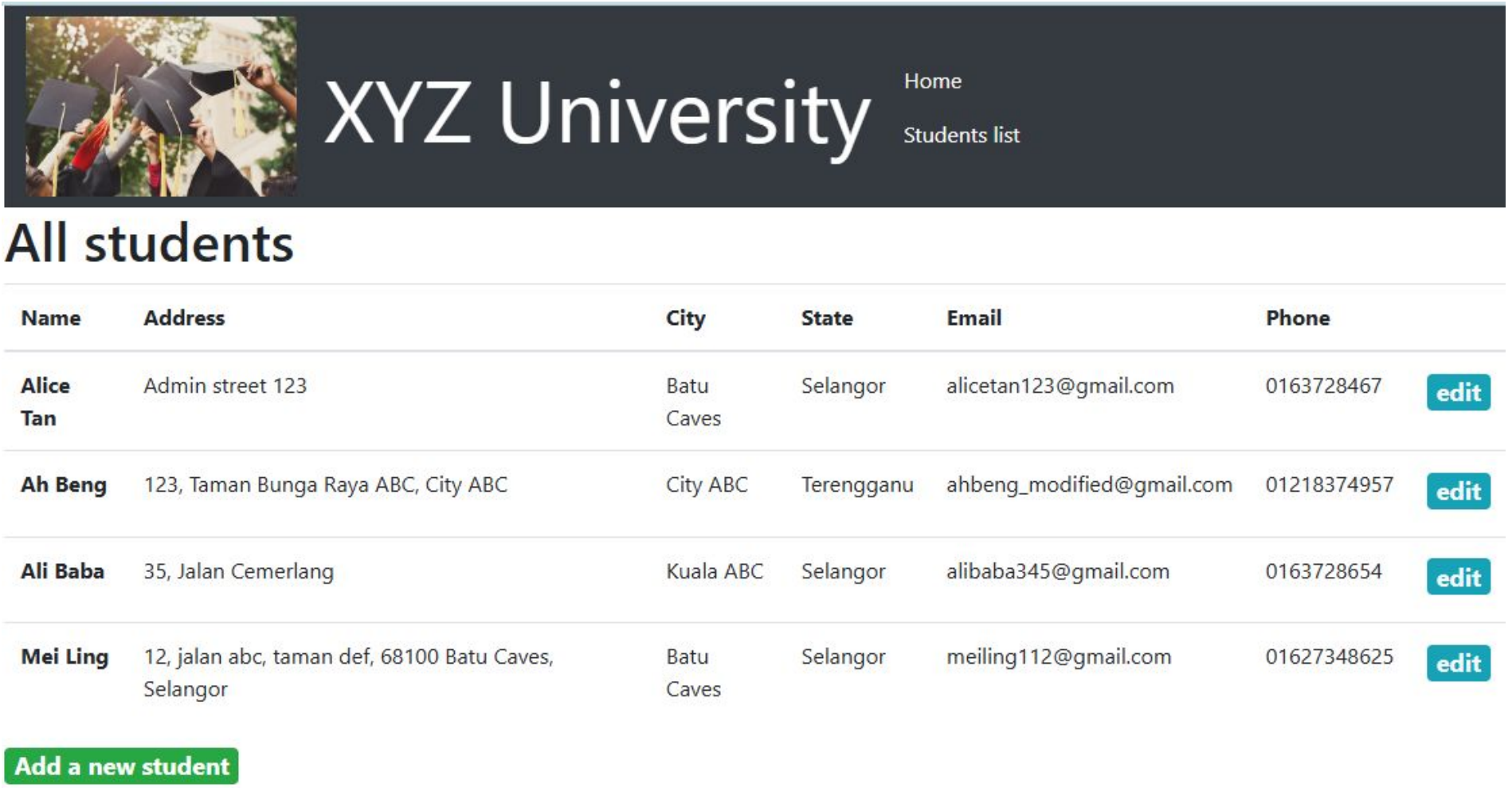
Result (Cloud9)

```
MySQL [STUDENTS]> select * from students;
+----+-----------+-----------------------------------------------------+-----------+------------+--------------------------+-------------+
| id | name      | address                                             | city      | state      | email                    | phone       |
+----+-----------+-----------------------------------------------------+-----------+------------+--------------------------+-------------+
|  1 | Alice Tan | Admin street 123                                    | Batu Caves | Selangor   | alicetan123@gmail.com    | 0163728467  |
|  2 | Ah Beng   | 123, Taman Bunga Raya ABC, City ABC                 | City ABC   | Terengganu | ahbeng_modified@gmail.com | 01218374957 |
|  3 | Ali Baba  | 35, Jalan Cemerlang                                 | Kuala ABC  | Selangor   | alibaba345@gmail.com     | 0163728654  |
|  5 | Mei Ling  | 12, jalan abc, taman def, 68100 Batu Caves, Selangor | Batu Caves | Selangor   | meiling112@gmail.com     | 01627348625 |
+----+-----------+-----------------------------------------------------+-----------+------------+--------------------------+-------------+
4 rows in set (0.001 sec)

MySQL [STUDENTS]>
```

