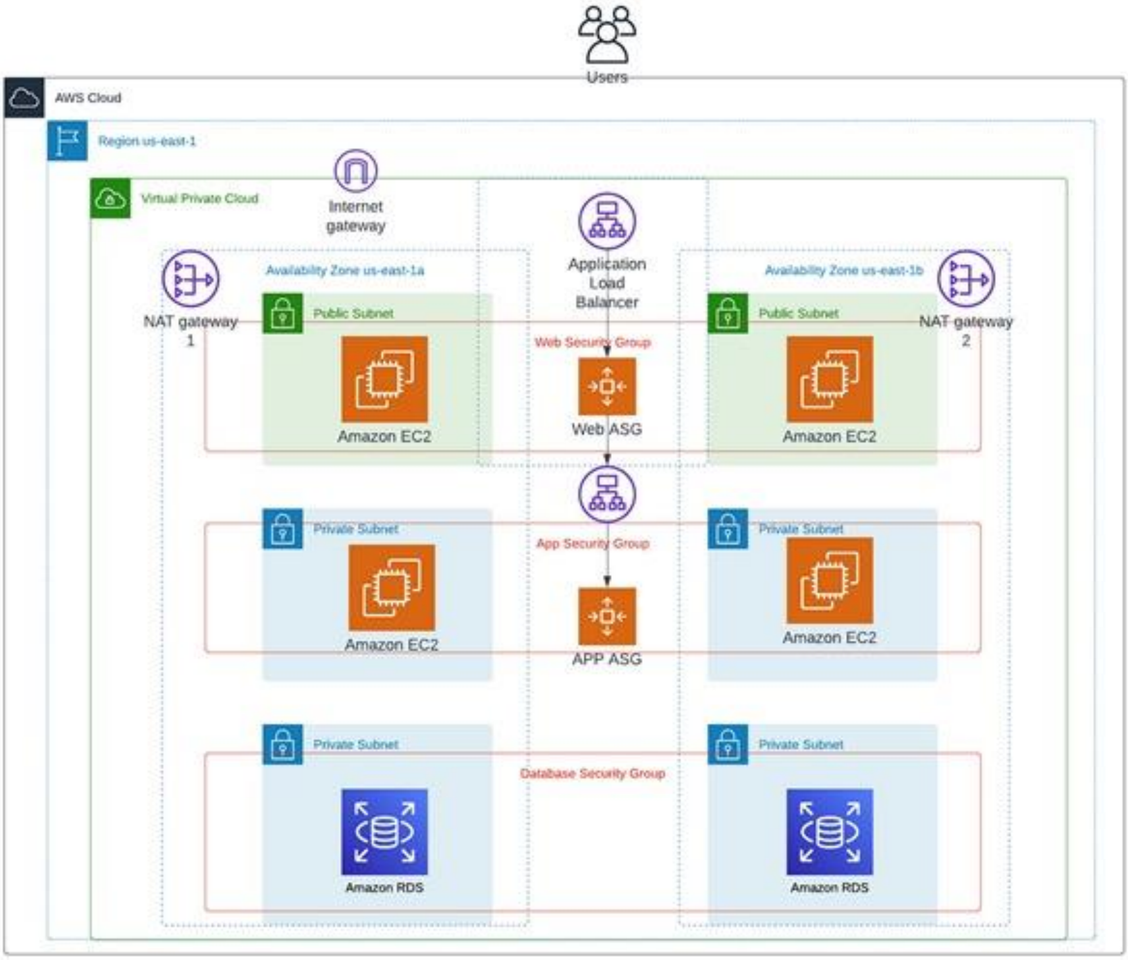
Project-1

Building a 3-tier web application architecture with AWS

Name: Mulam Hema Gnana Prasuna Gargeye

Gmail: hemaprasu29@gmail.com



Intro

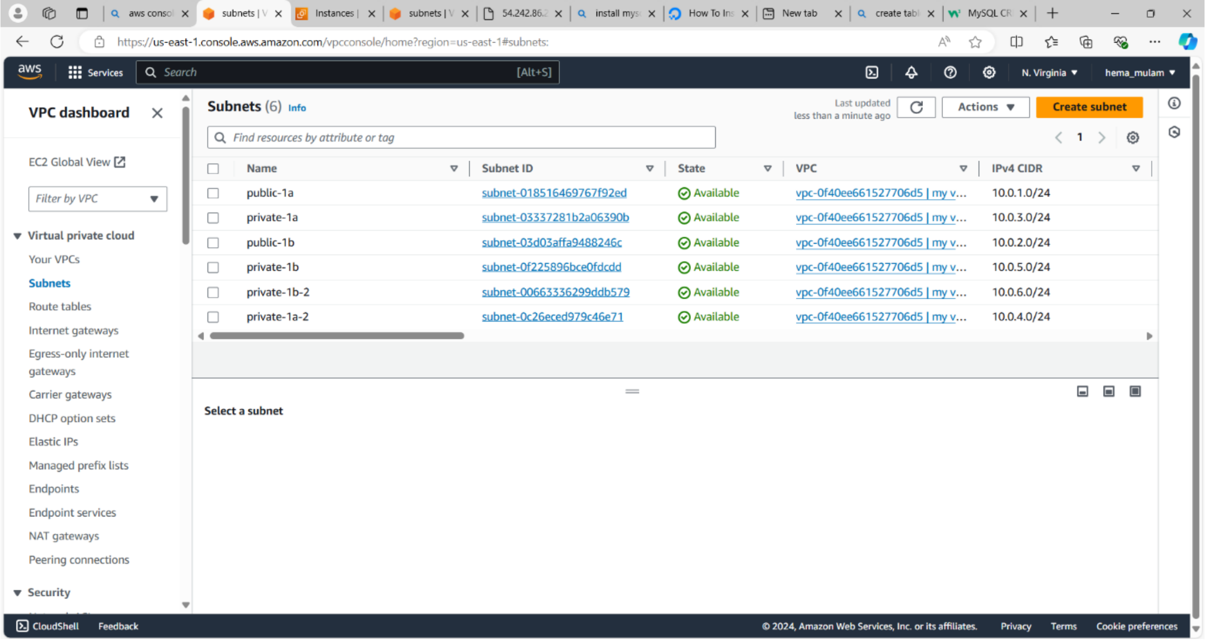
When building a cloud-based application, the underlying architecture and environment are just as critical as the application itself. There are many considerations when deciding on the proper architecture of your app:

1. **Scalability:** How easily and/or frequently does the app need to scale up or down? How much value do you put into not having to constantly micro-manage and monitor resource usage?
