|  |  |
| --- | --- |
| **Declaration** |  |
| Questions in this exercise are intentionally complex and could be convoluted or confusing. This is by design and to simulate real life situations where customers seldom give crystal clear requirements and ask unambiguous questions. | |
| I have read the above statement and agree to these conditions | |
| I AGREE | Satyadeep Sharma |
| <Enter your name above this line to indicate that you are in agreement> |

|  |  |
| --- | --- |
| **Instructions** |  |
| Every screenshot requested in this workbook is compulsory and carries 0.5 marks | |
| Your AWS account ID must be clearly visible in every screenshot using the AWS console; missing id or using someone else's id is not permitted. Such cases will be considered as plagiarism and severe penalty will be imposed. | |
| All screenshots must be in the order mentioned under "Expected Screenshots" for every step | |
| DO NOT WAIT UNTIL THE LAST MINUTE. | |
| The file should be renamed in the format BATCH\_FIRSTNAME\_LASTNAME\_PROJECT1. For example: IITR\_FSD\_VIJAY\_DWIVEDI\_PROJECT1.docx | |

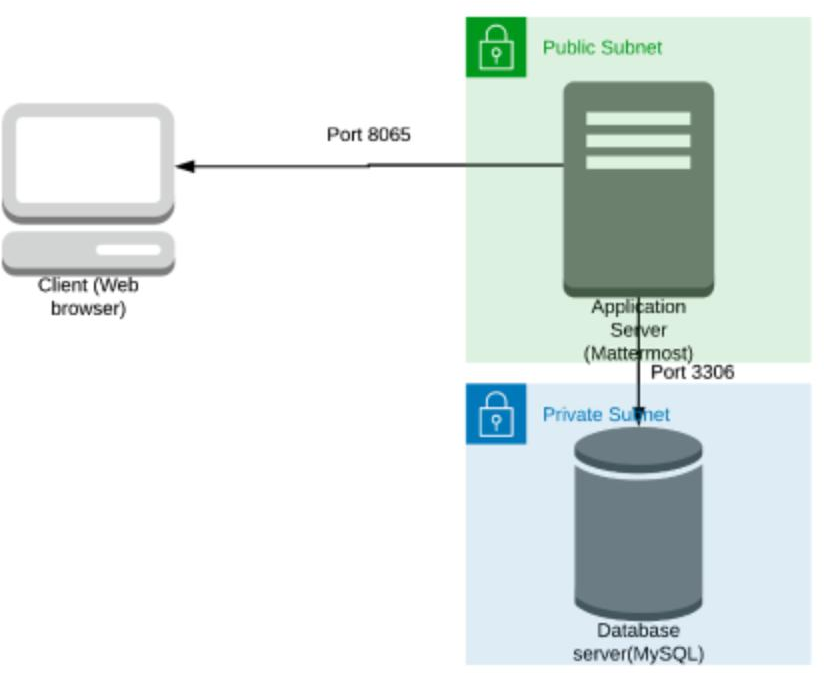
|  |  |
| --- | --- |
| **Resource Clean Up** |  |
| Cloud is always pay per use model and all resources/services that we consume are chargeable. Cleaning up when you’ve completed your lab or project is always necessary. This is true whether you’re doing a lab or implementing a project at your workplace. | |
| After completing the lab, make sure to delete each resource created in reverse chronological order. | |

## Scenario

Team communication and instant messaging solutions are an integral part of any business environment today. As of 2020, the total number of users of Slack and Microsoft Teams exceeded 20 million.

Some organizations might have compliance policies in place which do not allow them to use services managed by third parties. They will prefer solutions that can be managed and hosted on servers controlled by them. The same will extend to communication solutions as well.

**Architecture diagram**



|  |  |
| --- | --- |
| **Architecture Implementation** | |
| 1 | Implement 2 different subnets (one public and the other private) in a custom VPC |
| 2 | Install and configure MySQL on an Amazon Linux 2 instance on the private subnet using the instructions provided. (Hint: Use a bastion host and a NAT gateway) |

|  |  |
| --- | --- |
| 3 | Install and configure Mattermost on an Amazon Linux 2 instance on the public subnet using the provided instructions. |
| 4 | Configure the security groups to allow the ports as shown in the architecture. |
| 5 | Test the installation by accessing the IP of the public instance in a browser via the port 8065. |

**Step 1: VPC and Subnet Creation**

Step number A

Step name Creation of VPC

Instructions 1) Navigate to VPC using the Services button at the top of the screen

1. Select "Your VPCs" on the left side of the screen
2. Click on "Create VPC"
3. Enter the following fields :

Name: Project 1 VPC

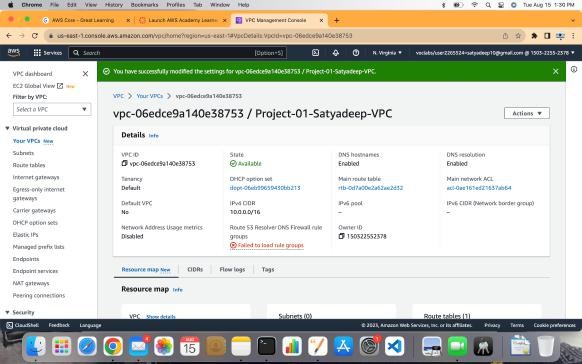
IPv4 CIDR Block : 10.0.0.0/16

The rest of the options can be ignored

1. Select "Create VPC"
2. Select the VPC and click on Actions->Edit DNS hostnames
3. Enable DNS hostnames and click on Save

Expected 1) Created VPC with properties visible screenshots

**<Insert Screenshot a(1) here>**



Step number Step name Instructions

Expected screenshots

b

Creation of public subnet

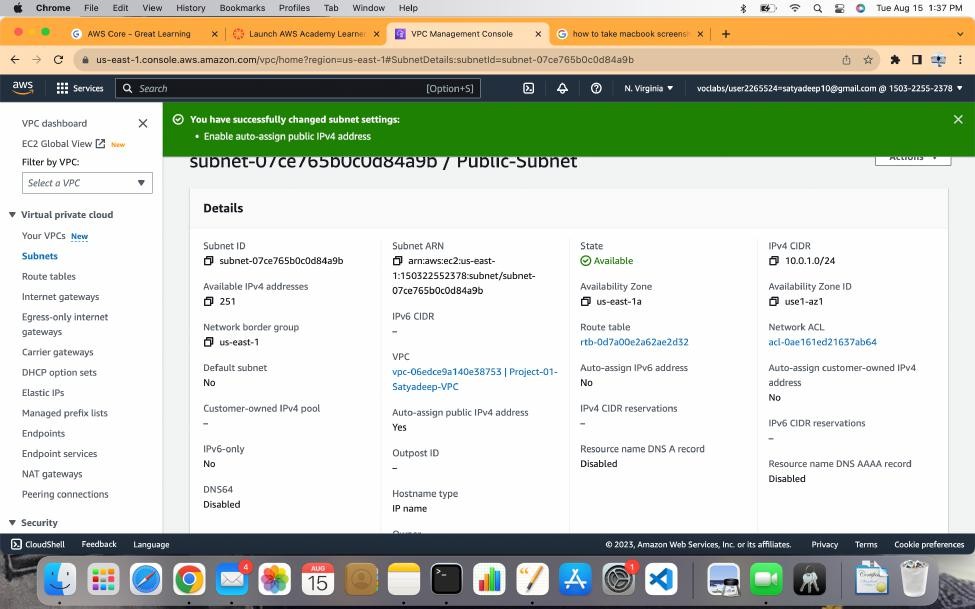
1. Navigate to VPC->Subnets
2. Click on "Create Subnet"
3. Enter the following fields Name tag : Public Subnet

VPC : Select the Project 1 VPC IPv4 CIDR block : 10.0.1.0/24

The other options can be ignored

1. Click on Create
2. Once the subnet has been created, select the subnet and click on Actions->Modify Auto-assign IP settings
3. Enable the option "Auto assign IPv4" and select Save
   1. Subnet Creation screen

**<Insert Screenshot b(1) here>**



Step number Step name Instructions

Expected screenshots

C

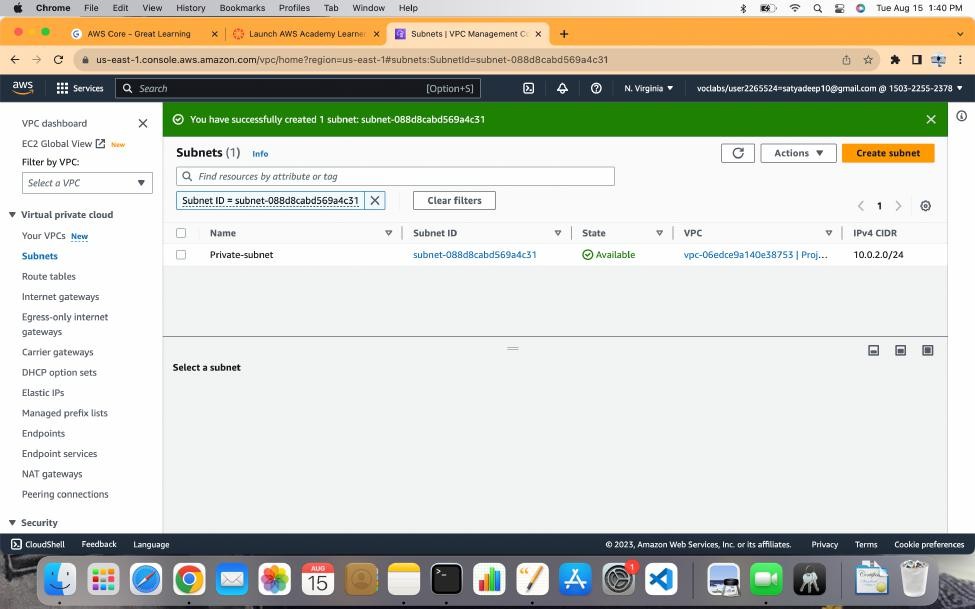
Creation of private subnet

1. Navigate to VPC->Subnets
2. Click on "Create Subnet"
3. Enter the following fields Name tag : Private Subnet VPC : Select the Project 1 VPC IPv4 CIDR block : 10.0.2.0/24