Scenario 3: Delete Student

Initial Student List (Web Page)



Scenario 3: Delete Student

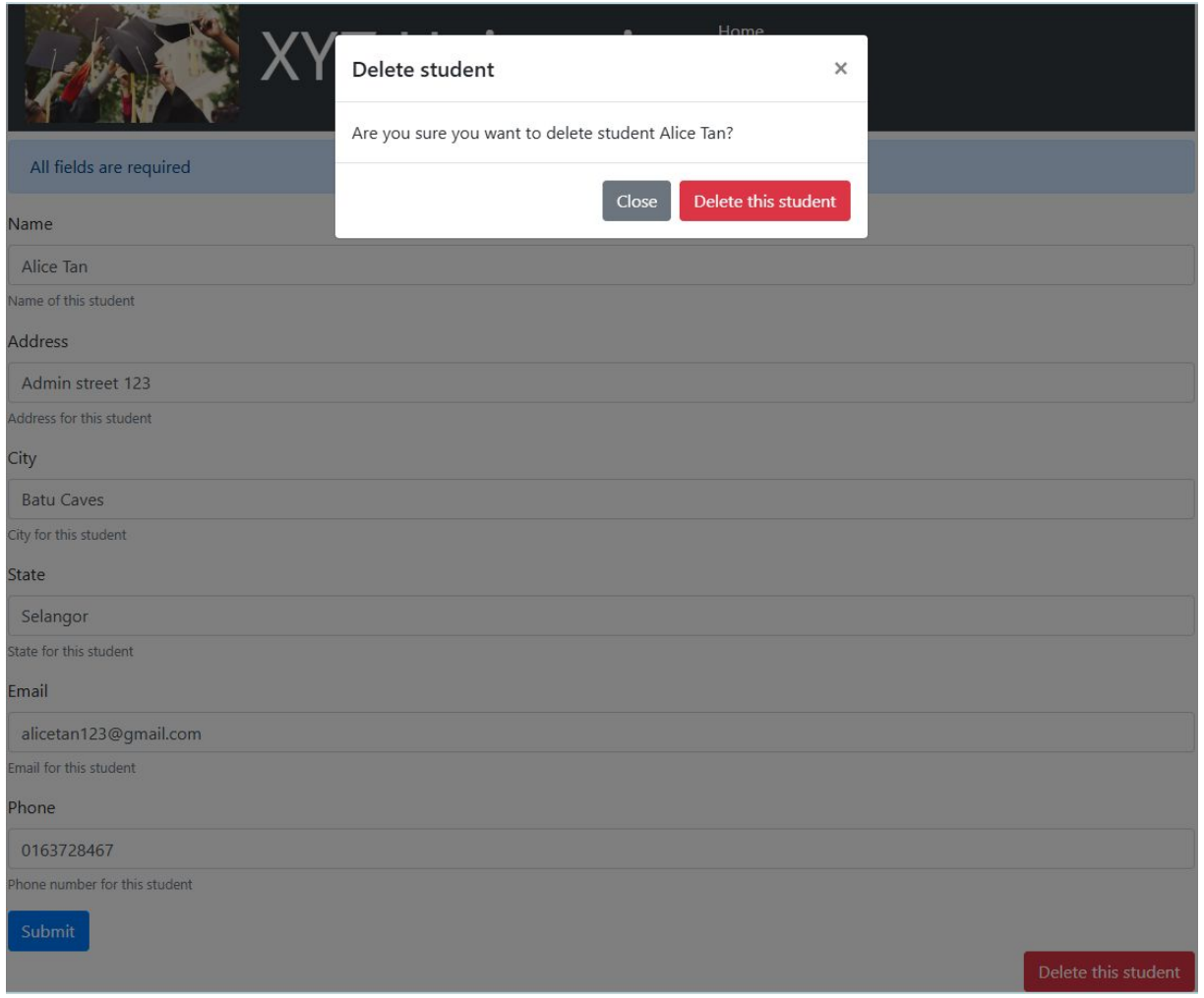
Initial Student List (Cloud9)

```
MySQL [STUDENTS]> select * from students;
+----+-----------+-----------------------------------------------------+-----------+------------+---------------------------+-------------+
| id | name      | address                                             | city      | state      | email                     | phone       |
+----+-----------+-----------------------------------------------------+-----------+------------+---------------------------+-------------+
|  1 | Alice Tan | Admin street 123                                    | Batu Caves | Selangor   | alicetan123@gmail.com     | 0163728467  |
|  2 | Ah Beng   | 123, Taman Bunga Raya ABC, City ABC                 | City ABC   | Terengganu | ahbeng_modified@gmail.com | 01218374957 |
|  3 | Ali Baba  | 35, Jalan Cemerlang                                 | Kuala ABC  | Selangor   | alibaba345@gmail.com      | 0163728654  |
|  5 | Mei Ling  | 12, jalan abc, taman def, 68100 Batu Caves, Selangor | Batu Caves | Selangor   | meiling112@gmail.com      | 01627348625 |
+----+-----------+-----------------------------------------------------+-----------+------------+---------------------------+-------------+
4 rows in set (0.001 sec)

MySQL [STUDENTS]>
```