2. **Availability:** How readily available is your app? How important is being able to go through long periods of time without failures? If failure does occur in a part of your app, how vulnerable is the rest?
3. **Security:** How secure is your app? How does your app handle security permissions for different parts of your app? If an attack happens in one part of your app, how vulnerable is the rest?

Required AWS Services:

1) Virtual Private Cloud (Subnets – 6, Internet gate way – 1, Route tables – 2, Nat gate way – 1)
2) Elastic cloud Compute (EC2)
3) Load Balancer
4) Auto- Scaling Group
5) Relational Database Service (RDS)

Create VPC :



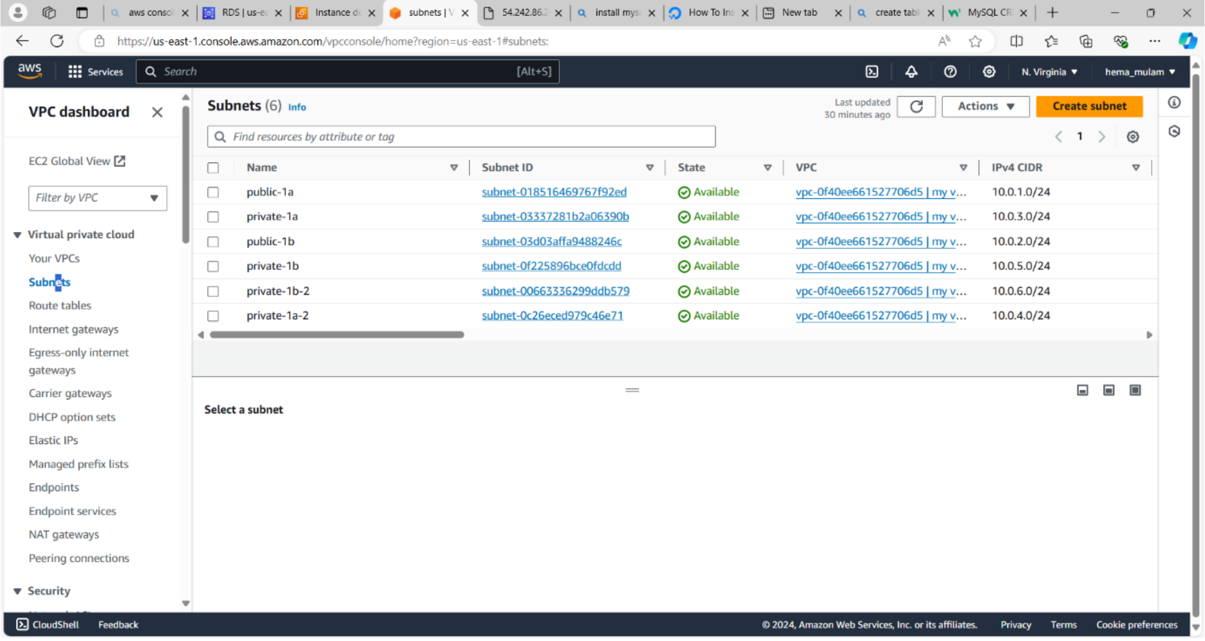
https://us-east-1.console.aws.amazon.com/vpcconsole/home?region=us-east-1#subnets:

Subnets (6) Info

Name	Subnet ID	State	VPC	IPv4 CIDR
public-1a	subnet-018516469767f92ed	Available	vpc-0f40ee661527706d5 | my v...	10.0.1.0/24
private-1a	subnet-03337281b2a06390b	Available	vpc-0f40ee661527706d5 | my v...	10.0.3.0/24
public-1b	subnet-03d03affa9488246c	Available	vpc-0f40ee661527706d5 | my v...	10.0.2.0/24
private-1b	subnet-0f225896bce0fdcdd	Available	vpc-0f40ee661527706d5 | my v...	10.0.5.0/24
private-1b-2	subnet-00663336299ddb579	Available	vpc-0f40ee661527706d5 | my v...	10.0.6.0/24
private-1a-2	subnet-0c26eced979c46e71	Available	vpc-0f40ee661527706d5 | my v...	10.0.4.0/24

- Go to VPC dashboard click on create VPC.
- Click on VPC only and name tag as my-project-1.
- Give IPV4 CIDR (classless inter domain routing) as 10.0.0.0/16.
- Click on VPC, it is created.

CREATE SUBNETS :



Subnets (6)

Name	Subnet ID	State	VPC	IPv4 CIDR
public-1a	subnet-018516469767f92ed	Available	vpc-0f40ee661527706d5 | my v...	10.0.1.0/24
private-1a	subnet-03337281b2a06390b	Available	vpc-0f40ee661527706d5 | my v...	10.0.3.0/24
public-1b	subnet-03d03affa9488246c	Available	vpc-0f40ee661527706d5 | my v...	10.0.2.0/24
private-1b	subnet-0f225896bce0fdcdd	Available	vpc-0f40ee661527706d5 | my v...	10.0.5.0/24
private-1b-2	subnet-00663336299ddb579	Available	vpc-0f40ee661527706d5 | my v...	10.0.6.0/24
private-1a-2	subnet-0c26eced979c46e71	Available	vpc-0f40ee661527706d5 | my v...	10.0.4.0/24

- Create 6 subnets (2-public, 4-private).
- Create first subnet.
- Click on subnet, click on create subnet, select our VPC (my-project-1).
- Give name tag as my-public-subnet-east-1a, select availability zone as us-east-1a. Give CIDR as 10.0.1.0/24 and created it.

- Create Second subnet.
- Click on subnet, click on create subnet, select our VPC (my-project-1).
- Give name tag as my-public-subnet-east-1b, select availability zone as us-east-1b. Give CIDR as 10.0.2.0/24 and created it.

Create Third subnet.

- Click on subnet, click on create subnet, select our VPC (my-project-1).

- Give name tag as private-subnet-east-1a-1, select availability zone as us-east-1a. Give CIDR as 10.0.3.0/24 and created it.

Create fourth subnet.

- Click on subnet, click on create subnet, select our VPC (my-project-1).

- Give name tag as my-private-subnet-1a-2, select availability zone as us-east-1a. Give CIDR as 10.0.4.0/24 and created it.

Create FIFTH subnet.

- Click on subnet, click on create subnet, select our VPC (my-project-1).

