USER MANUAL

9/13/2023

I. Introduction

This Project requires creating and deploying a photo album website on a simple AWS architecture.

II . Create a secure Virtual Private Cloud (VPC)

Create a secure Virtual Private Cloud (VPC) .The VPC is named ‘AKaggdas’ because we need to give it a name using the initial of our first name and Last name. The VPC has two availability zones each with a private and public subnet with suitable CIDR .

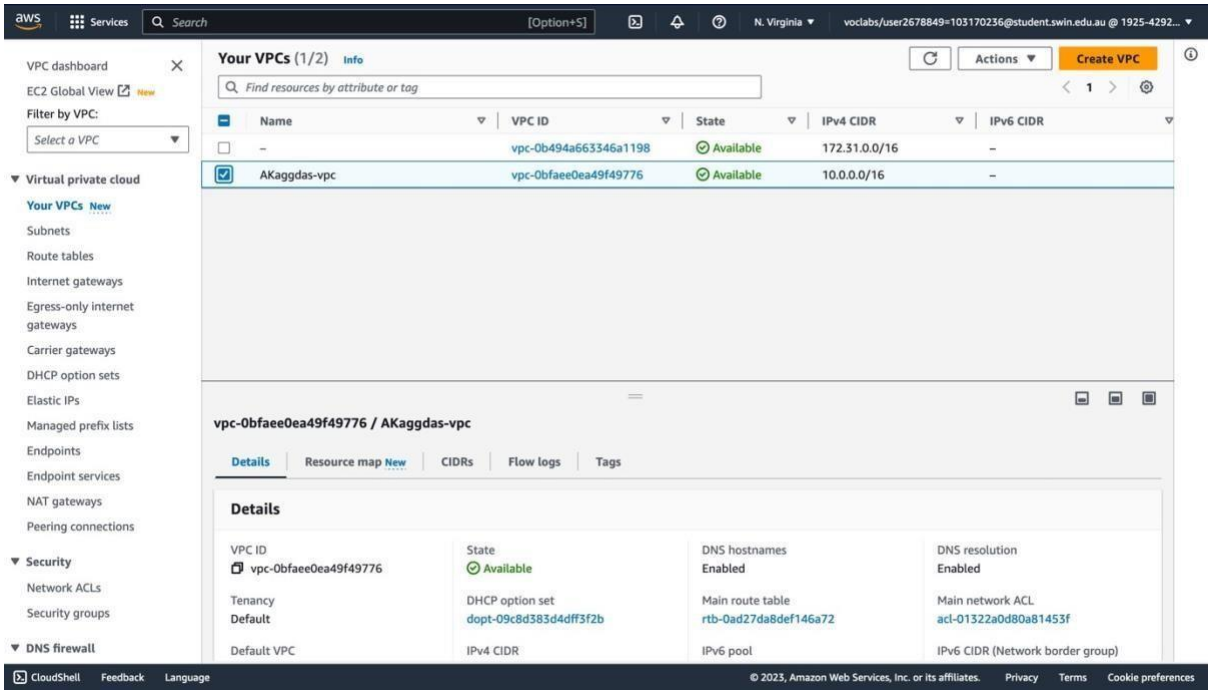

Figure 1 - Virtual Private Cloud

III. Route Tables

- **Public Route Table Configuration :**

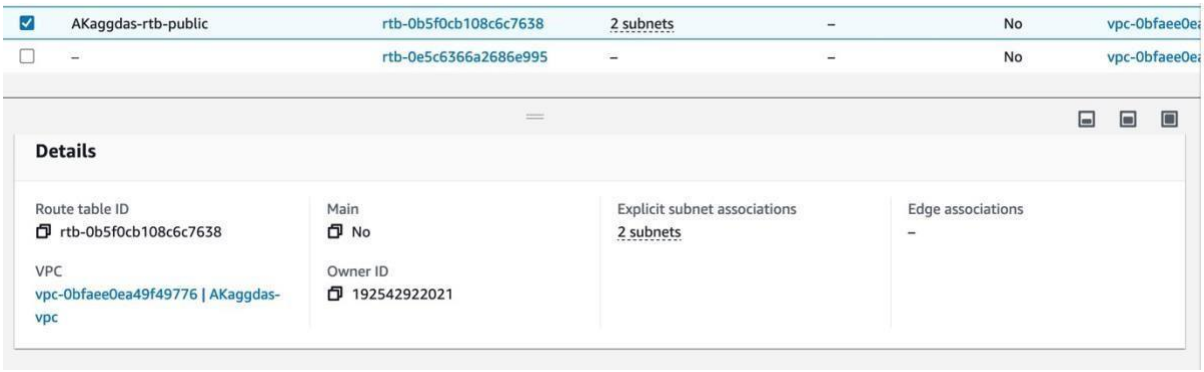

Figure 2 - ’AKaggdas’ Public Route table

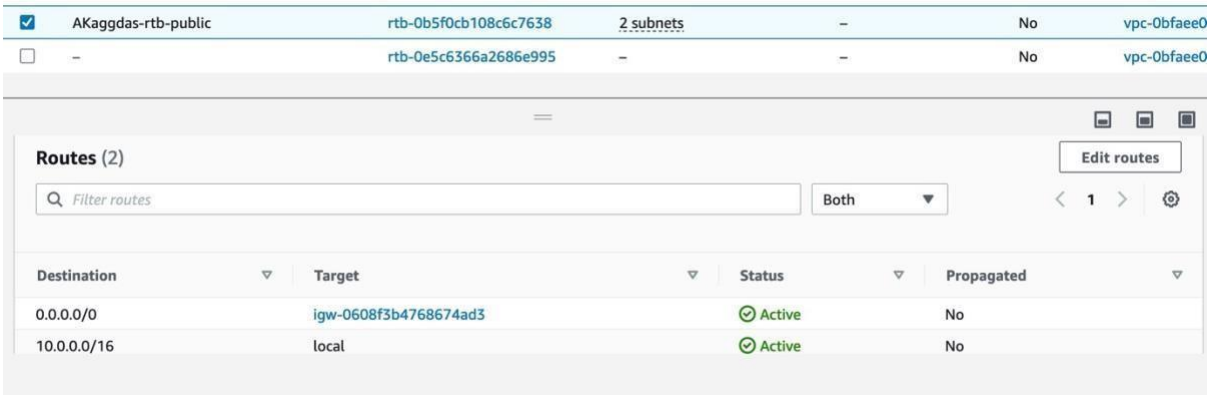

Figure 3 -'AKaggdas' Public Routes

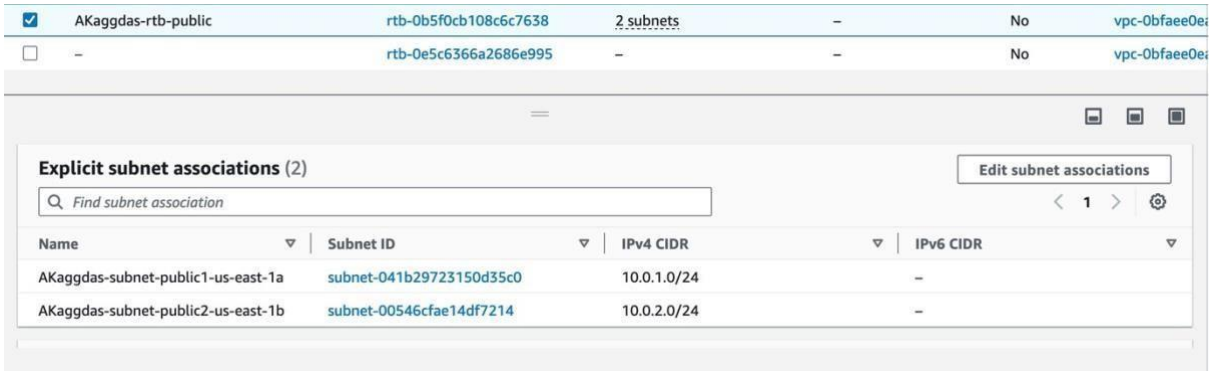

Figure 4 - 'AKaggdas' Public Route table Subnet Associations

▯ Private Route Table Configuration :