Scenario 3: Delete Student

Delete Student (Alice Tan)



Scenario 3: Delete Student

Result (Web Page)

XYZ University

Home

Students list

All students

Name	Address	City	State	Email	Phone	
Ah Beng	123, Taman Bunga Raya ABC, City ABC	City ABC	Terengganu	ahbeng_modified@gmail.com	01218374957	edit
Ali Baba	35, Jalan Cemerlang	Kuala ABC	Selangor	alibaba345@gmail.com	0163728654	edit
Mei Ling	12, jalan abc, taman def, 68100 Batu Caves, Selangor	Batu Caves	Selangor	meiling112@gmail.com	01627348625	edit

Add a new student

Scenario 3: Delete Student

Result (Cloud9)

```
MySQL [STUDENTS]> select * from students;
+----+----------+-----------------------------------------------------+-----------+-----------+--------------------------+-------------+
| id | name     | address                                             | city      | state     | email                    | phone       |
+----+----------+-----------------------------------------------------+-----------+-----------+--------------------------+-------------+
|  2 | Ah Beng  | 123, Taman Bunga Raya ABC, City ABC                 | City ABC  | Terengganu | ahbeng_modified@gmail.com | 01218374957 |
|  3 | Ali Baba | 35, Jalan Cemerlang                                 | Kuala ABC | Selangor  | alibaba345@gmail.com     | 0163728654  |
|  5 | Mei Ling | 12, jalan abc, taman def, 68100 Batu Caves, Selangor | Batu Caves | Selangor  | meiling112@gmail.com     | 01627348625 |
+----+----------+-----------------------------------------------------+-----------+-----------+--------------------------+-------------+
3 rows in set (0.001 sec)

MySQL [STUDENTS]>
```