The other options can be ignored

1. Click on Create
   1. Subnet Creation screen

**<Insert Screenshot c(1) here>**



**Step 2 : Internet Gateway and VPC**

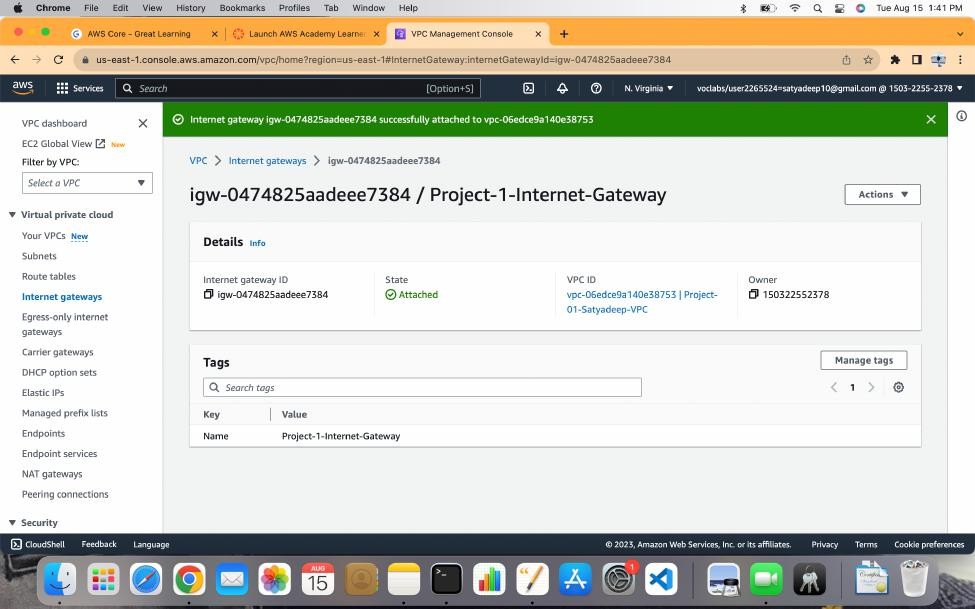
Step number a

Step name Creation and Configuration of Internet Gateway Instructions 1) Navigate to VPCs->Internet Gateway

1. Click on "Create Internet Gateway"
2. Enter the name tag "Project 1 Internet Gateway" and click on "Create Internet Gateway"
3. After the gateway is created, select it and click on Actions->Attach to VPC
4. Select the Project 1 VPC and click on "Attach Internet Gateway"

Expected 1) Creation of Internet Gateway screenshots

**<Insert Screenshot a(1) here >**



Step number b

Step name Creation of public route table

Instructions 1) Navigate to VPC -> Route Tables and click on Create Route table

1. Enter the name tag "Public Route Table", select the Project 1 VPC from the dropdown and click on Create
2. Once the route table is created, select it and select the Routes tab below the list of route tables
3. Click in Edit Routes and add the following route (Don't edit the existing one)

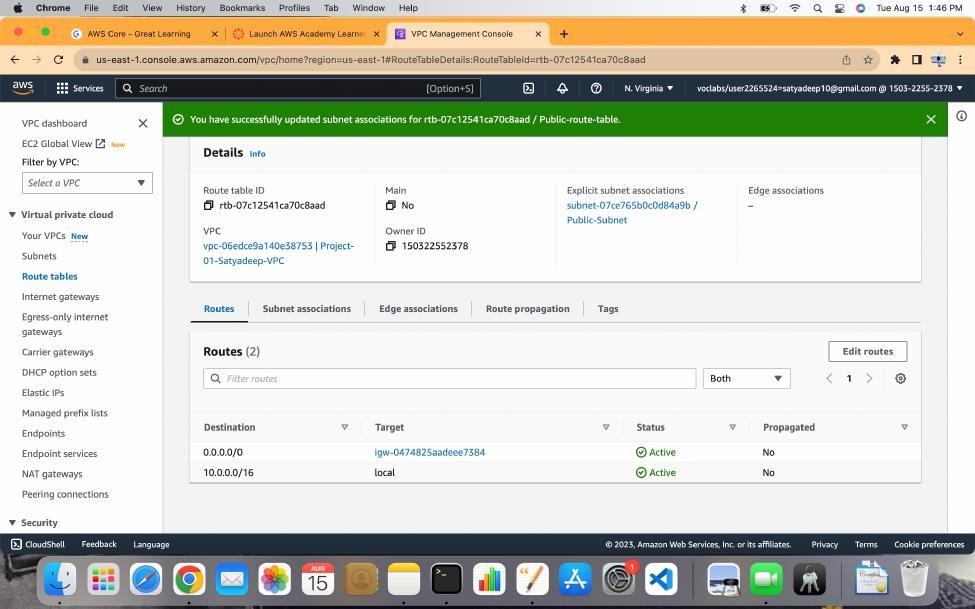
* Destination : 0.0.0.0/0
* Target : Select Internet Gateway and the select the Project 1 Internet Gateway

Click on Save Routes

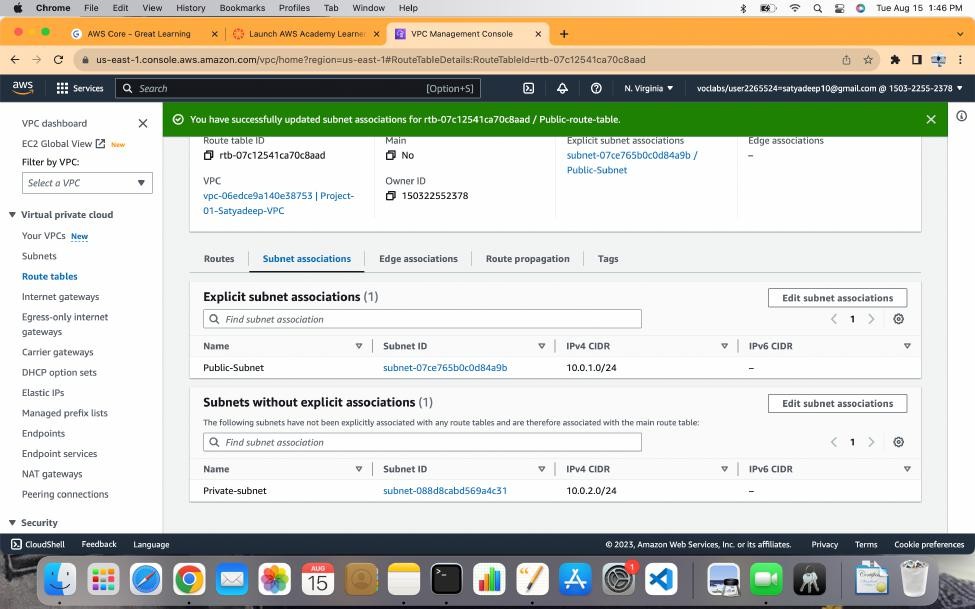
1. Select the Subnet Associations tab and click on Edit Subnet Associations
2. Select the Public Subnet from the list and click on Save

Expected 1) Route list of the route table screenshots 2) Subnet Associations of the route table

**<Insert Screenshot b(1) here>**



**<Insert Screenshot b(2) here>**



Step number c

Step name Creation of NAT gateway

Instructions 1) Navigate to VPC using the Services button at the top of the screen

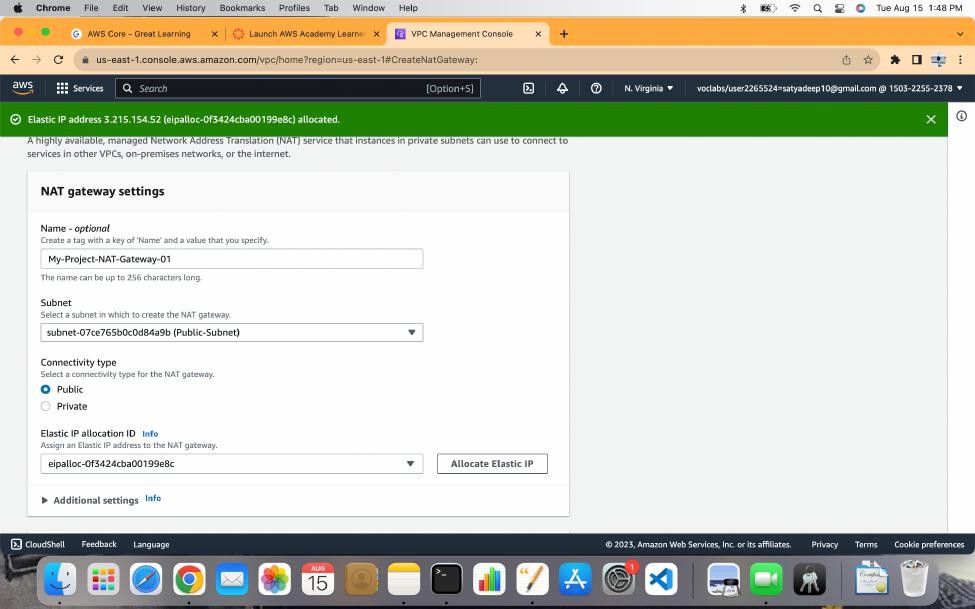
1. Select NAT Gateway at the left side of the screen
2. Click on Create NAT Gateway

* Deploy it in the public subnet
* Connectivity type : Public
* Allocate an elastic IP by clicking on “Allocate Elastic IP”

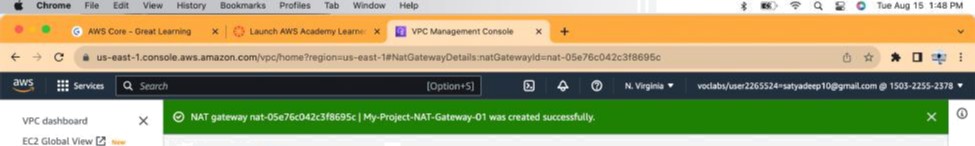
4) Click on “Create NAT Gateway” to create the gateway