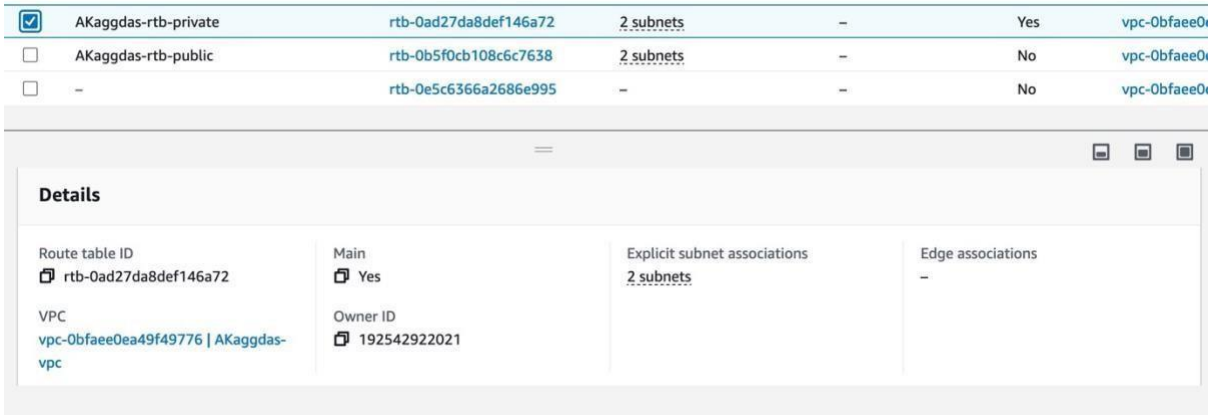

Figure 5 - 'AKaggdas' Private Route table

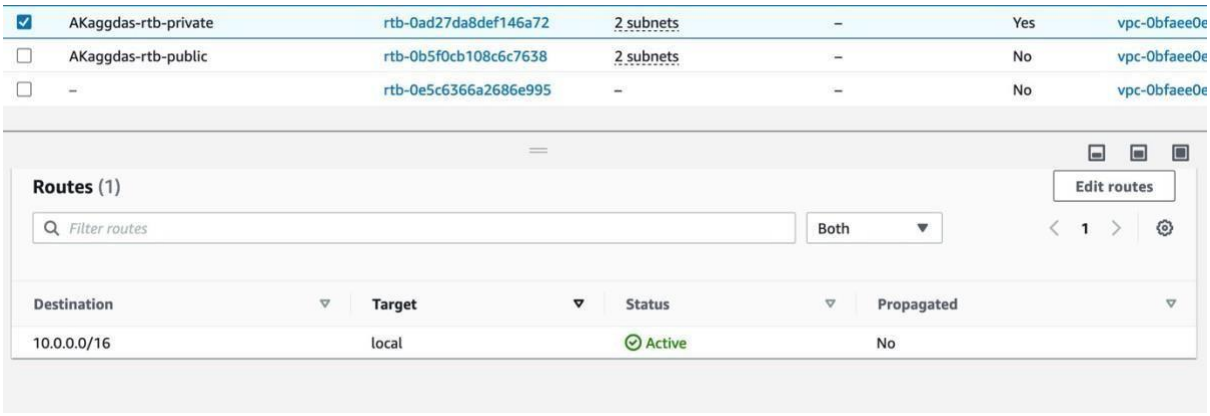

Figure 6 -'AKaggdas' Private Routes

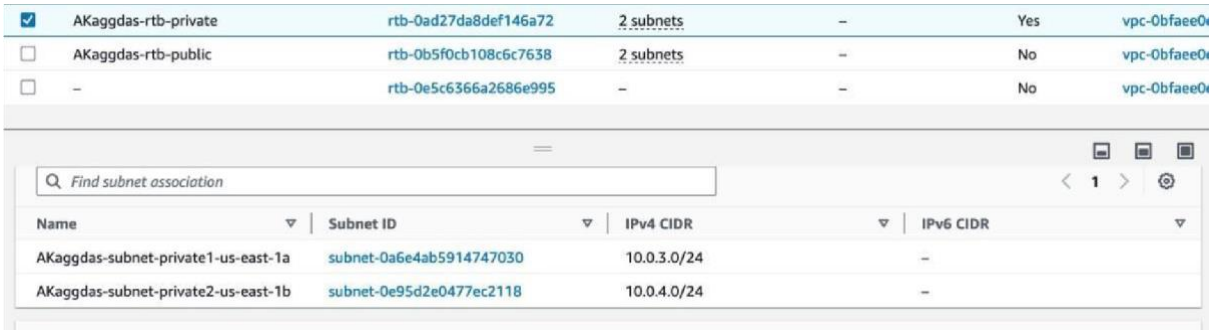

Figure 7 - 'AKaggdas' Private Route table Subnet Associations

IV. Create Security groups

We create three security groups : 1] TestInstanceSG 2] WebServerSG 3] DBServerSG .We edit the **Inbound rules** for all the three and leave the outbound rules to default.