Conclusion

Conclusion

- Modernized & Solved downtime and performance issues
- AWS Well-Architected Framework principles:
  - High Availability → Multi-AZ + Load Balancer + Auto Scaling
  - Security → VPC isolation, IAM, Secrets Manager
  - Cost Efficiency → Free-tier eligible instances & optimized services
- Key AWS Services
  - EC2, RDS, VPC, Cloud9, Secrets Manager, ELB, CloudWatch
- Outcome
  - Scalable, reliable and secure student management system
  - support peak admissions.

Lesson Learned

Lessons Learned

Challenge & Solution

- **Challenge**
  - RDS in private subnet couldn’t connect to EC2 in ASG due to misconfigured route tables & SGs.
- **Solution**
  - Fixed by adjusting SG rules (MySQL traffic only from EC2/Cloud9) + correct private route table setup.

New Skill Acquired

- **How to integrate RDS with Auto Scaling EC2**
  - During load testing, new EC2 instances scaled automatically and still connected to RDS via Secrets Manager without manual setup.

Lessons Learned

Future Improvement

- **Extend scalability for university needs**
  - Example:
    - Support multiple faculties/departments in the university
    - Each handling thousands of concurrent student records
  - How?
    - Adding read replicas for RDS and scaling web tier across more regions.

Guided and Challenge Lab Score

Lim Jun Wei

Grades for limjw-wm22@student.tarc.edu.my

Print Grades (javascript:window.print())

Course: AWS Academy Cloud Arch | Arrange By: Due Date | Apply

Name	Due	Submitted	Status	Score
Challenge (Cafe) lab: Creating a Dynamic Website for the Café Lab Assignments		Jul 28 at 12:14am		30 / 30
(Optional) Guided lab: Breaking a Monolithic Node.js Application into Microservices Lab Assignments				- / 56
Academy Cloud Architecting Course Assessment Assignments				- / 100
Capstone Project Lab Assignments				- / 56
Capstone Project Lab Assignments				- / 35
Challenge (Café) lab: Automating Infrastructure Deployment Lab Assignments		Sep 12 at 1:47pm		56 / 56
Challenge (Café) lab: Creating a Scalable and Highly Available Environment for the Café Lab Assignments		Sep 12 at 12:09pm		56 / 56
Challenge (Cafe) lab: Creating a Static Website for the Cafe Lab Assignments		Jul 14 at 4:26pm		29 / 29

Name	Due	Submitted	Status	Score
Challenge (Cafe) lab: Creating a VPC Networking Environment for the Café Lab Assignments		Sep 11 at 11:30pm		56 / 56
Challenge (Café) lab: Implementing a Serverless Architecture for the Café Lab Assignments				- / 56
Challenge (Cafe) lab: Migrating a Database to Amazon RDS Lab Assignments		Sep 11 at 7:59pm		25 / 25
Guided lab: Automating Infrastructure with AWS CloudFormation Lab Assignments		Sep 12 at 12:31pm		56 / 56
Guided lab: Building Decoupled Applications by Using Amazon SQS Lab Assignments		Sep 12 at 2:28pm		56 / 56
Guided Lab: Configuring Hybrid Storage and Migrating Data with AWS Storage Gateway S3 File Gateway Lab Assignments				- / 40
Guided lab: Creating a Highly Available Environment Lab Assignments		Sep 12 at 11:15am		56 / 56
Guided lab: Creating a Virtual Private Cloud Lab Assignments		Sep 11 at 8:21pm		56 / 56
Guided lab: Creating a VPC Peering Connection Lab Assignments		Sep 11 at 11:50pm		56 / 56
Guided lab: Creating an Amazon RDS Database Lab Assignments		Sep 11 at 7:25pm		20 / 20
Guided lab: Encrypting Data at Rest by Using AWS Encryption Options		Sep 12 at 12:26am		56 / 56