Expected 1) NAT gateway creation details screenshots 2) Gateway after creation

**<Insert Screenshot c(1) here>**



**<Insert Screenshot c(2) here>**



*~~\*~~* nat-05e76c042c3f8695c / My-Project-NAY-Gateway-01 



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Step number

Step name

Instructio ns

d

Creation of private route tables

Expected screensh ots

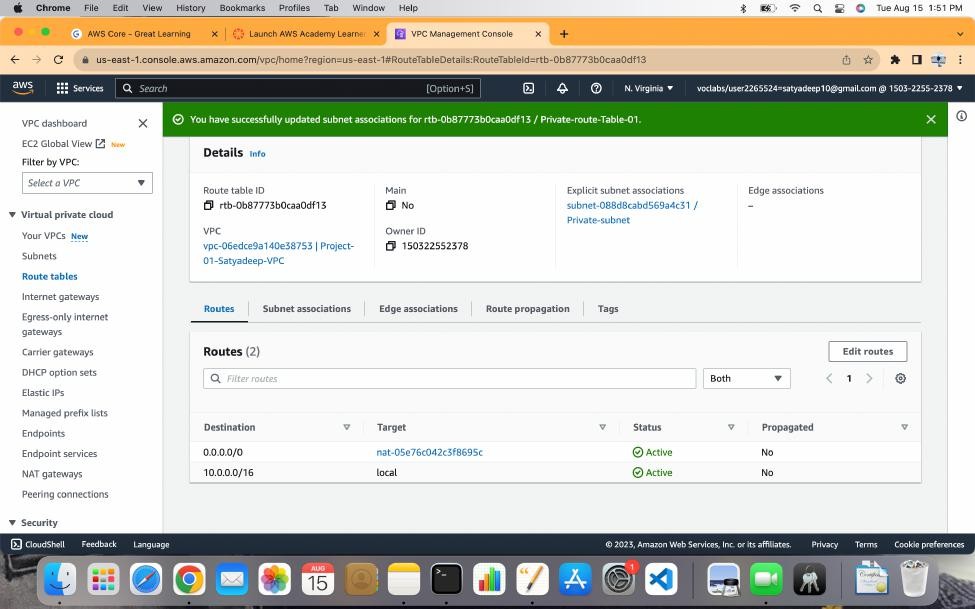
1. Navigate to VPC -> Route Tables and click on Create Route table
2. Enter the name tag "Private Route Table", select the Project 1 VPC from the dropdown and click on Create
3. Once the route table is created, select it and select the Routes tab below the list of route tables
4. Click in Edit Routes and add the following route (Don't edit the existing one)

* Destination : 0.0.0.0/0
* Target: Select NAT Gateway and select the NAT Gateway created in the previous step

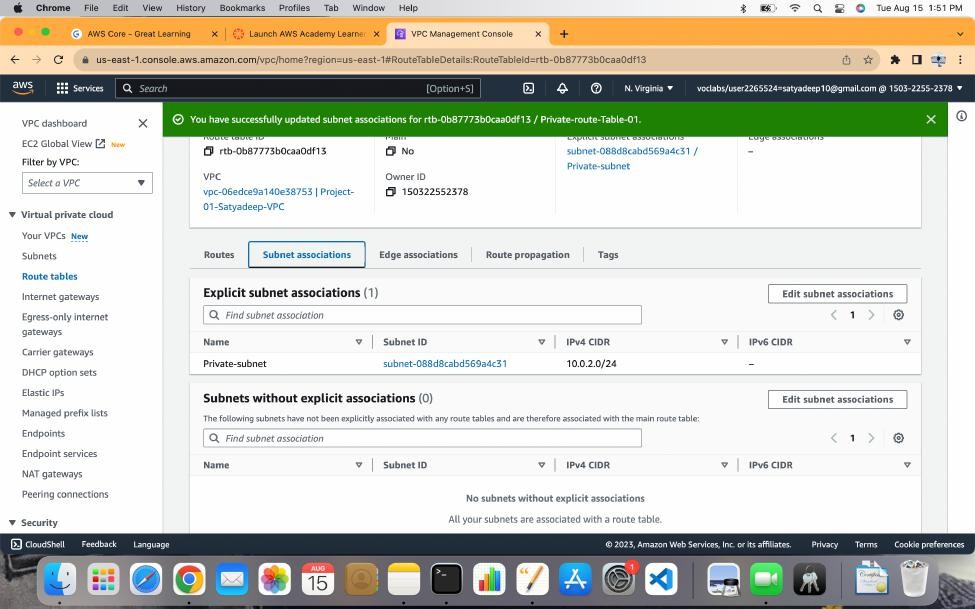
Click on Save Routes

1. Select the Subnet Associations tab and click on Edit Subnet Associations
2. Select the private Subnet from the list and click on Save
   1. Route list of the route table
   2. Subnet association of the route table

## <Insert Screenshot for d(1) here >



**<Insert Screenshot for d(2) here>**



**Step 3 : Creation of database and application servers**

Step number

Step name

a

Creation of application server

Instructions 1) Navigate to EC2 using the Services button at the top of the screen

1. Select Instances at the left side of the screen
2. Click on Launch Instance

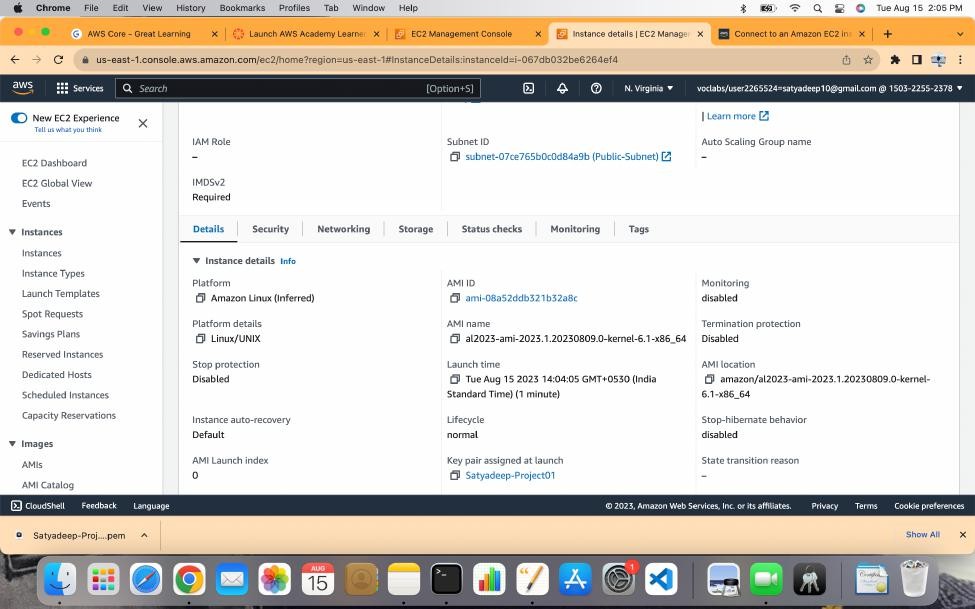
* Select the AMI Amazon 2 Linux
* Select the instance type t2.micro
* Select Network as "Project 1 VPC" and subnet as "Public Subnet"
* For the security group, open the ports 80,443, 22 and 8065 for source set to "Anywhere"