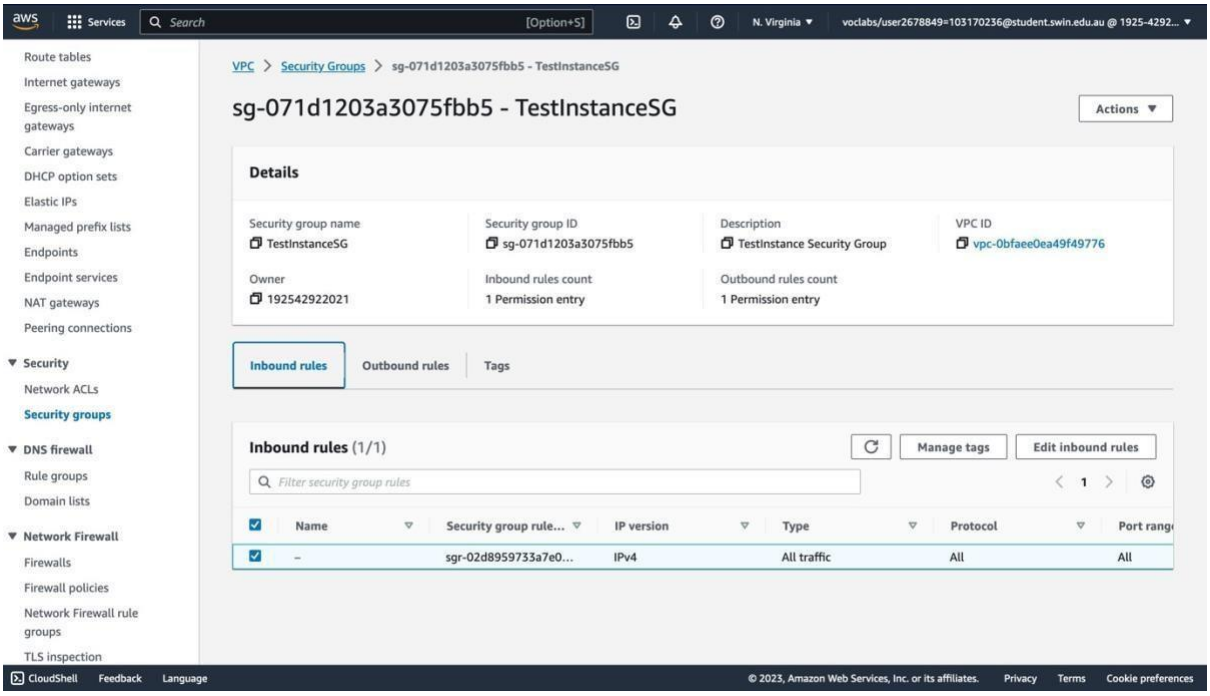

Figure 8 - Test Instance Security Group

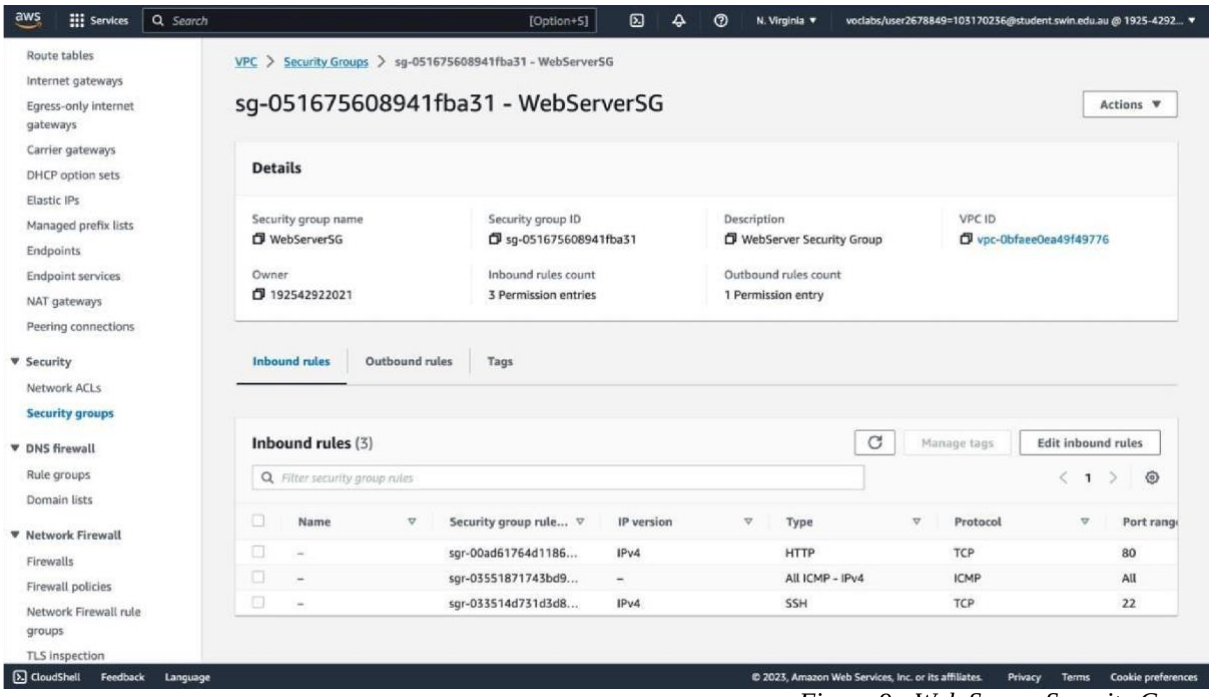

Figure 9 - Web Server Security Group

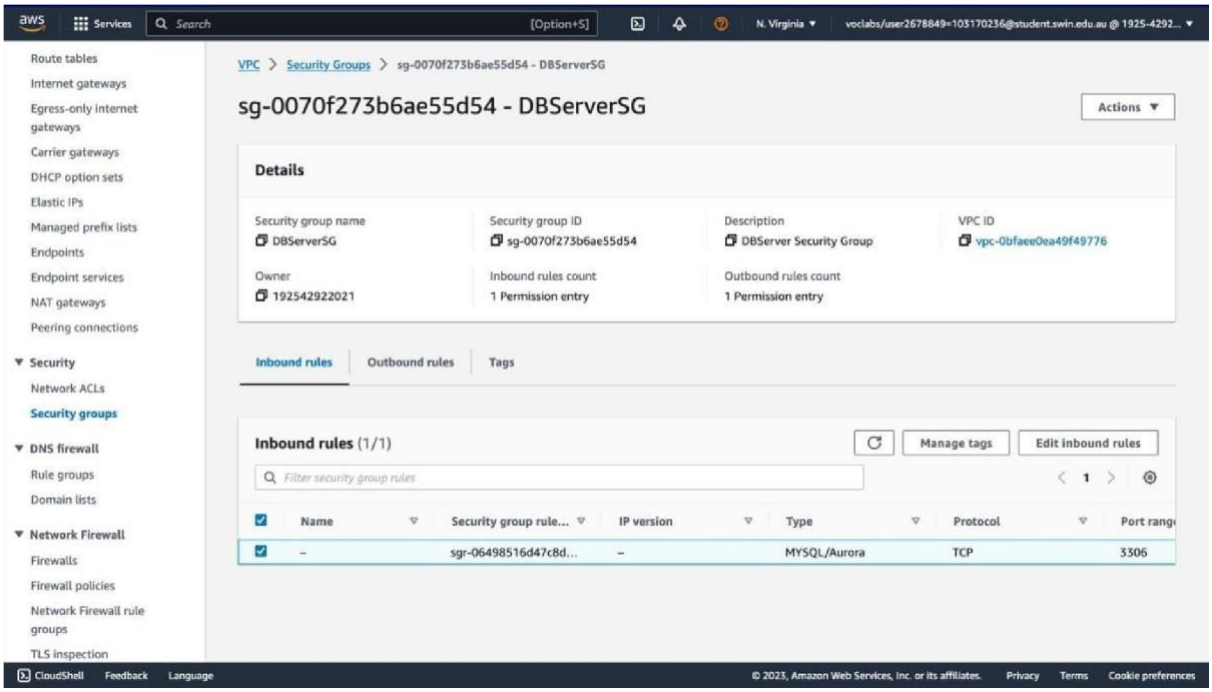

Figure 10 – Data base Server Security Group

V. Create Key Pair

We create a key pair to associate with the EC2 instances .