Lim Jun Wei

Name	Due	Submitted	Status	Score	
Lab Assignments					
Guided Lab: Exploring AWS Identity and Access Management (IAM) **Lab Assignments**		Jul 7 at 1:23pm		56 / 56	
Guided lab: Implementing a Serverless Architecture on AWS **Lab Assignments**				- / 56	
Guided lab: Introducing Amazon Elastic File System (Amazon EFS) **Lab Assignments**		Jul 25 at 1:16pm		15 / 15	
Guided lab: Securing Applications by using Amazon Cognito **Lab Assignments**				- / 56	
Module 2 Knowledge Check **Assignments**				- / 100	
Module 3 Knowledge Check **Assignments**				- / 100	
Module 4 Knowledge Check **Assignments**				- / 100	
Module 5 Knowledge Check **Assignments**				- / 100	
Module 6 Knowledge Check **Assignments**				- / 100	
Module 7 Knowledge Check **Assignments**				- / 100	
Module 8 Knowledge Check **Assignments**				- / 100	
Module 9 Knowledge Check **Assignments**				- / 100	

Name	Due	Submitted	Status	Score	
Module 10 Knowledge Check **Assignments**				- / 100	
Module 11 Knowledge Check **Assignments**				- / 100	
Module 12 Knowledge Check **Assignments**				- / 100	
Module 13 Knowledge Check **Assignments**				- / 100	
Module 14 Knowledge Check **Assignments**				- / 100	
Module 15 Knowledge Check **Assignments**				- / 100	
Module 16 Knowledge Check **Assignments**				- / 100	
Lab Assignments				100%	679.00 / 679.00
Assignments				N/A	0.00 / 0.00
Total				100%	679.00 / 679.00

Ong Yi Xin

Grades for ongyx-wm22@student.tarc.edu.my

Print Grades (javascript:window.print())

Course: AWS Academy Cloud Arch | Arrange By: Module | Apply

Name	Due	Submitted	Status	Score
Module 2 Knowledge Check Assignments				- / 100
Guided Lab: Exploring AWS Identity and Access Management (IAM) Lab Assignments		Jul 7 at 5:26am		56 / 56
Module 3 Knowledge Check Assignments				- / 100
Challenge (Cafe) lab: Creating a Static Website for the Cafe Lab Assignments		Jul 14 at 10:04am		28 / 29
Module 4 Knowledge Check Assignments				- / 100
Guided lab: Introducing Amazon Elastic File System (Amazon EFS) Lab Assignments		Jul 24 at 12:09pm		15 / 15
Challenge (Cafe) lab: Creating a Dynamic Website for the Café Lab Assignments		Jul 27 at 2pm		27 / 30
Module 5 Knowledge Check Assignments				- / 100

Name	Due	Submitted	Status	Score
Guided lab: Creating an Amazon RDS Database Lab Assignments		Sep 12 at 1:19am		20 / 20
Challenge (Cafe) lab: Migrating a Database to Amazon RDS Lab Assignments		Sep 12 at 2:15am		25 / 25
Module 6 Knowledge Check Assignments				- / 100
Guided lab: Creating a Virtual Private Cloud Lab Assignments		Sep 12 at 2:43am		56 / 56
Challenge (Cafe) lab: Creating a VPC Networking Environment for the Café Lab Assignments		Sep 12 at 3:27am		56 / 56
Module 7 Knowledge Check Assignments				- / 100
Guided lab: Creating a VPC Peering Connection Lab Assignments		Sep 12 at 4am		56 / 56
Module 8 Knowledge Check Assignments				- / 100
Guided lab: Securing Applications by using Amazon Cognito Lab Assignments				- / 56
Guided lab: Encrypting Data at Rest by Using AWS Encryption Options Lab Assignments		Sep 12 at 5:03am		56 / 56
Module 9 Knowledge Check Assignments				- / 100