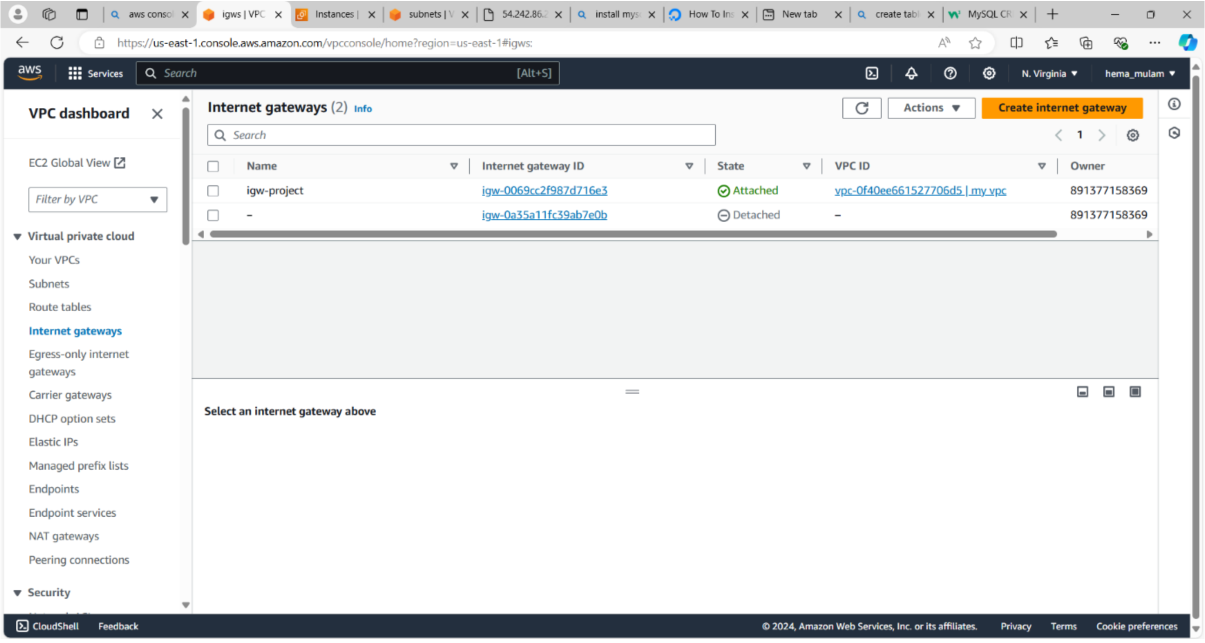
- Give name tag as my-private-subnet-1b-1, select availability zone as us-east-1b. Give CIDR as 10.0.5.0/24 and created it.

Create SIXTH subnet.

- Click on subnet, click on create subnet, select our VPC (my-project-1).

- Give name tag as private-subnet-1b-2, select availability zone as us-east-1b. Give CIDR as 10.0.6.0/24 and created it.

Create internet gateway, name tag as my-project-1



https://us-east-1.console.aws.amazon.com/vpcconsole/home?region=us-east-1#igws:

Internet gateways (2) Info

□	Name	Internet gateway ID	State	VPC ID	Owner
□	igw-project	igw-0069cc2f987d716e3	Attached	vpc-0f40ee661527706d5 | my vpc	891377158369
□	-	igw-0a35a11fc39ab7e0b	Detached	–	891377158369

Select an internet gateway above

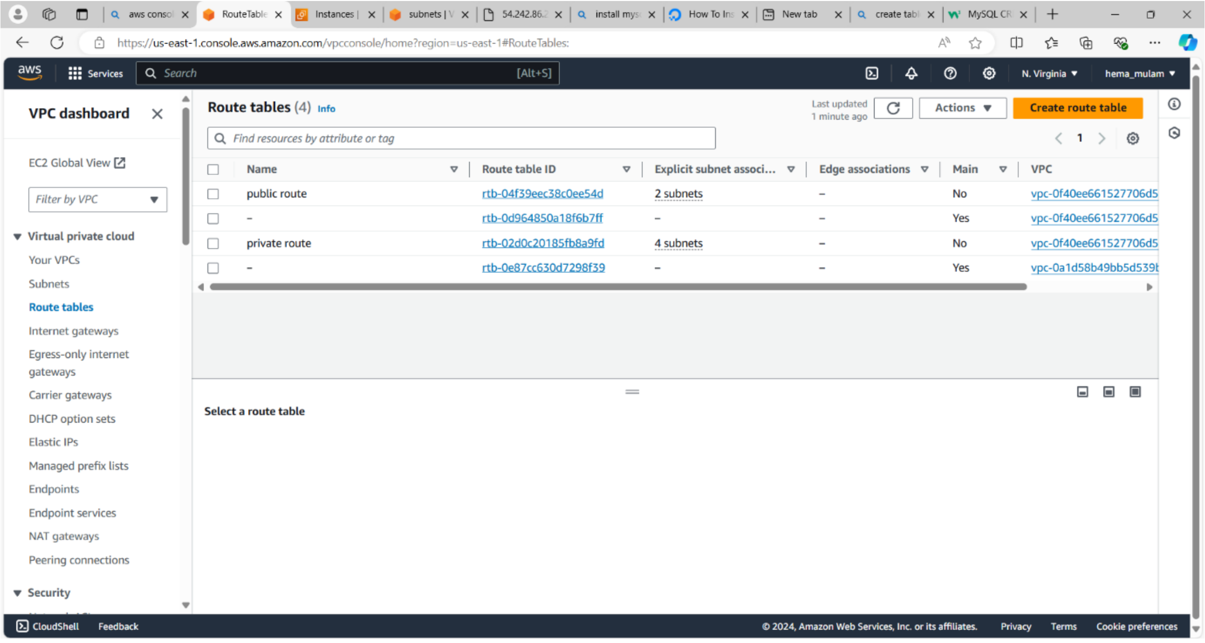
This internet gateway is attached to VPC.