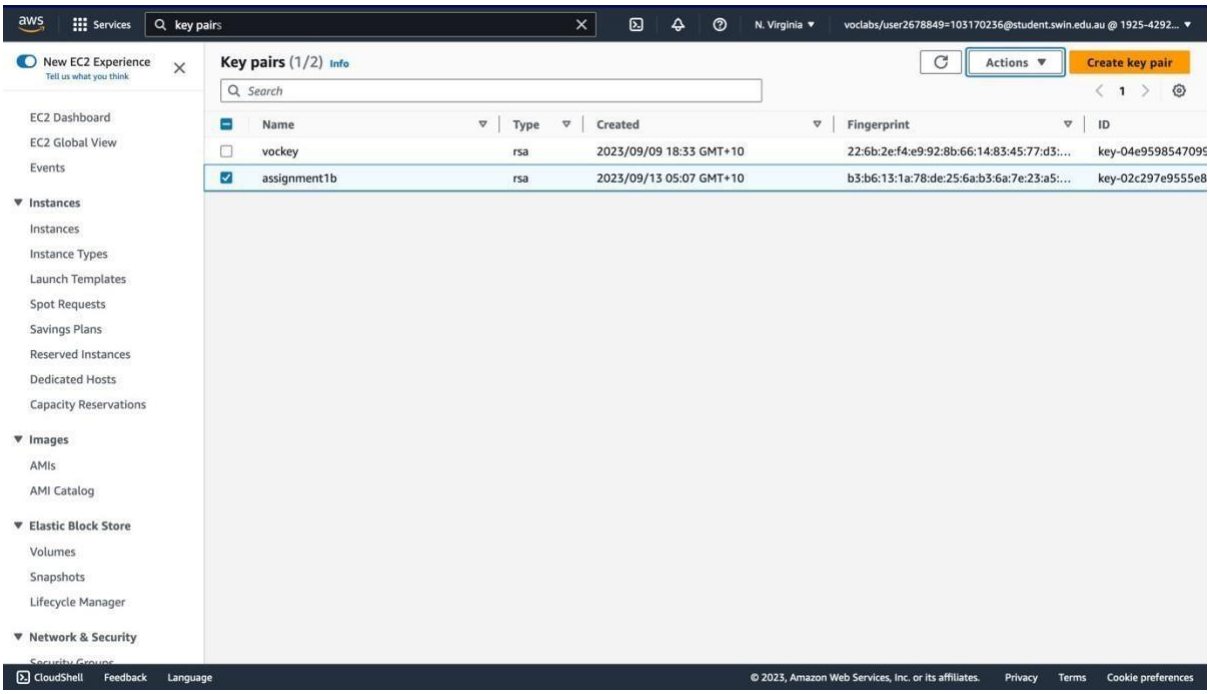

Figure 11 - Key Pair

VI. Create EC2 Instances

Web server Instance:

We create two EC2 instances, a 'test' instance and a 'web server' instance. We first create the Web Server EC2 instance. The instance type for Web Server Instance is *t2.micro and* Amazon Machine Image is *Amazon Linux 2 AMI (HVM), SSD Volume Type.* When we edit the network settings we select 'AKaggdas-vpc' . Now we expand Advanced settings copy the content provided to us in the 'Install_PHP_AWS.rtf' and paste it in the user data box. We launch the instance . We then add an Elastic IP Address to this instance by allocating an Elastic IP address in the same region. The web server instance is in the public subnet.

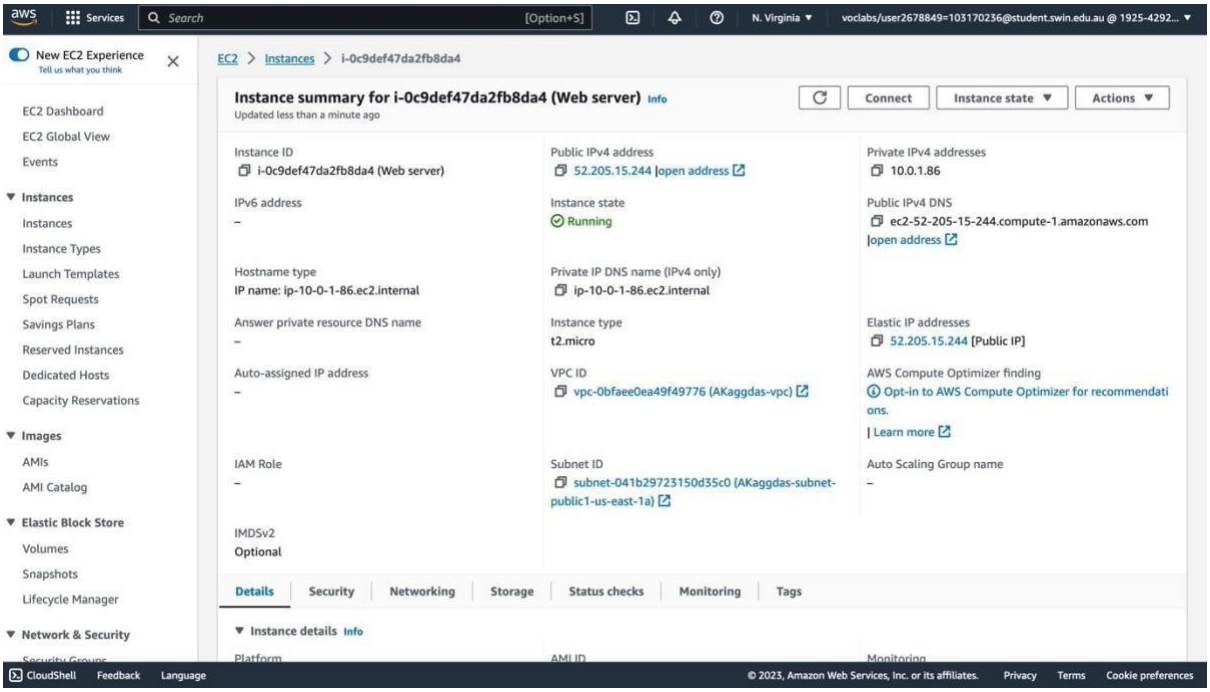

Figure 12 – Summary of Web Server Instance

Test instance :

The configuration for the test instance is the same as for the web server instance, except that the test instance does not have a public IP address and is located in a private subnet. This instance is used for demonstration purposes only. It does not contribute to the functionality of Photo Album website.