Ong Yi Xin

Name	Due	Submitted	Status	Score
Guided lab: Creating a Highly Available Environment Lab Assignments		Sep 12 at 5:33am		52.27 / 56
Challenge (Café) lab: Creating a Scalable and Highly Available Environment for the Café Lab Assignments		Sep 12 at 6:57am		46.97 / 56
Module 10 Knowledge Check Assignments				- / 100
Guided lab: Automating Infrastructure with AWS CloudFormation Lab Assignments		Sep 12 at 7:27am		42 / 56
Challenge (Café) lab: Automating Infrastructure Deployment Lab Assignments		Sep 12 at 2:28pm		50.4 / 56
Module 11 Knowledge Check Assignments				- / 100
Module 12 Knowledge Check Assignments				- / 100
Guided lab: Building Decoupled Applications by Using Amazon SQS Lab Assignments		Sep 13 at 1:35am		56 / 56
Module 13 Knowledge Check Assignments				- / 100
Guided lab: Implementing a Serverless Architecture on AWS Lab Assignments				- / 56
(Optional) Guided lab: Breaking a Monolithic Node.js Application into Microservices				- / 56

Name	Due	Submitted	Status	Score	
Lab Assignments					
Challenge (Café) lab: Implementing a Serverless Architecture for the Café Lab Assignments				- / 56	
Module 14 Knowledge Check Assignments				- / 100	
Module 15 Knowledge Check Assignments				- / 100	
Guided Lab: Configuring Hybrid Storage and Migrating Data with AWS Storage Gateway S3 File Gateway Lab Assignments				- / 40	
Module 16 Knowledge Check Assignments				- / 100	
Capstone Project Lab Assignments				- / 35	
Academy Cloud Architecting Course Assessment Assignments				- / 100	
Capstone Project Lab Assignments				- / 56	
Lab Assignments				94.64%	642.63 / 679.00
Assignments				N/A	0.00 / 0.00
Total				94.64%	642.63 / 679.00

Chia Ming Yi

Grades for chiamy-wm22@student.tarc.edu.my

Print Grades (javascript:window.print())

Course: AWS Academy Cloud Arch | Arrange By: Module | Apply

Name	Due	Submitted	Status	Score
Module 2 Knowledge Check Assignments				- / 100
Guided Lab: Exploring AWS Identity and Access Management (IAM) Lab Assignments		Jul 7 at 5:27am		56 / 56
Module 3 Knowledge Check Assignments				- / 100
Challenge (Cafe) lab: Creating a Static Website for the Cafe Lab Assignments		Jul 15 at 1:41am		29 / 29
Module 4 Knowledge Check Assignments				- / 100
Guided lab: Introducing Amazon Elastic File System (Amazon EFS) Lab Assignments		Sep 11 at 5:32am		15 / 15
Challenge (Cafe) lab: Creating a Dynamic Website for the Café Lab Assignments		Sep 11 at 1:05pm		30 / 30
Module 5 Knowledge Check Assignments				- / 100
Guided lab: Creating an Amazon RDS Database Lab Assignments		Sep 11 at 9:30am		20 / 20
Challenge (Cafe) lab: Migrating a Database to Amazon RDS Lab Assignments		Sep 12 at 4:33am		25 / 25
Module 6 Knowledge Check Assignments				- / 100
Guided lab: Creating a Virtual Private Cloud Lab Assignments		Sep 11 at 3:32pm		56 / 56
Challenge (Cafe) lab: Creating a VPC Networking Environment for the Café Lab Assignments		Sep 12 at 6am		56 / 56
Module 7 Knowledge Check Assignments				- / 100
Guided lab: Creating a VPC Peering Connection Lab Assignments		Sep 12 at 7:04am		56 / 56
Module 8 Knowledge Check Assignments				- / 100
Guided lab: Securing Applications by using Amazon Cognito Lab Assignments				- / 56
Guided lab: Encrypting Data at Rest by Using AWS Encryption Options Lab Assignments		Sep 12 at 9:13am		56 / 56
Module 9 Knowledge Check Assignments				- / 100
Guided lab: Creating a Highly Available Environment Lab Assignments		Sep 12 at 9:42am		52.27 / 56
Challenge (Café) lab: Creating a Scalable and Highly Available Environment for the Café		Sep 12 at 1:20pm		46.97 / 56