4) Launch the instance after creating a new pem file and downloading it

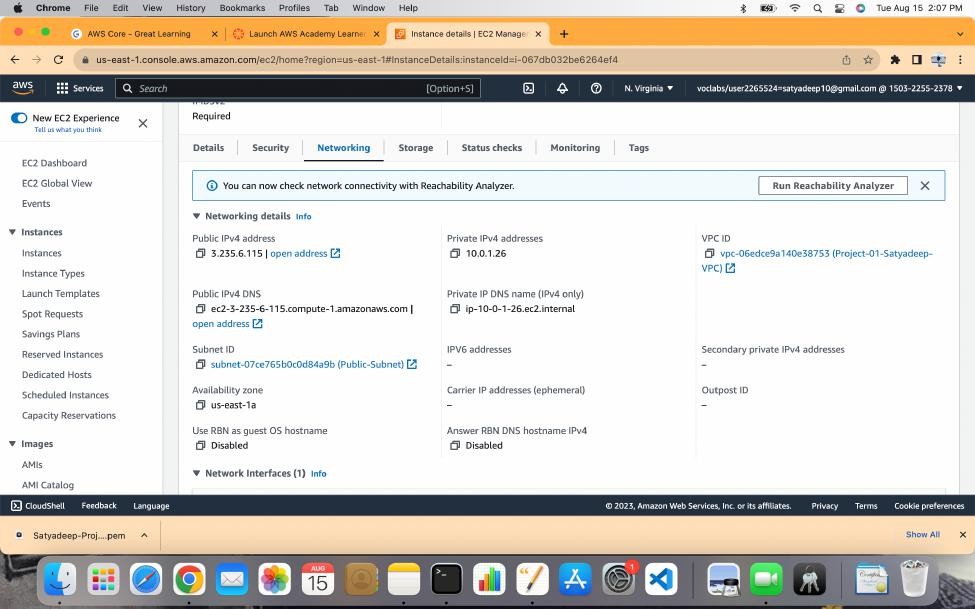
Expected screenshots

1. AMI used
2. Instance configuration screen
3. Security group rules
4. Instance after creation

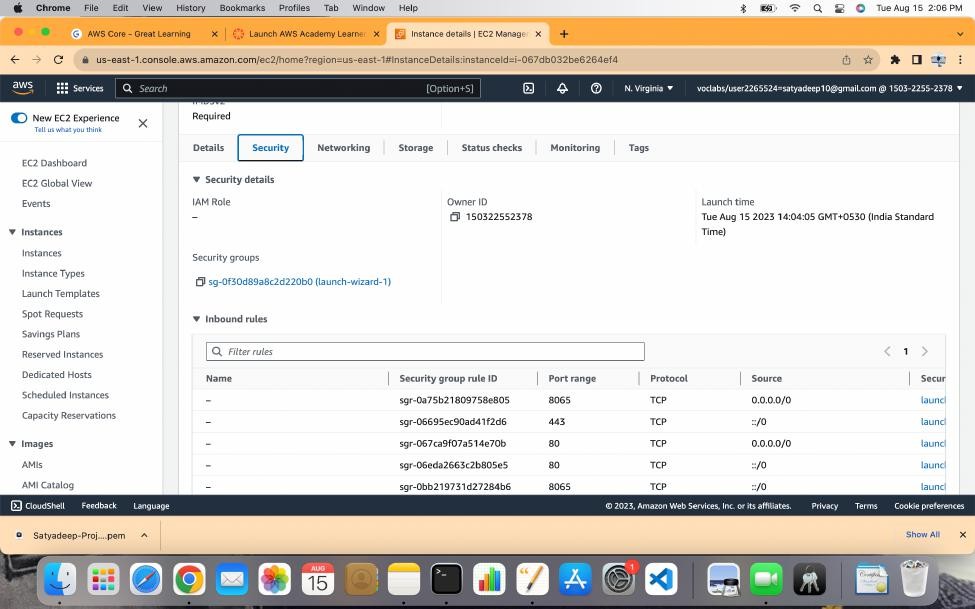
**<Insert screenshot a(1) here>**



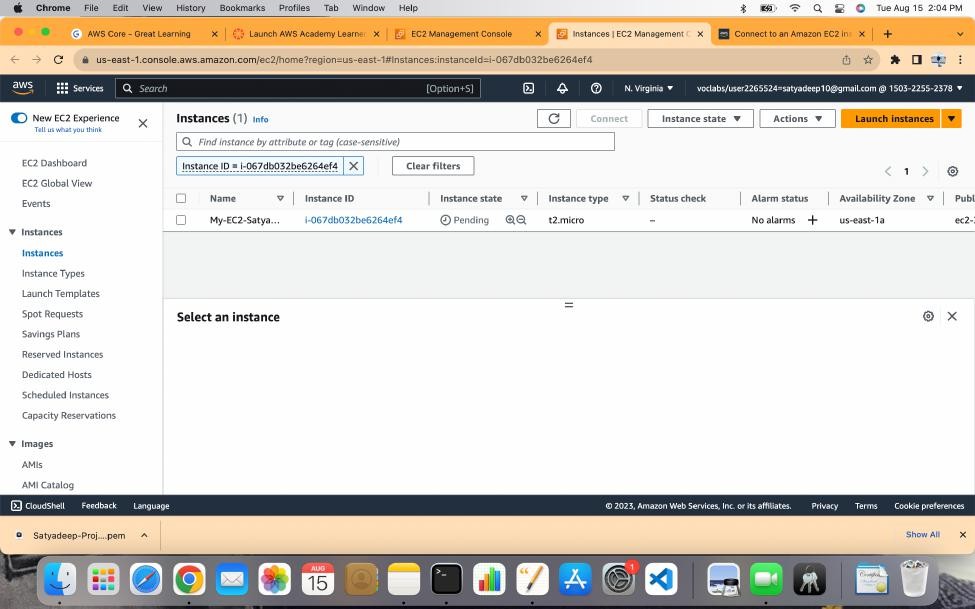
**<Insert screenshot a(2) here>**



**<Insert screenshot a(3) here>**



**<Insert screenshot a(4) here>**



Step number

Step name

b

Creation of database server

Instructions 1) Navigate to EC2 using the Services button at the top of the screen

1. Select Instances at the left side of the screen
2. Click on Launch Instance

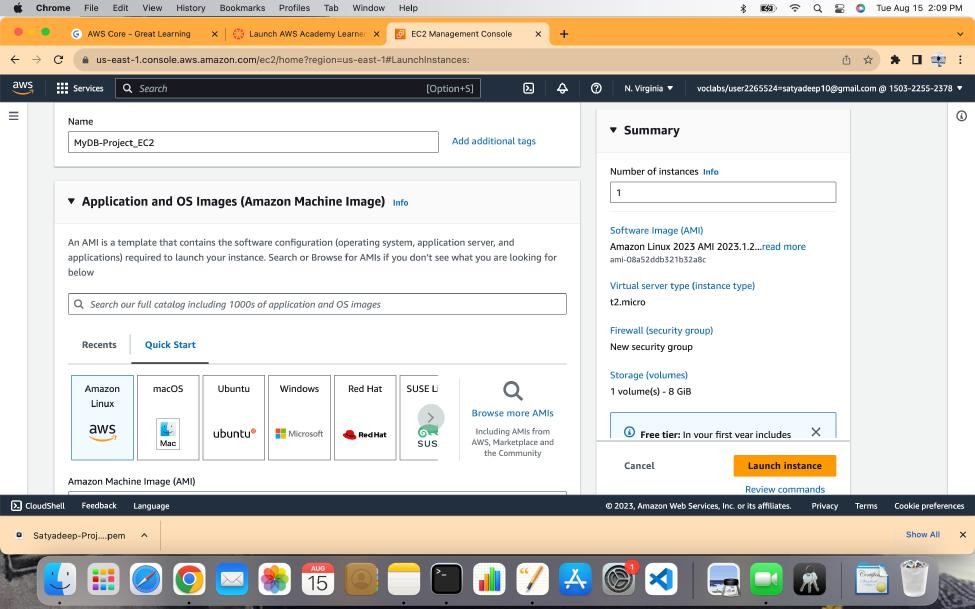
* Select the AMI Amazon 2 Linux
* Select the instance type t2.micro
* Select Network as "Project 1 VPC" and subnet as "Private Subnet"
* For the security group, open the ports 80, 443,22 and 3306 for source set to "Anywhere"

4) Launch the instance by selecting the same pem file created in the previous step

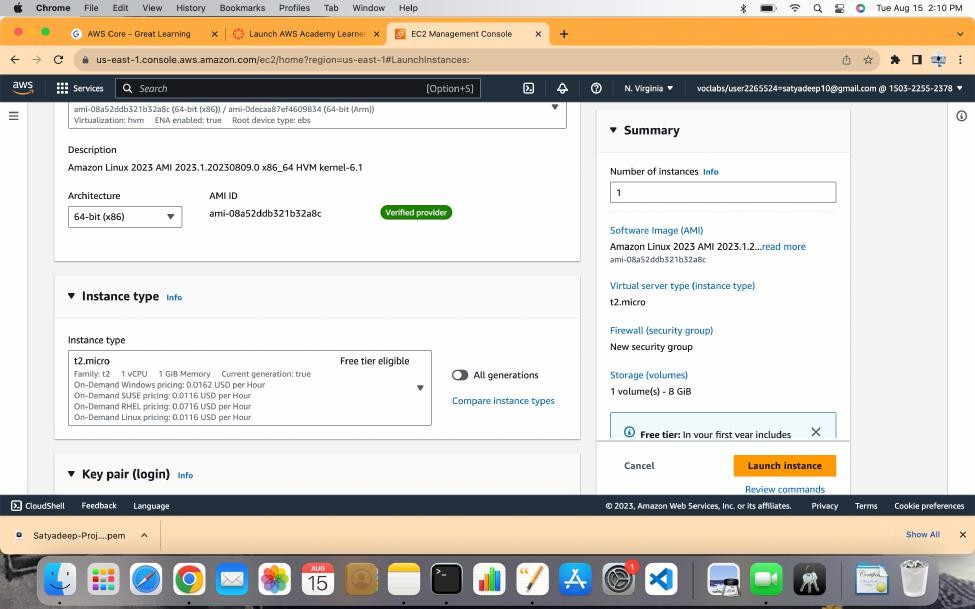
Expected screenshots

1. AMI used
2. Instance configuration screen
3. Security group rules
4. Instance after creation

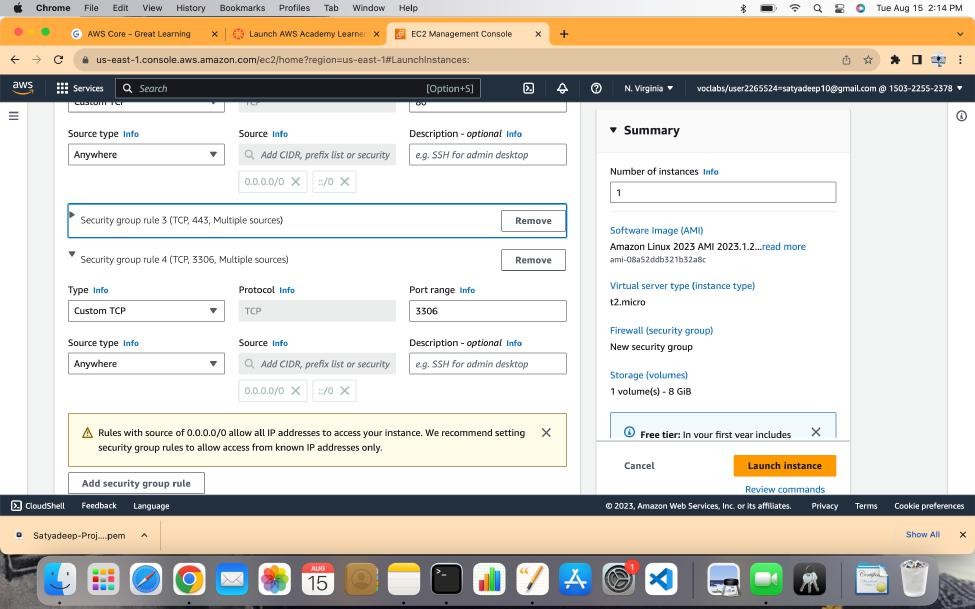
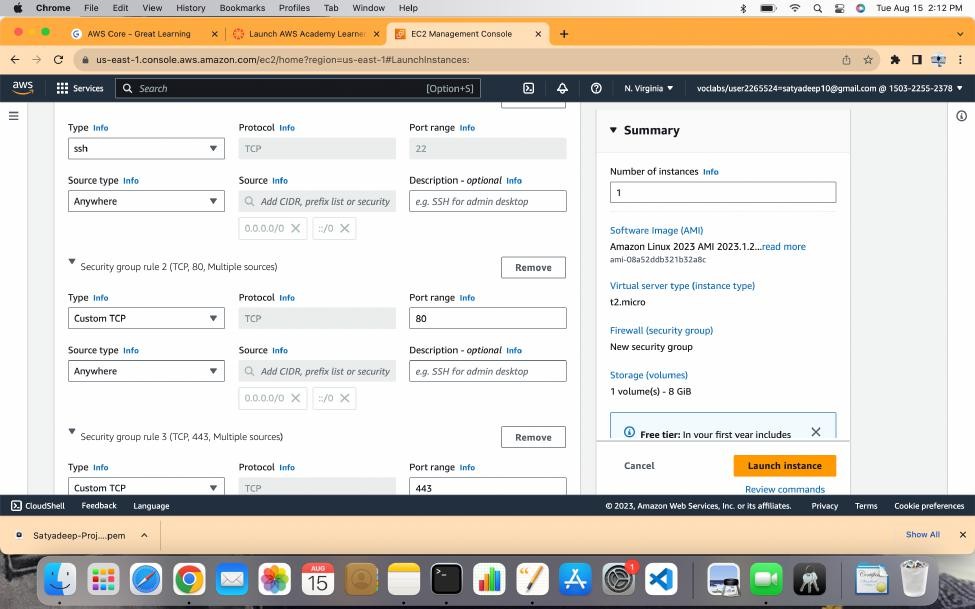
**<Insert screenshot b(1) here>**