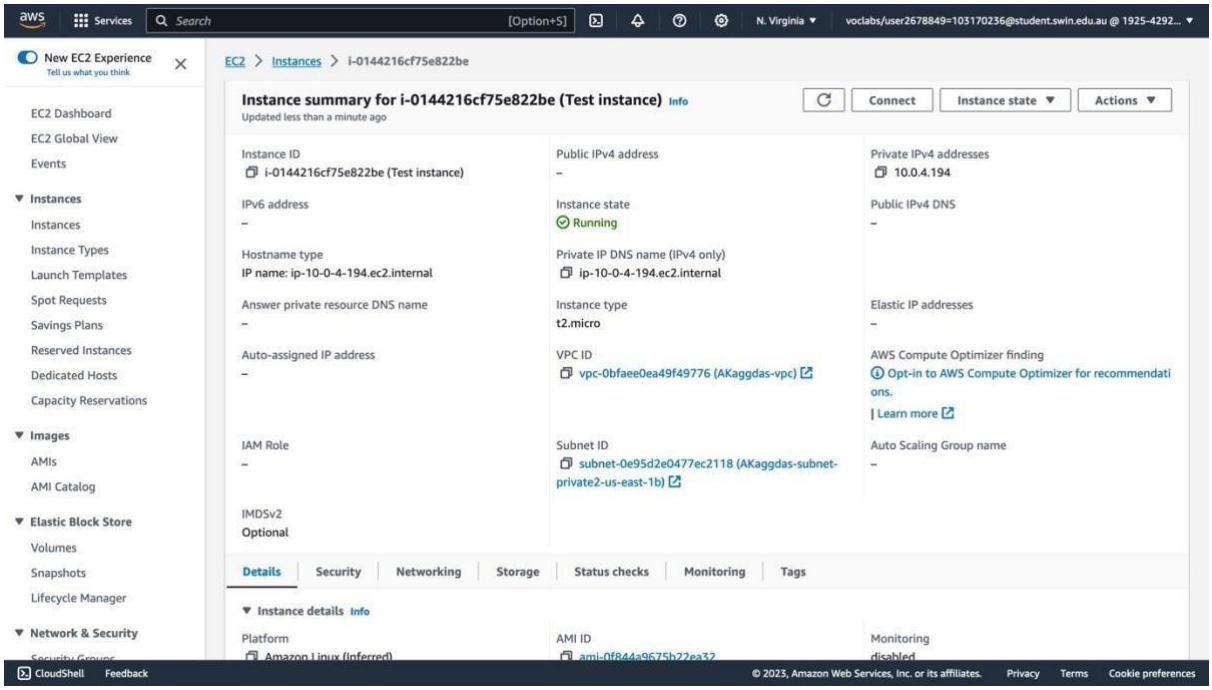

Figure 13 – Summary of Test Instance

We successfully access the test instance in the private subnet by using the commands displayed in the figure below.

```
aishwaryakaggdas@Aishwaryas-MacBook-Air Desktop % ssh-agent bash

The default interactive shell is now zsh.
To update your account to use zsh, please run `chsh -s /bin/zsh`.
For more details, please visit https://support.apple.com/kb/HT208050.
bash-3.2$ ssh-add -L
-L: No such file or directory
bash-3.2$ ssh-add -K assignment1b.pem
Identity added: assignment1b.pem (assignment1b.pem)
bash-3.2$ ssh-add -L
-L: No such file or directory
bash-3.2$ ssh-add -L assignment1b.pem
-L: No such file or directory
Identity added: assignment1b.pem (assignment1b.pem)
bash-3.2$ ssh -A ec2-user@52.205.15.244
Last login: Fri Sep 15 12:38:27 2023 from 106.216.202.4

       __|  __|_  )
       _|  (     /   Amazon Linux 2 AMI
      ___|\___|___|

https://aws.amazon.com/amazon-linux-2/
5 package(s) needed for security, out of 36 available
Run "sudo yum update" to apply all updates.
-bash: warning: setlocale: LC_CTYPE: cannot change locale (UTF-8): No such file or directory
[ec2-user@ip-10-0-1-86 ~]$ ssh ec2-user@10.0.4.194

       __|  __|_  )
       _|  (     /   Amazon Linux 2 AMI
      ___|\___|___|

https://aws.amazon.com/amazon-linux-2/
[ec2-user@ip-10-0-4-194 ~]$
```

.

Figure 14 - SSH into an instance in a private subnet

We are able to establish a connection (ICMP ping) between this instance and the Bastion/Web server instance by pinging the public IP address of the web server.

```
https://aws.amazon.com/amazon-linux-2/
5 package(s) needed for security, out of 36 available
Run "sudo yum update" to apply all updates.
-bash: warning: setlocale: LC_CTYPE: cannot change locale (UTF-8): No such file or directory
[ec2-user@ip-10-0-1-86 ~]$ ping 10.0.4.194
PING 10.0.4.194 (10.0.4.194) 56(84) bytes of data.
64 bytes from 10.0.4.194: icmp_seq=1 ttl=255 time=0.799 ms
64 bytes from 10.0.4.194: icmp_seq=2 ttl=255 time=0.713 ms
64 bytes from 10.0.4.194: icmp_seq=3 ttl=255 time=0.770 ms
64 bytes from 10.0.4.194: icmp_seq=4 ttl=255 time=0.752 ms
64 bytes from 10.0.4.194: icmp_seq=5 ttl=255 time=0.790 ms
64 bytes from 10.0.4.194: icmp_seq=6 ttl=255 time=0.742 ms
64 bytes from 10.0.4.194: icmp_seq=7 ttl=255 time=0.709 ms
64 bytes from 10.0.4.194: icmp_seq=8 ttl=255 time=0.807 ms
64 bytes from 10.0.4.194: icmp_seq=9 ttl=255 time=0.706 ms
64 bytes from 10.0.4.194: icmp_seq=10 ttl=255 time=0.717 ms
64 bytes from 10.0.4.194: icmp_seq=11 ttl=255 time=0.773 ms
64 bytes from 10.0.4.194: icmp_seq=12 ttl=255 time=0.777 ms
```

Figure 15 – Ping the web server

VII. Create an Amazon RDS DB Instance

This RDS instance has the following configs:

- DB engine version: *MySQL 8.0.34*
- Template: *Free tier*
- Public access: *No*

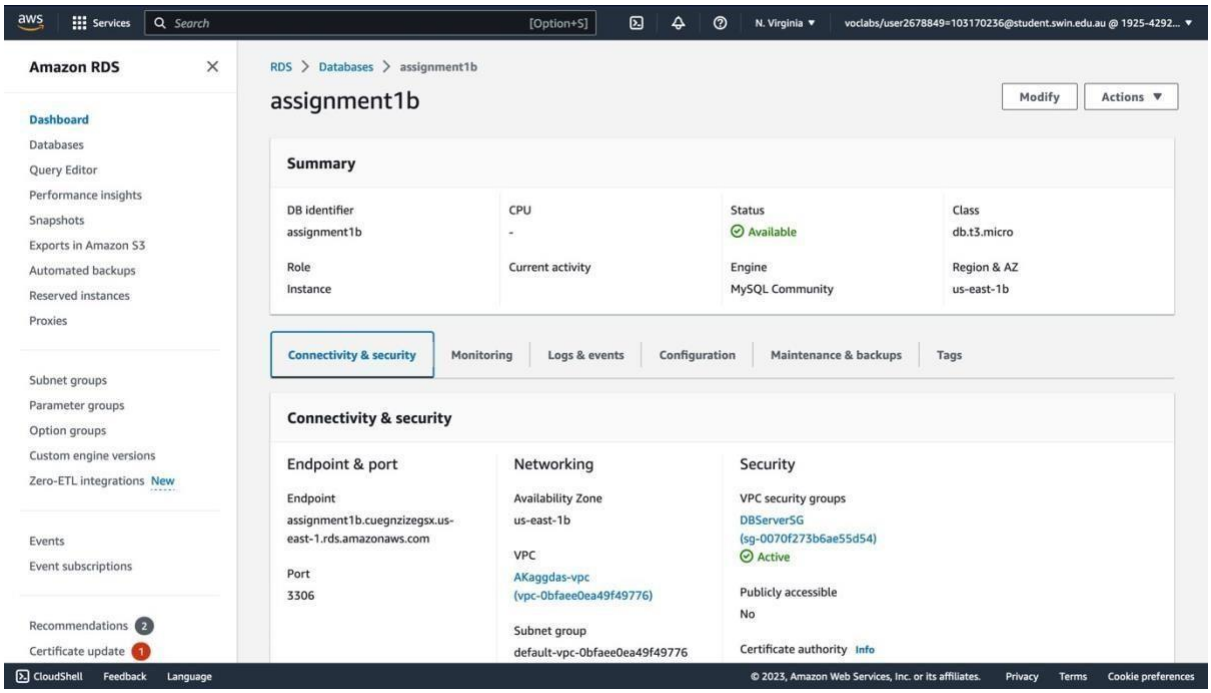

Figure 16- Summary of RDS

VIII. Install phpMyAdmin

We install phpMyAdmin (a web-based MySQL administration tool) on our EC2 web server instance and manage our database through phpMyAdmin's UI. We follow the instructions in *Install phpMyAdmin on EC2.pdf* file.