- Go to actions in internet gate way and click on attach to VPC

- Select our VPC (my-project-1). Click on attach internet gateway. Click on attach internet gateway.

CREATE ROUTE TABLE :- give name as my-public-rt

- Select our VPC (my-project-1), create it. Click on route table id, open it.
- Go down click on edit subnet association.
- Select both public subnet and click on save association. Go to actions click on edit routes.
- Click on add routes give all traffic (0.0.0.0/0) and select our internet gateway, save changes.



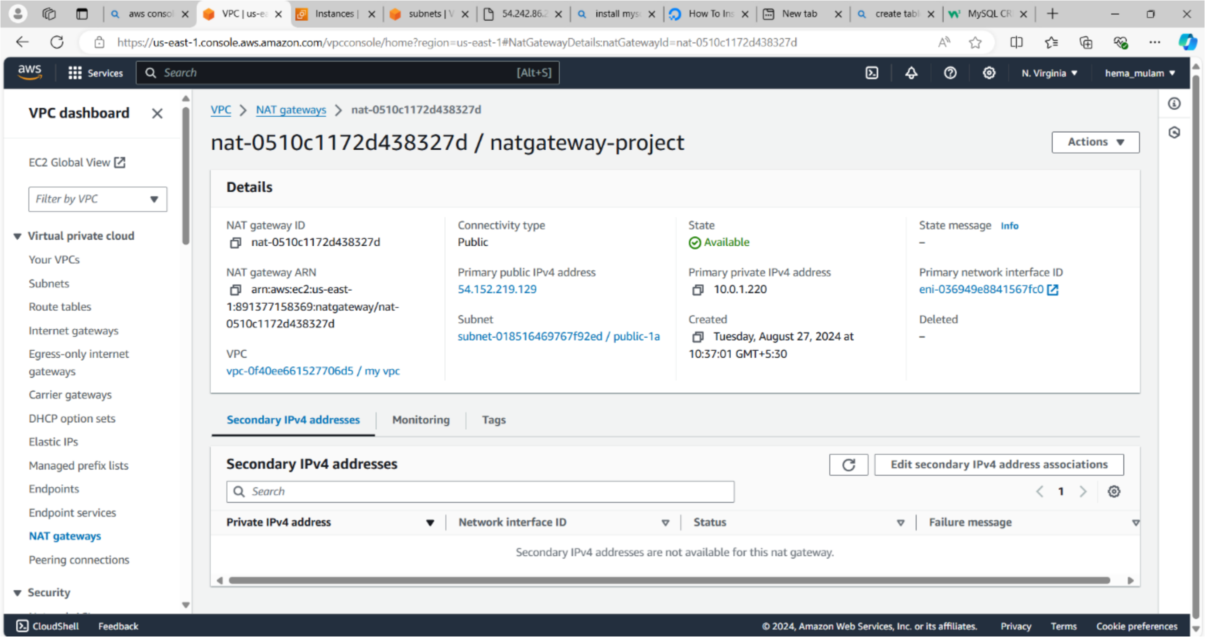
Route tables (4) Info

Name	Route table ID	Explicit subnet associ...	Edge associations	Main	VPC
public route	rtb-04f39eec38c0ee54d	2 subnets	–	No	vpc-0f40ee661527706d5
-	rtb-0d964850a18f6b7ff	–	–	Yes	vpc-0f40ee661527706d5
private route	rtb-02d0c20185fb8a9fd	4 subnets	–	No	vpc-0f40ee661527706d5
-	rtb-0e87cc630d7298f39	–	–	Yes	vpc-0a1d58b49bb5d539b

Create Private route table name as private-rt.

- Select our VPC, (my-project-1), create it.
- Click on route table id, open it.
- Go down click on edit subnet association.
- Select all private subnet and click on save association.
- Create NAT gateway, give name as project-1-natgt.
- Select public subnet(private-subnet-1a).