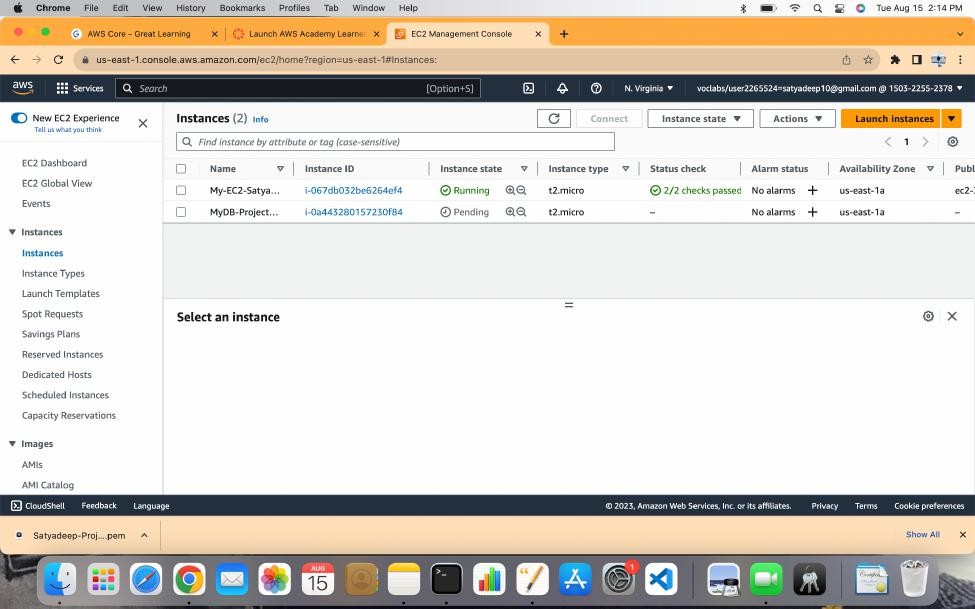
**<Insert screenshot b(2) here>**

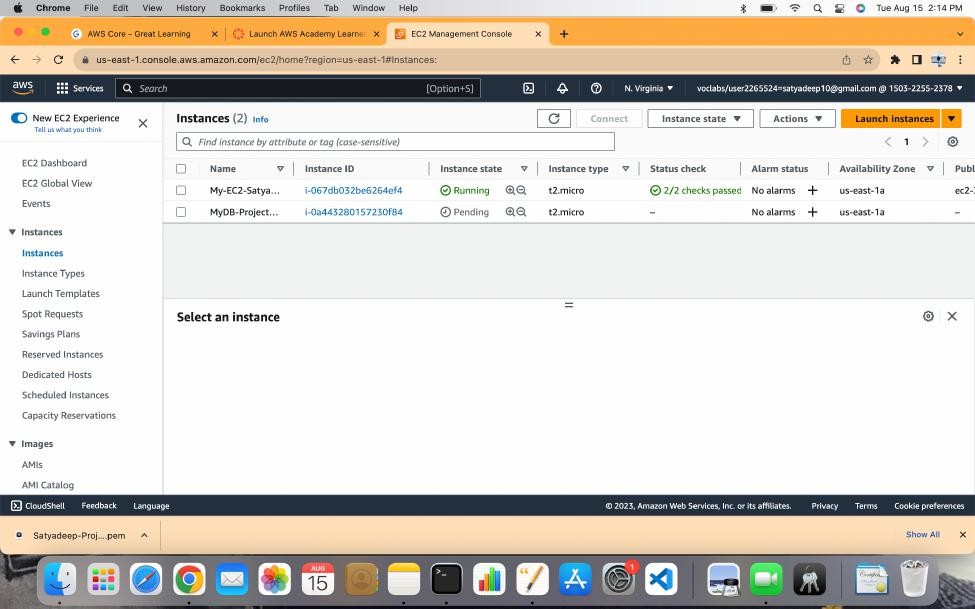
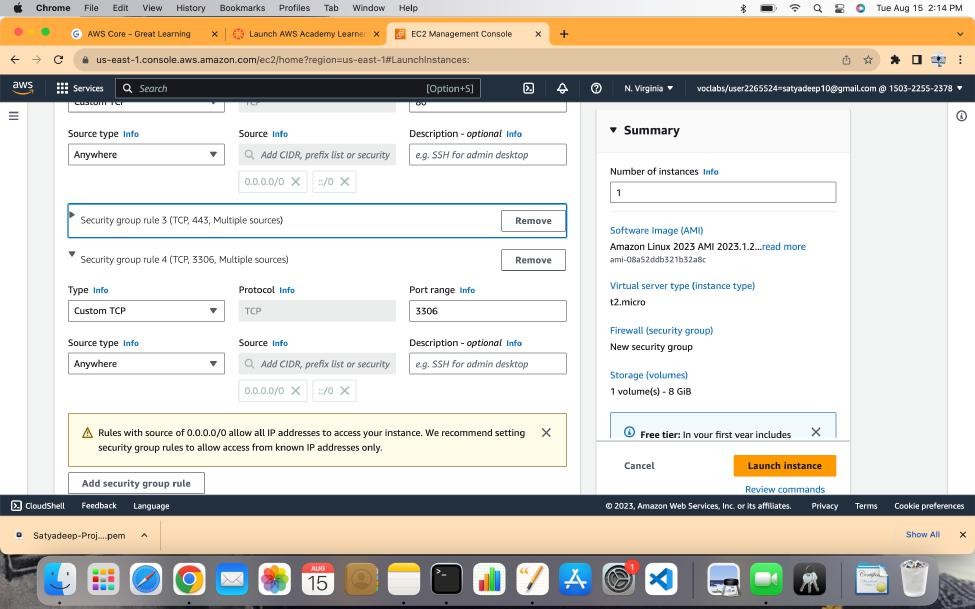
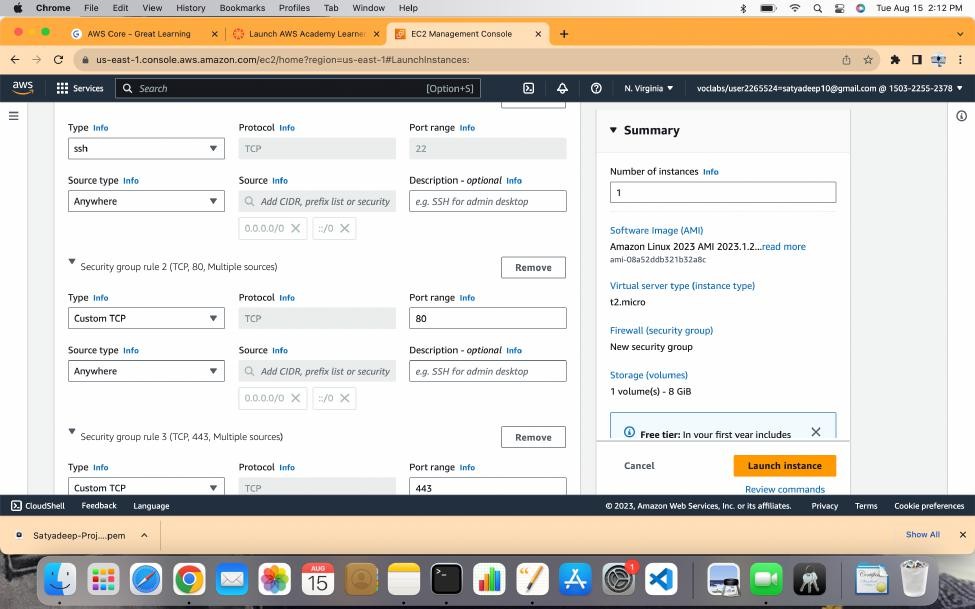