We Create a database in our RDS instance with a table called ***photos*** that stores meta-data about the photos stored in the S3 bucket. This table should have the following columns:

- Photo title (*varchar(255)* type)
- Description (*varchar(255)* type)
- Creation date (*date* type)
- Keywords (*varchar(255)* type)
- Reference to the photo object in S3 (*varchar(255)* type)

```
aishwaryakaggdas@Aishwaryas-MacBook-Air Desktop % chmod 400 assignment1b.pem
aishwaryakaggdas@Aishwaryas-MacBook-Air Desktop % ssh -i assignment1b.pem ec2-user@3.86.24.81

       __|  __|_  )
       _|  (     /   Amazon Linux 2 AMI
      ___|\___|___|

https://aws.amazon.com/amazon-linux-2/
-bash: warning: setlocale: LC_CTYPE: cannot change locale (UTF-8): No such file or directory
[ec2-user@ip-10-0-1-86 ~]$ cd /var/www/html
[ec2-user@ip-10-0-1-86 html]$ wget https://files.phpmyadmin.net/phpMyAdmin/5.2.1/phpMyAdmin-5.2.1-english.zip
--2023-09-12 19:17:12--  https://files.phpmyadmin.net/phpMyAdmin/5.2.1/phpMyAdmin-5.2.1-english.zip
Resolving files.phpmyadmin.net (files.phpmyadmin.net)... 89.187.177.16, 156.146.36.23, 2a02:6ea0:c400::11, ...
Connecting to files.phpmyadmin.net (files.phpmyadmin.net)|89.187.177.16|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 10448276 (10.0M) [application/zip]
Saving to: 'phpMyAdmin-5.2.1-english.zip'

100%[=======================================================================================================>] 10,448,276  --.-K/s   in 0.1s

2023-09-12 19:17:12 (95.1 MB/s) - 'phpMyAdmin-5.2.1-english.zip' saved [10448276/10448276]

[ec2-user@ip-10-0-1-86 html]$ unzip phpMyAdmin-5.2.1-english.zip
Archive:  phpMyAdmin-5.2.1-english.zip
   creating: phpMyAdmin-5.2.1-english/
  extracting: phpMyAdmin-5.2.1-english/.rtlcssrc.json
  inflating: phpMyAdmin-5.2.1-english/CONTRIBUTING.md
  inflating: phpMyAdmin-5.2.1-english/ChangeLog
  inflating: phpMyAdmin-5.2.1-english/LICENSE
  inflating: phpMyAdmin-5.2.1-english/README
  extracting: phpMyAdmin-5.2.1-english/RELEASE-DATE-5.2.1
  extracting: phpMyAdmin-5.2.1-english/babel.config.json
  inflating: phpMyAdmin-5.2.1-english/composer.json
  inflating: phpMyAdmin-5.2.1-english/composer.lock
  inflating: phpMyAdmin-5.2.1-english/config.sample.inc.php
   creating: phpMyAdmin-5.2.1-english/doc/
   creating: phpMyAdmin-5.2.1-english/doc/html/
   creating: phpMyAdmin-5.2.1-english/doc/html/_images/
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/chart.png
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/column_chart.png
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/line_chart.png
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/pie_chart.png
  extracting: phpMyAdmin-5.2.1-english/doc/html/_images/pma-relations-links.png
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/pma-relations-relation-link.png
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/pma-relations-relation-name.png
```

Figure 17 - Download phpMyAdmin onto your Linux EC2

```
https://aws.amazon.com/amazon-linux-2/
-bash: warning: setlocale: LC_CTYPE: cannot change locale (UTF-8): No such file or directory
[ec2-user@ip-10-0-1-86 ~]$ cd /var/www/html
[ec2-user@ip-10-0-1-86 html]$ wget https://files.phpmyadmin.net/phpMyAdmin/5.2.1/phpMyAdmin-5.2.1-english.zip
--2023-09-12 19:17:12--  https://files.phpmyadmin.net/phpMyAdmin/5.2.1/phpMyAdmin-5.2.1-english.zip
Resolving files.phpmyadmin.net (files.phpmyadmin.net)... 89.187.177.16, 156.146.36.23, 2a02:6ea0:c400::11, ...
Connecting to files.phpmyadmin.net (files.phpmyadmin.net)|89.187.177.16|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 10448276 (10.0M) [application/zip]
Saving to: 'phpMyAdmin-5.2.1-english.zip'

100%[=======================================================================================================>] 10,448,276  --.-K/s   in 0.1s

2023-09-12 19:17:12 (95.1 MB/s) - 'phpMyAdmin-5.2.1-english.zip' saved [10448276/10448276]

[ec2-user@ip-10-0-1-86 html]$ unzip phpMyAdmin-5.2.1-english.zip
Archive:  phpMyAdmin-5.2.1-english.zip
   creating: phpMyAdmin-5.2.1-english/
 extracting: phpMyAdmin-5.2.1-english/.rtlcssrc.json
  inflating: phpMyAdmin-5.2.1-english/CONTRIBUTING.md
  inflating: phpMyAdmin-5.2.1-english/ChangeLog
  inflating: phpMyAdmin-5.2.1-english/LICENSE
  inflating: phpMyAdmin-5.2.1-english/README
 extracting: phpMyAdmin-5.2.1-english/RELEASE-DATE-5.2.1
 extracting: phpMyAdmin-5.2.1-english/babel.config.json
  inflating: phpMyAdmin-5.2.1-english/composer.json
  inflating: phpMyAdmin-5.2.1-english/composer.lock
  inflating: phpMyAdmin-5.2.1-english/config.sample.inc.php
   creating: phpMyAdmin-5.2.1-english/doc/
   creating: phpMyAdmin-5.2.1-english/doc/html/
   creating: phpMyAdmin-5.2.1-english/doc/html/_images/
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/chart.png
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/column_chart.png
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/line_chart.png
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/pie_chart.png
 extracting: phpMyAdmin-5.2.1-english/doc/html/_images/pma-relations-links.png
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/pma-relations-relation-link.png
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/pma-relations-relation-name.png
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/pma-relations-relation-view-link.png
 extracting: phpMyAdmin-5.2.1-english/doc/html/_images/query_result_operations.png
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/scatter_chart.png
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/spline_chart.png
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/timeline_chart.png
  inflating: phpMyAdmin-5.2.1-english/doc/html/_images/usergroups.png
   creating: phpMyAdmin-5.2.1-english/doc/html/_sources/
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/bookmarks.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/charts.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/config.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/copyright.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/credits.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/developers.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/faq.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/glossary.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/import_export.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/index.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/intro.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/other.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/privileges.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/relations.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/require.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/security.rst.txt
  inflating: phpMyAdmin-5.2.1-english/doc/html/_sources/settings.rst.txt
```

Figure 18 - unzip phpMyAdmin-5.2.1-english.zip

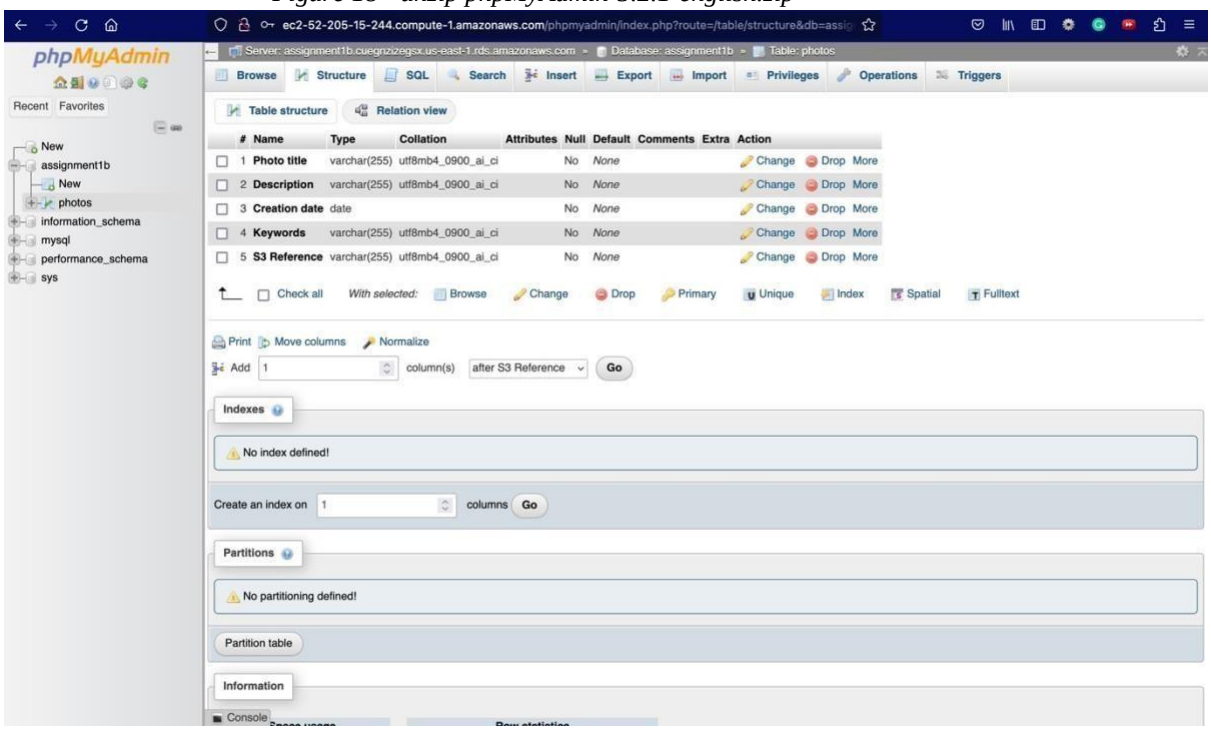

Figure 19- Access phpMyAdmin from your local machine and create Appropriate table on your RDS Database:

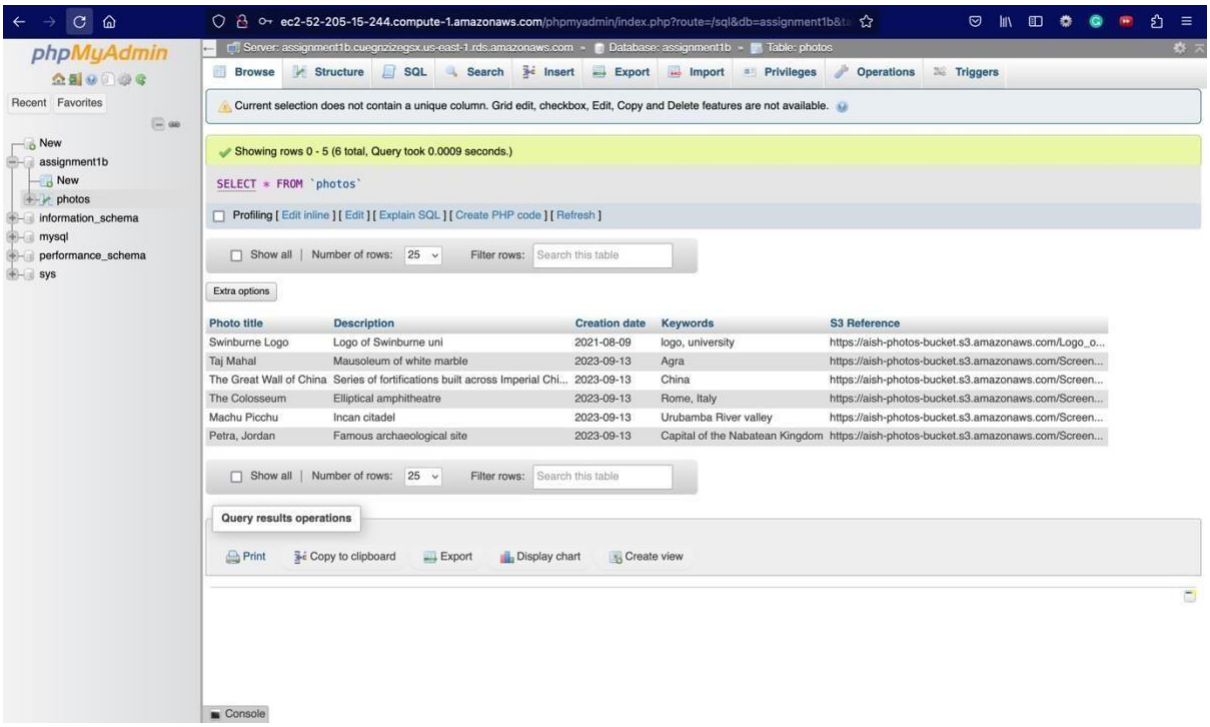

Figure 20- Populate 'photos' table with a few records

IX. Reconfigure phpMyAdmin

We Open Filezilla and navigate to phpmyadmin directory (var/www/html/phpmyadmin).We change the name of config.sample.inc.php file to config.inc.php. We open config.inc.php file and look for this line:
$cfg['Servers'][$i]['host'] = 'localhost';

Replace 'localhost' with the endpoint of your RDS instance.

$cfg['Servers'][$i]['host'] = 'assignment1b.cuegnzizegsx.us-east-1.rds.amazonaws.com';