Chia Ming Yi

Name	Due	Submitted	Status	Score	
Module 15 Knowledge Check Assignments				- / 100	
Guided Lab: Configuring Hybrid Storage and Migrating Data with AWS Storage Gateway S3 File Gateway Lab Assignments				- / 40	
Module 16 Knowledge Check Assignments				- / 100	
Capstone Project Lab Assignments				- / 35	
Academy Cloud Architecting Course Assessment Assignments				- / 100	
Capstone Project Lab Assignments				- / 56	
Lab Assignments				89.32%	606.50 / 679.00
Assignments				N/A	0.00 / 0.00
Total				89.32%	606.50 / 679.00

Name	Due	Submitted	Status	Score	
Lab Assignments					
Module 10 Knowledge Check Assignments				- / 100	
Guided lab: Automating Infrastructure with AWS CloudFormation Lab Assignments		Sep 12 at 2:17pm		28 / 56	
Challenge (Café) lab: Automating Infrastructure Deployment Lab Assignments		Sep 13 at 2:34pm		33.6 / 56	
Module 11 Knowledge Check Assignments				- / 100	
Module 12 Knowledge Check Assignments				- / 100	
Guided lab: Building Decoupled Applications by Using Amazon SQS Lab Assignments		Sep 13 at 3:52pm		46.67 / 56	
Module 13 Knowledge Check Assignments				- / 100	
Guided lab: Implementing a Serverless Architecture on AWS Lab Assignments				- / 56	
(Optional) Guided lab: Breaking a Monolithic Node.js Application into Microservices Lab Assignments				- / 56	
Challenge (Café) lab: Implementing a Serverless Architecture for the Café Lab Assignments				- / 56	
Module 14 Knowledge Check Assignments				- / 100	

Formatted References (APA)

Formatted References (APA)

- “Connecting an EC2 Instance and an RDS Database Automatically - Amazon Relational Database Service.” Docs.aws.amazon.com, docs.aws.amazon.com/AmazonRDS/latest/UserGuide/ec2-rds-connect.html. Accessed 8 Sept. 2025.
- “Automatically Connecting an EC2 Instance and a DB Instance - Amazon Relational Database Service.” Amazon.com, 2025, docs.aws.amazon.com/AmazonRDS/latest/UserGuide/ec2-rds-connect.html? Accessed 8 Sept. 2025.
- “Security Best Practices for Your VPC - Amazon Virtual Private Cloud.” Amazon.com, 2025, docs.aws.amazon.com/vpc/latest/userguide/vpc-security-best-practices.html? Accessed 8 Sept. 2025.
- Tech With, Yeshwanth. “How Can I Connect to AWS RDS Instance from AWS EC2? | Connect to AWS RDS from AWS EC2 | AWS RDS Demo.” Www.youtube.com, 22 Sept. 2022, www.youtube.com/watch?v=7e_mjVUV-zA. Accessed 8 Sept. 2025.

Formatted References (APA)

- Rahul Wagh. “AWS EC2 Auto Scaling Explained: Ultimate Tutorial + Live Demo - Part 18.” YouTube, 27 May 2024, www.youtube.com/watch?v=LrVWHCWnecI. Accessed 8 Sept. 2025.
- “Getting Started - AWS Pricing Calculator.” Amazon.com, 2025, docs.aws.amazon.com/pricing-calculator/latest/userguide/getting-started.html? Accessed 8 Aug. 2025.
- “Calculator Assumptions.” Amazon Web Services, Inc., aws.amazon.com/calculator/calculator-assumptions/. Accessed 8 Sept. 2025.

Thank you