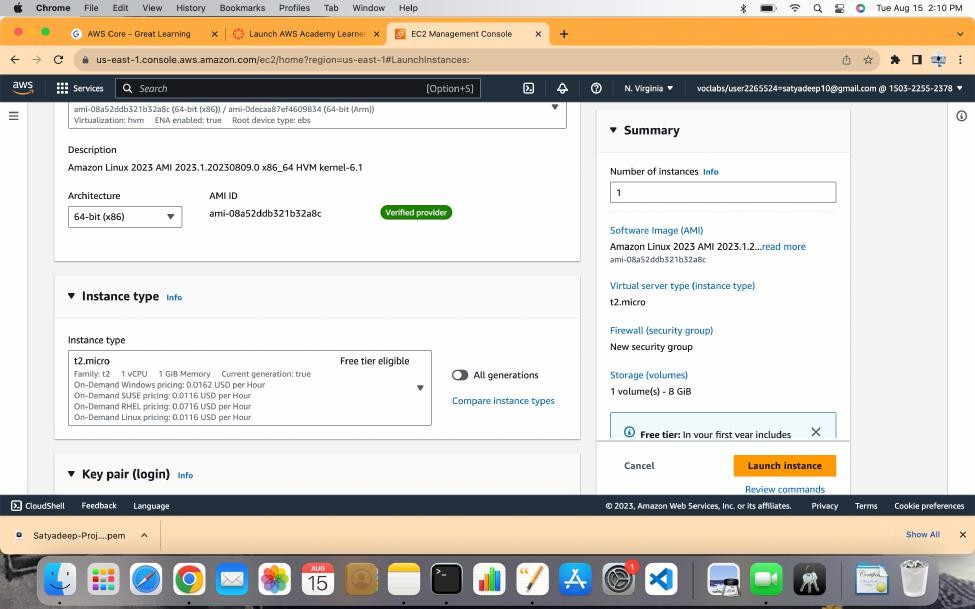
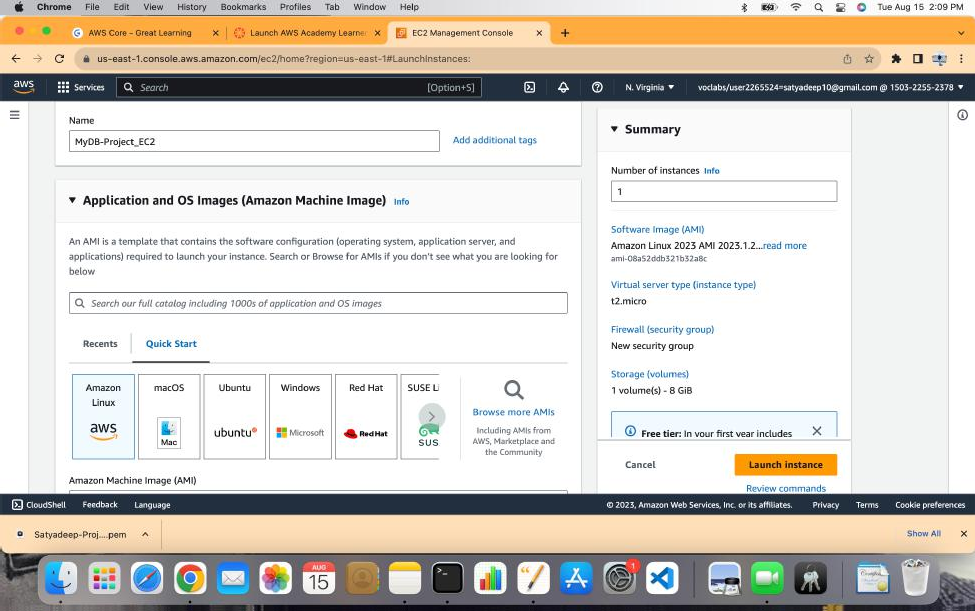
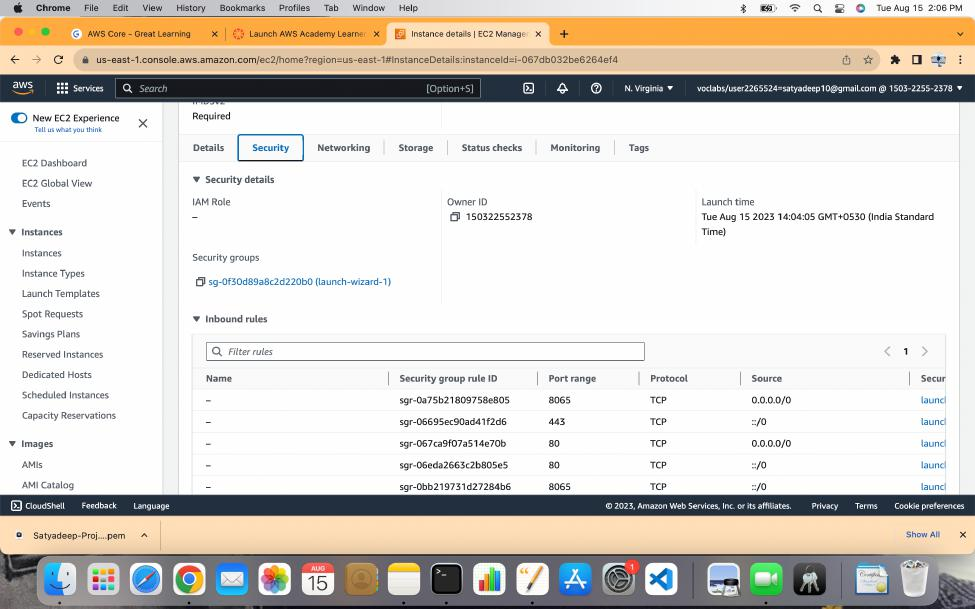
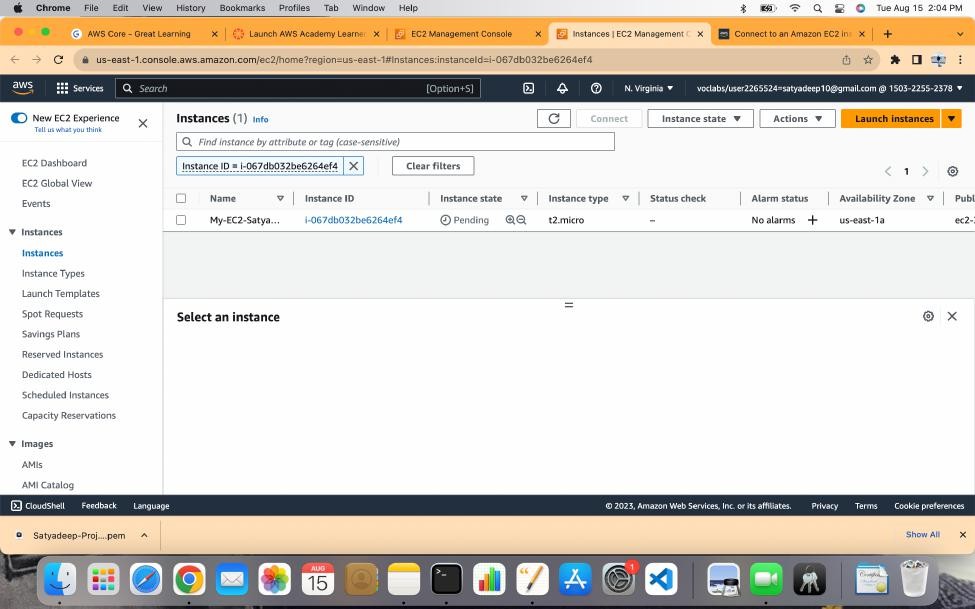
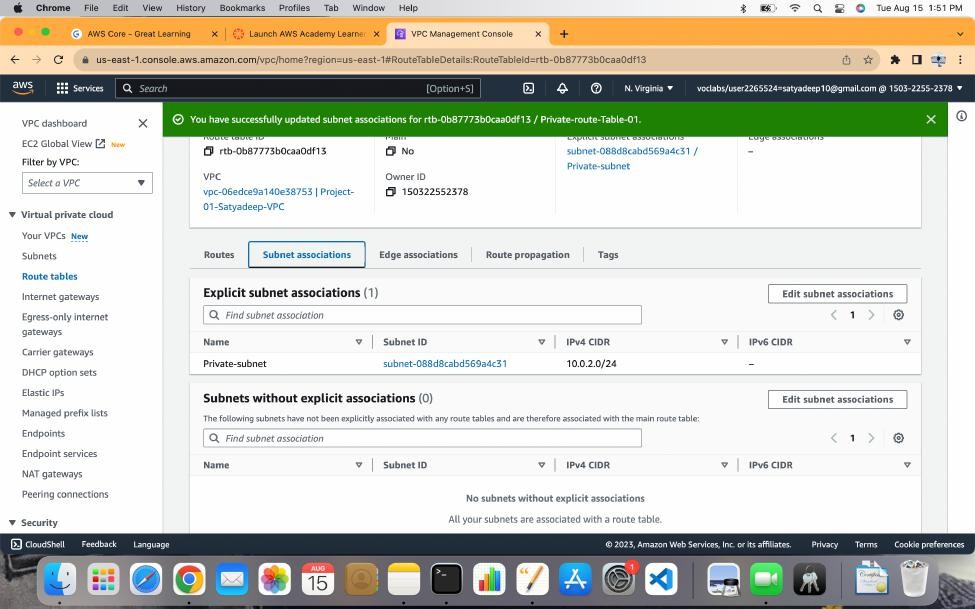
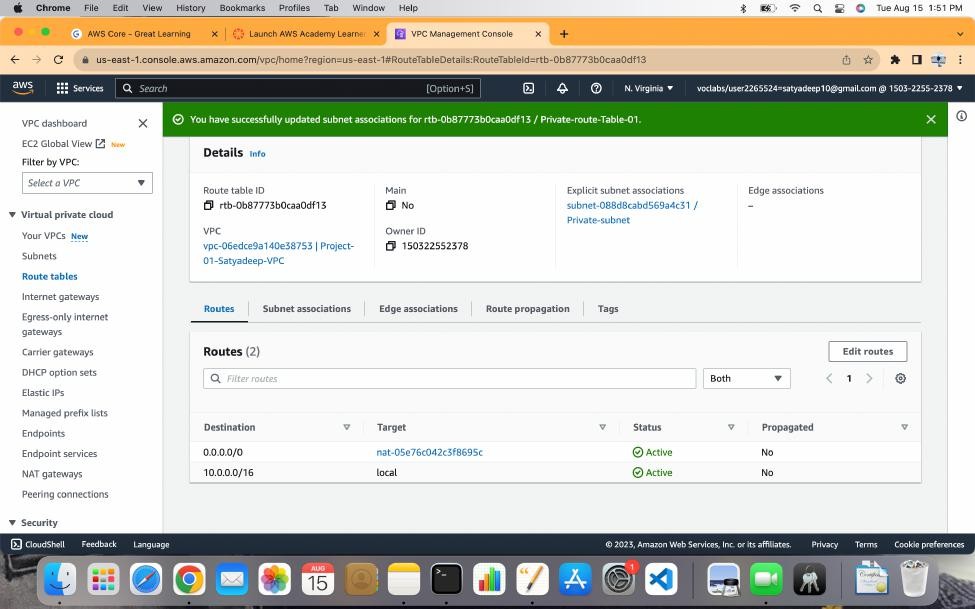