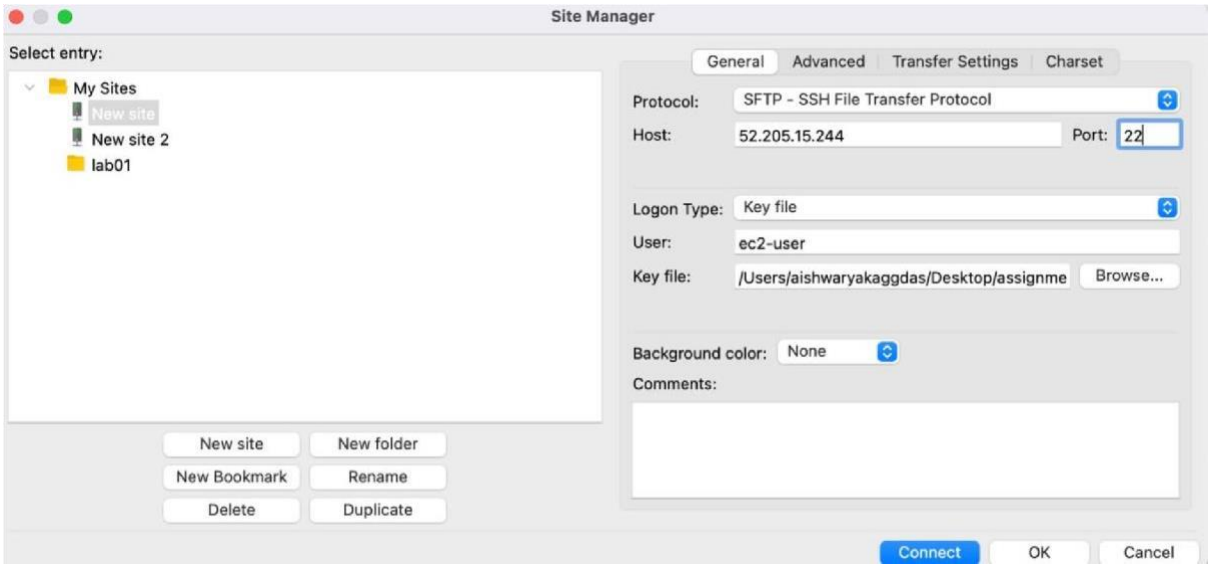

Figure 21 – Connect to FileZilla

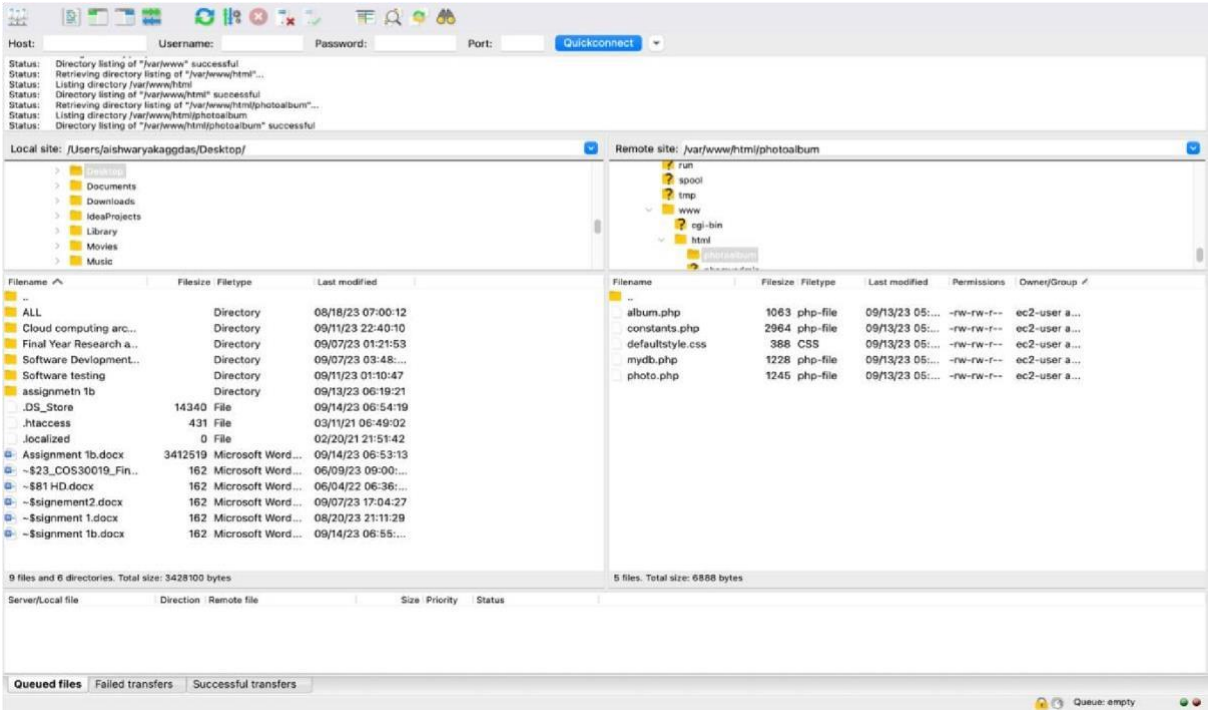

Figure 22- Navigate to phpmyadmin directory

X . Functional requirements of Photo Album website

The Photo Album website has the following functional requirements.

2.1 – Photo storage

We create an S3 bucket and name it 'aish-photos-bucket' to store our photos. We manually upload some photos onto S3 bucket and ensure they have been successfully uploaded.

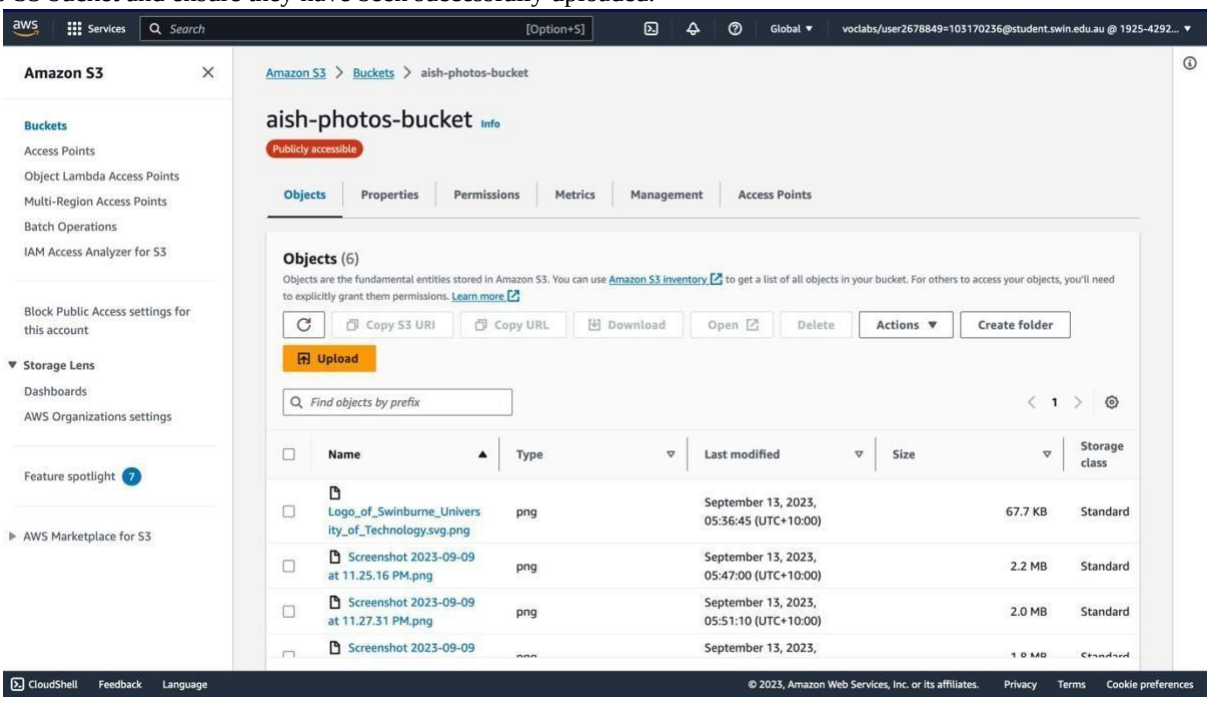

Figure 23 – aish-photos bucket

2.2 – Photo meta-data in RDS Database

We populate the table with a few records the first being

- Photo title: *Swinburne Logo*
- Description: *Logo of Swinburne uni*
- Creation date: *2021-08-09* Keywords: *logo, university*
- Object URL in S3: https://aishphotosbucket.s3.amazonaws.com/Logo_of_Swinburne_University_of_Technology.svg.png

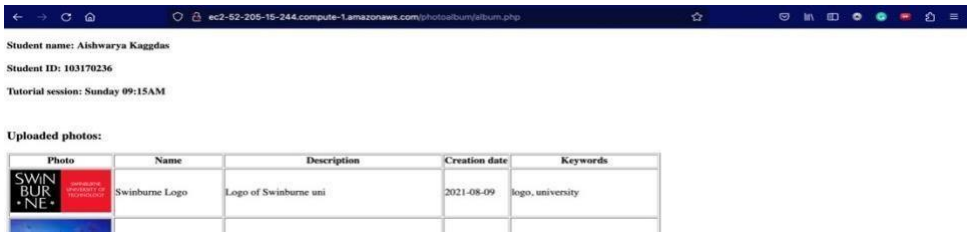

Figure 24 – First record of the table

2.3 – Photo Album website functionality

The website is able to list all the photos (stored in the S3 bucket) along with their meta-data (stored in the database).

Figure 25 – album.php

URL of the album.*php :*

http://ec2-52-205-15-244.compute-1.amazonaws.com/photoalbum/album.php

XI. Problems And Achievements

Problems:

The objects in the S3 bucket were not publicly accessible, which was one of the challenges I faced. To solve the problem, I researched and discovered that we require to attach a public bucket policy to make the objects accessible to everyone. The link that I used to resolve this issue is provided below.

URL : https://saturncloud.io/blog/how-to-access-images-from-amazon-s3-by-url/

The web server needed an additional layer of protection, which was my second problem. I was unable to design and deploy a network ACL .I attempted but failed to complete this task. It was the most difficult part of the project.

Achievements :

- Create VPC with 2 public and 2 private subnets
- Correct Public and Private Routing tables with correct subnet associations Security groups properly configured and attached.
- Correct Web server and Test instances running in correct subnets
- Database schema as specified
- Database running in correct subnets
- S3 objects publicly accessible, using proper access policy

Functional Requirements:

- album.php page displayed from EC2 Web server
- Provided URL is persistent (Elastic IP Association)
- Photos loaded from S3 with matching metadata from RDS
- Web server instance reachable from Test instance via ICMP