- Select connectivity type as IPV4.
- Click on allocate Elastic IP



VPC > NAT gateways > nat-0510c1172d438327d

nat-0510c1172d438327d / natgateway-project

Details

NAT gateway ID nat-0510c1172d438327d	Connectivity type Public	State Available	State message Info –
NAT gateway ARN arn:aws:ec2:us-east-1:891377158369:natgateway/nat-0510c1172d438327d	Primary public IPv4 address 54.152.219.129	Primary private IPv4 address 10.0.1.220	Primary network interface ID eni-036949e8841567fc0
VPC vpc-0f40ee661527706d5 / my vpc	Subnet subnet-018516469767f92ed / public-1a	Created Tuesday, August 27, 2024 at 10:37:01 GMT+5:30	Deleted –

Secondary IPv4 addresses

Private IPv4 address	Network interface ID	Status	Failure message

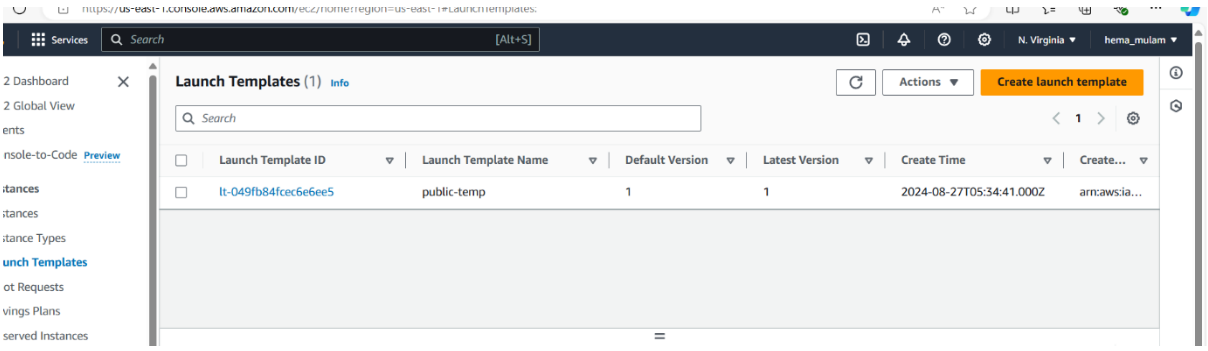
Secondary IPv4 addresses are not available for this nat gateway.

Now go to private route and click on actions.

- Click on edit routes and add route.
- Give all traffic (0.0.0.0/0) and select NAT gateway.

Create Autoscaling group.

- For creating autoscaling group we need to create an launch template.
- Click on create a launch template.
- Template name as my-project-1-template-1.
- Create Another Template as my-template-2.



Launch Templates (1)

Launch Template ID	Launch Template Name	Default Version	Latest Version	Create Time	Create...
lt-049fb84fcec6e6ee5	public-temp	1	1	2024-08-27T05:34:41.000Z	arn:aws:ia...

- After creating two templates go to auto scaling groups

- Give name as autoscaling-public-east-1a for 1st one & Give name as private-autoscaling-group-template for 2nd one .

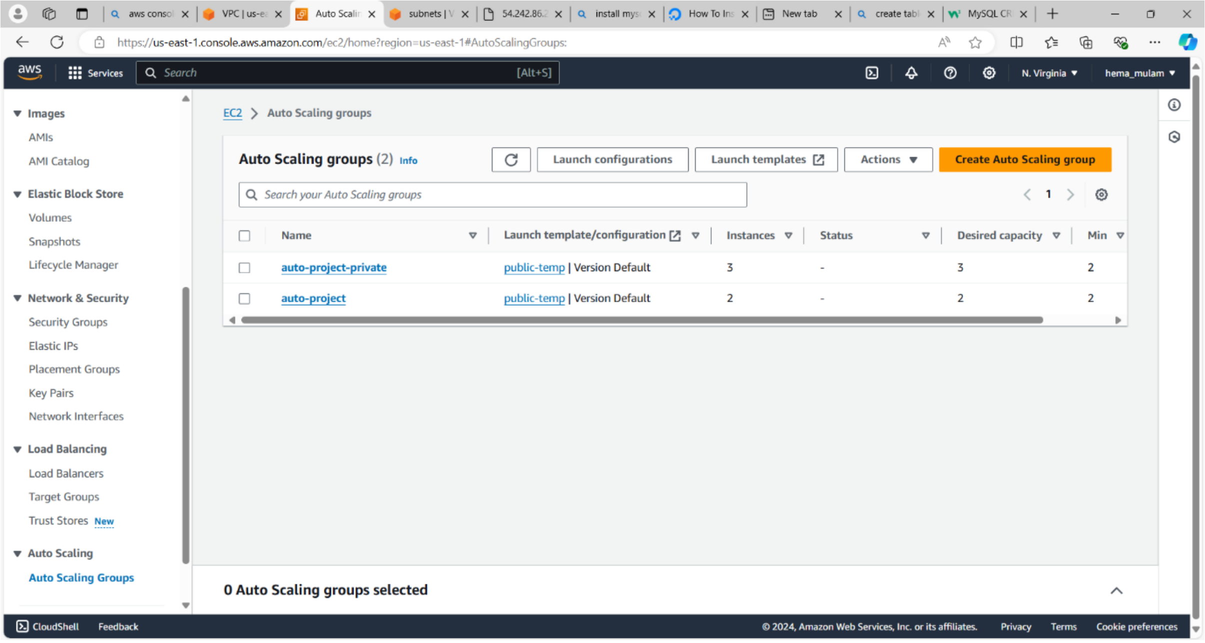
- Choose the created launch template (my-project-1-template-1) and click on next.