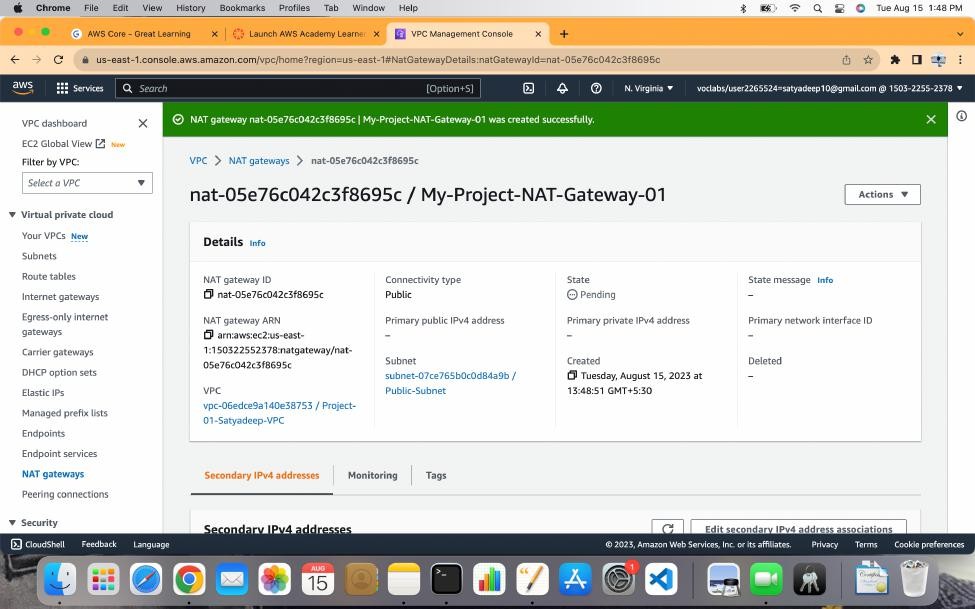
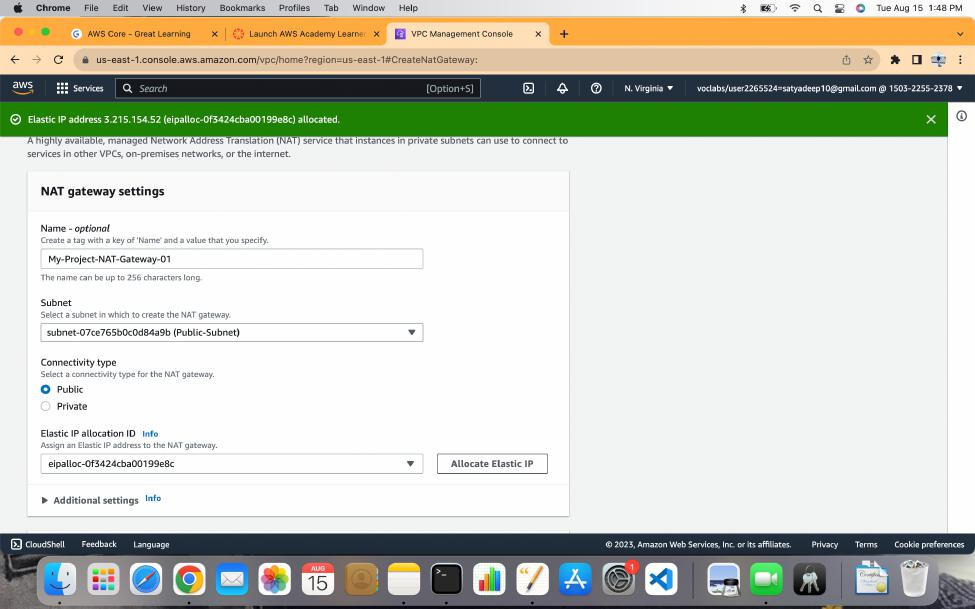
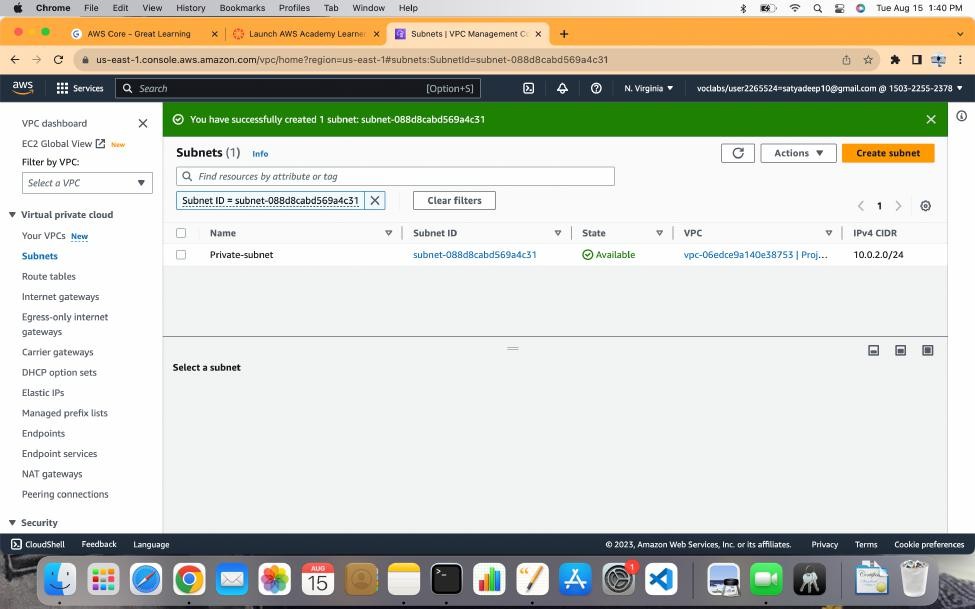
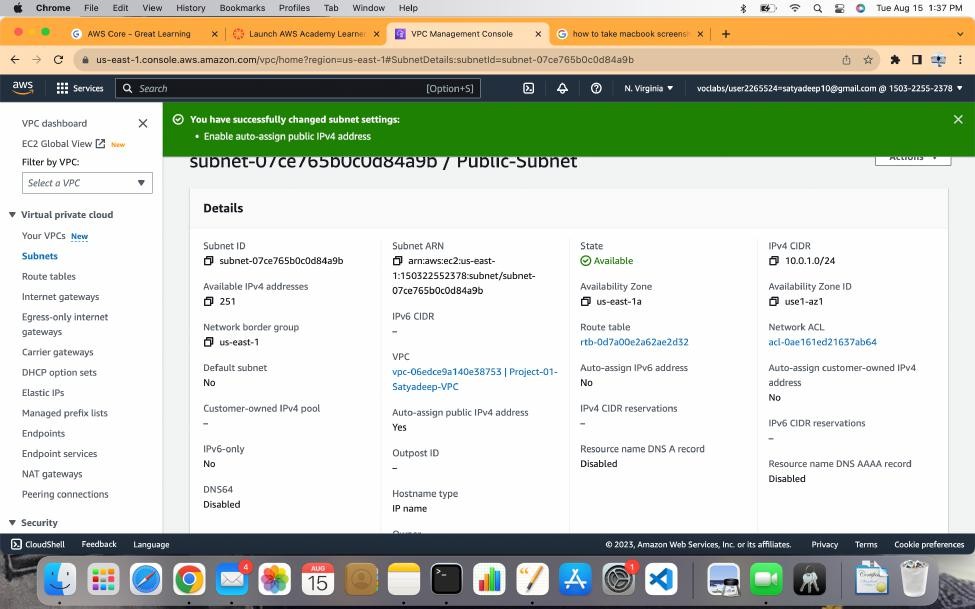
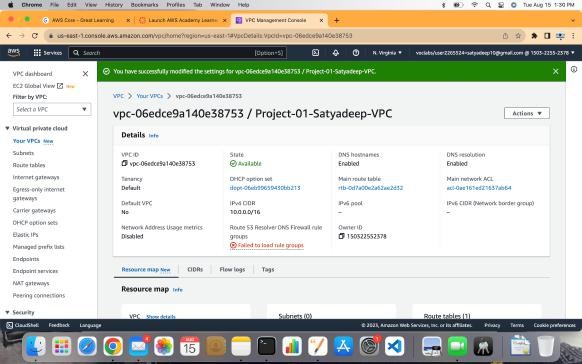


**<Insert screenshot b(3) here>**



**<Insert screenshot b(4) here>**





**Step 4: Application and Database Installation and Testing**

Step a

number

Step name Installation and configuration of MySQL

Instructions 1) Copy the database pem file into the application server using the below command *scp -i <application server pem file> <database server pem file > ec2-user@<application server public IP>:/home/ec2-user*

1. Log into the application server using SSH/Putty
2. From the application server, log into the database server using the pem file copied in step 1and the private IP address of the database server with the following command *ssh -i <database server pem file> ec2-user@<private IP of database server>*
3. Enter the following commands to install and configure MySQL on the database server

*sudo yum update*

*wget* [*http://dev.mysql.com/get/mysql57-community-release-el7-9.noarch.rpm*](http://dev.mysql.com/get/mysql57-community-release-el7-9.noarch.rpm) *sudo yum localinstall mysql57-community-release-el7-9.noarch.rpm -y*

*sudo yum install mysql-community-server -y --nogpgcheck sudo systemctl start mysqld.service*

Run the below command to retrieve a temporary password for MySQL

*sudo grep 'temporary password' /var/log/mysqld.log | rev | cut -d" " -f1 | rev | tr -d "."*

Log in to MySQL with the below command and enter the above password when prompted

*mysql -u root -p*

Enter the below command after you login to MySQL

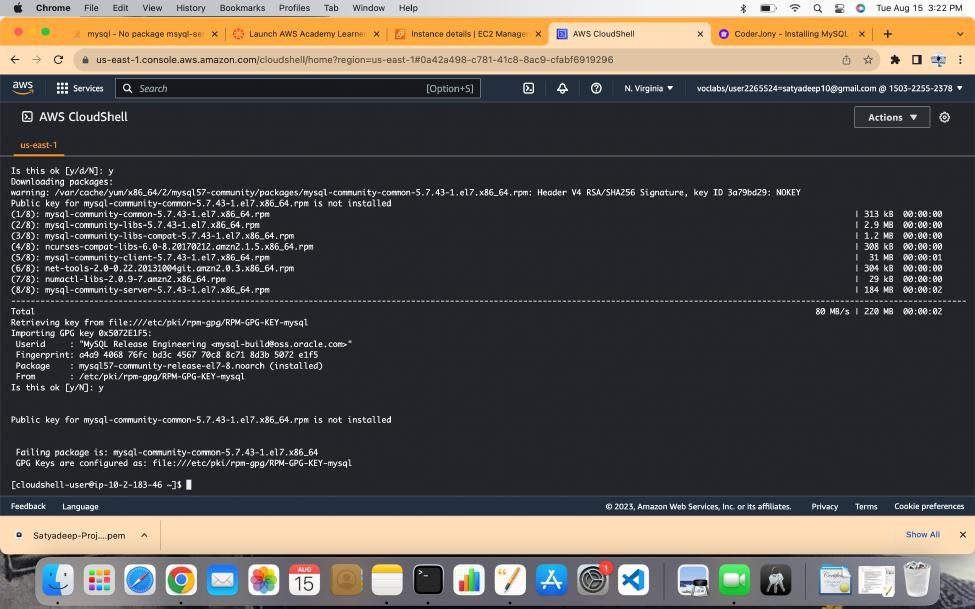
*ALTER USER 'root'@'localhost' IDENTIFIED BY 'Password42!';*

Type ‘exit’ into the MySQL prompt and press Enter to exit out of the MySQL environment. Enter the below commands to complete the setup. Ignore any warning messages you receive.

*wget https://d6opu47qoi4ee.cloudfront.net/install\_mysql\_linux.sh chmod 777 install\_mysql\_linux.sh*

*sudo ./install\_mysql\_linux.sh*

1. Type *exit* to exit the database server and go back to the application server



Expected screenshot s

1. Installation of MySQL
2. Retrieving the temporary password
3. Executing the provided script

## <Insert screenshot a(1) here>

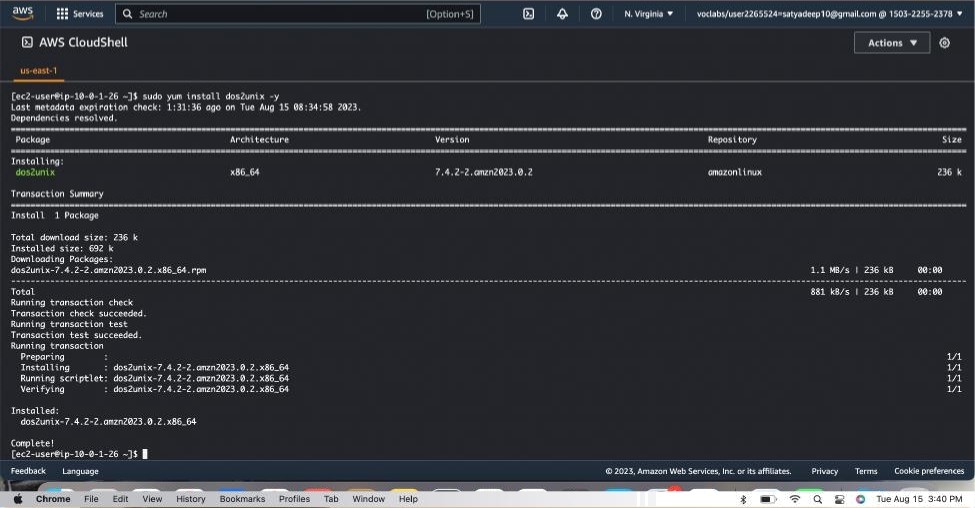
**<Insert screenshot a(2) here>**

**<Insert screenshot a(3) here>**

|  |
| --- |
| Step number b  Step name Installation and configuration of Mattermost |
| Instructions 1) Enter the following commands after logging into the application server via SSH to install and configure Mattermost  *wget https://d6opu47qoi4ee.cloudfront.net/install\_mattermost\_linux.sh sudo yum install dos2unix -y*  *sudo dos2unix install\_mattermost\_linux.sh*  *chmod 700 install\_mattermost\_linux.sh*  *sudo ./install\_mattermost\_linux.sh <private IP of MySQL server>*  Example : sudo ./*install\_mattermost\_linux* 173.65.34.7 *sudo chown -R mattermost:mattermost /opt/mattermost sudo chmod -R g+w /opt/mattermost*  *cd /opt/mattermost*  *sudo -u mattermost ./bin/mattermost*  2) Check whether the server has been successfully deployed by navigating to the following URL in your web browser. The web page might take a couple of minutes to load.  <public IP of the application server>:8065 |
| Expected 1) Executing the script screenshots 2) Starting the Mattermost server  3) Accessing the application via web browser |

**<Insert screenshot b(1) here>**

C g us-aast-1.consrge.awe.amazon.com/c1oudsheII/ficme°region us-east-0y0a42a4g 8-c7B1-'d tc8 -8ac9-cfa bf 6B192B6



C g us-east-1.consrge.awe.amazon.com/c1oudsheII/home°regiori us-east-0y0a42a4g 8- c7B1-•d tc8 -8ac9-cfa bf 6B19286

## <Insert screenshot b(2) here>

**<Insert screenshot b(3) here>**

**Step 5: Answer the following questions**

**Step 1:** Configure autoscaling group details

This step involves configuring settings for aspects such as monitoring, load balancers, and health check type.

**Step 2:** Configure scaling policies

# Some of the aspects that need configuration in this step include the number of instances needed, metric type, and target value. Users can also create alarms in this step.

**Step 3:** Configure notifications

# Here, users should select notifications that will be sent to a certain endpoint (e.g email) if specific events occur (e.g instance termination).

**Step 4:** Configure tags

# In this step, users should add new tags in the form of key-value pairs. These are used to identify a user’s group.

**Answer the following questions**

Q1 What is the default setting for DNS hostnames when a new VPC is created?

1. Enabled
2. Disabled
3. Can be set during VPC creation
4. Depends on the region used Enter your answer here

B

Q2 What is the term used for the machine when we use it to log into the database server?

1. Bastion Host
2. NAT Gateway
3. Tunnel Interface
4. SSH Gateway

Enter your answer here

A

Q3 The database server security group in this exercise has to keep port 3306 open.

Which protocol uses this port to communicate?

1. HTTPS
2. RDP
3. TCP
4. SCP

Enter your answer here

C

Q4 Which port is being used by Mattermost to communicate with the client application

a) 8080

b) 80

c) 443

d) 8065

Enter your answer here

D

Q5 Which of the following is a reason why we cannot set the CIDR block for the public subnet to 10.0.2.0/16, assuming the values for the other CIDR blocks are the same as mentioned in the instructions?

1. CIDR block overlaps with existing block
2. CIDR block is not a valid CIDR
3. CIDR block does not fall within the VPC
4. There is no reason, this is a perfectly valid CIDR Enter your answer here

A

Q6 Assume that you have been asked to create 3 EC2 instances - application server, the database server and NAT instance. Each of these instances have their own security groups with a set of ports to be kept open. One of those ports is entirely unnecessary for the given architecture to function. Which of the ports given in the option below could it be?

1. Port 22 on the NAT instances
2. Port 3306 on the database server
3. Port 443 on the NAT instance
4. Port 22 on the application server Enter your answer here

A

Q7 Describe the steps you would take to increase security of the servers you have deployed so that they are not reachable from external sources

1. Secure VPC : Create new VPCs and then defines custom route tables for each VPC as all other resources in your AWS account depend on it to communicate and exchange information.

1. Security groups: assign one or more security groups to your instance, then add rules to each security group to allow specific types of traffic to your instance.
2. Make use of IAM roles : create an IAM role and assign it to your EC2 instance. Configure IAM role to provide secure access to another AWS resource, such as an S3 bucket,
3. Protect EC2 instance against malware : Code is take from genuine source and AMI is from trusted source. Os and app are on latest patch. Anti-marlware is installed

Q8 Describe the steps required to deploy the given application in an autoscaling environment

**Step 1:** Choose AMI

This step involves choosing the AMI that

was created above.

**Step 2:** Choose instance type

# In this step, users should choose instance types that suit their need.

**Step 3:** Configure details

# This involves giving the launch configuration a name depending on the project you are working on. In this step, you can also enable monitoring and select the purchasing option.

**Step 4:** Add storage

# This step involves creating the storage settings for your instance.

**Step 5:** Configure security group

# Here, users should select a security group that will be attached automatically when a new instance is launched.

**Step 6:** Review

|  |  |
| --- | --- |
| **Grades distribution** |  |
| MCQs | 6 (1 mark each) |
| Subjective questions | 20 marks  (10+10) |
| Implementation screenshots | 24 marks (1 marks each) |
| Total | 50 marks |