- Select our VPC (my-project-1), and both public subnets for autoscaling-public-east-1a .

Select our VPC (my-project-1), and both private subnets for autoscaling-group-template .

- Create two auto scaling groups.

- at the time of creating auto scaling groups automatically we will create load balancer & target groups & Ec2 instances.



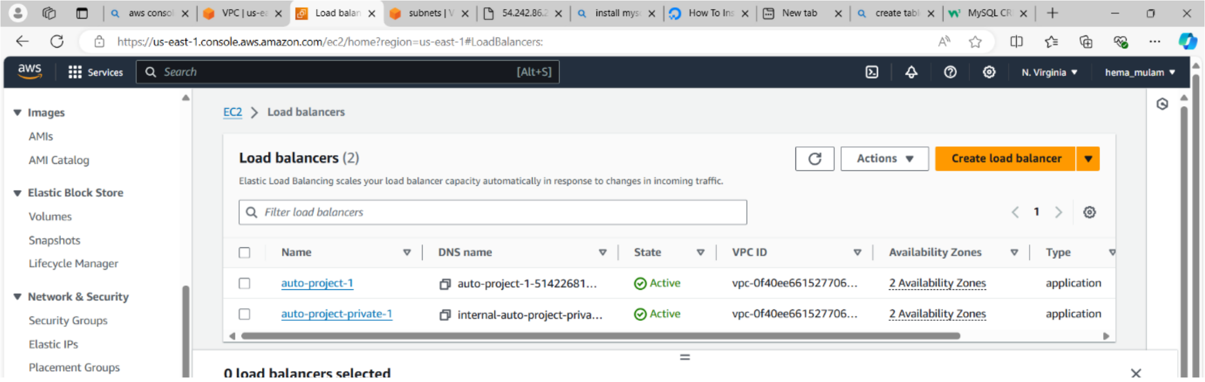
https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#AutoScalingGroups:

EC2 > Auto Scaling groups

Auto Scaling groups (2) Info

☐	Name	Launch template/configuration	Instances	Status	Desired capacity	Min
☐	auto-project-private	public-temp | Version Default	3	-	3	2
☐	auto-project	public-temp | Version Default	2	-	2	2

0 Auto Scaling groups selected



https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#LoadBalancers:

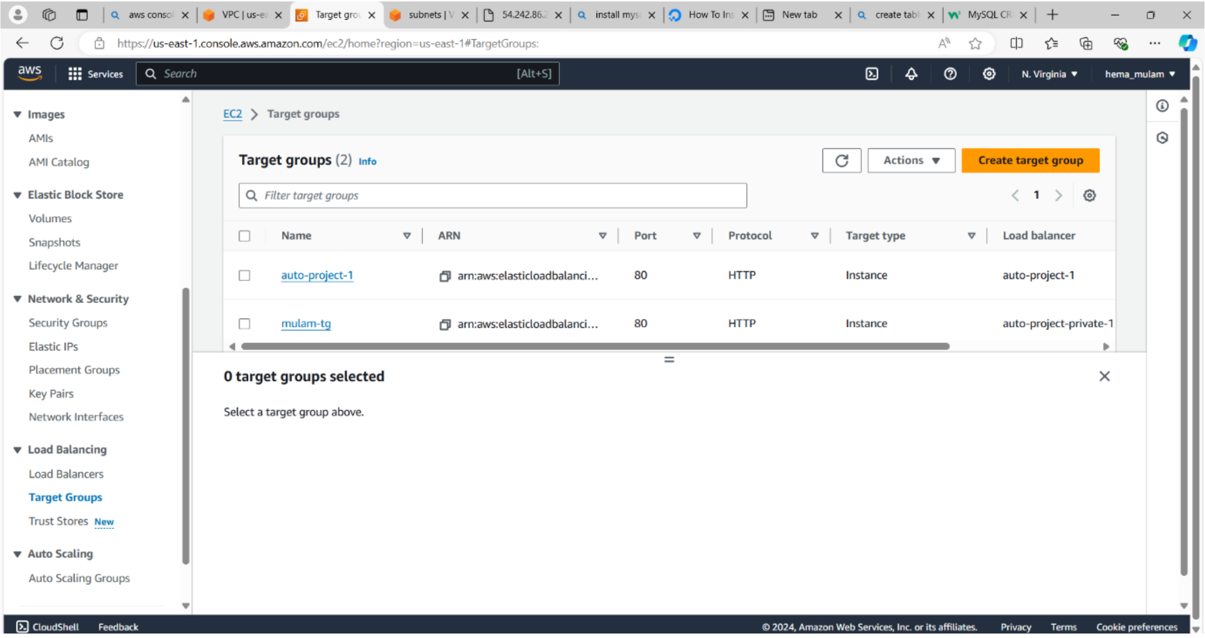
EC2 > Load balancers

Load balancers (2)

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

☐	Name	DNS name	State	VPC ID	Availability Zones	Type
☐	auto-project-1	auto-project-1-51422681...	Active	vpc-0f40ee661527706...	2 Availability Zones	application
☐	auto-project-private-1	internal-auto-project-priva...	Active	vpc-0f40ee661527706...	2 Availability Zones	application

0 load balancers selected



https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#TargetGroups:

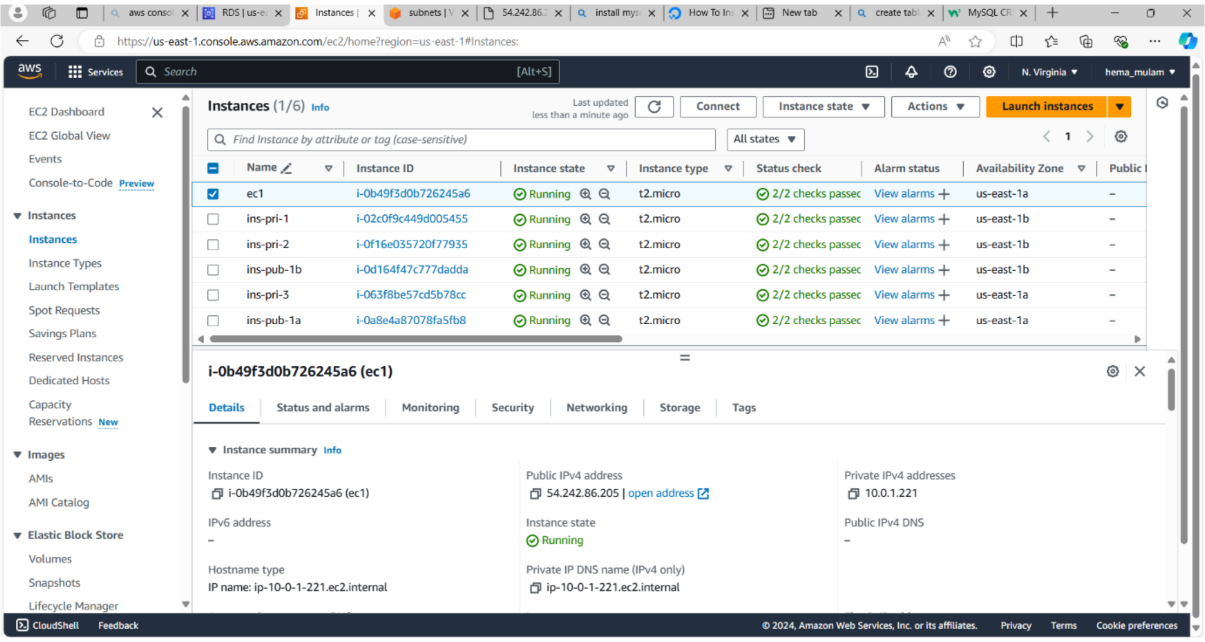
EC2 > Target groups

Target groups (2) Info

Name	ARN	Port	Protocol	Target type	Load balancer
auto-project-1	arn:aws:elasticloadbalanci...	80	HTTP	Instance	auto-project-1
mulam-tg	arn:aws:elasticloadbalanci...	80	HTTP	Instance	auto-project-private-1

0 target groups selected

Select a target group above.



https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#Instances:

Instances (1/6) Info

	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public I
☑	ec1	i-0b49f3d0b726245a6	Running	t2.micro	2/2 checks passec	View alarms	us-east-1a	–
□	ins-pri-1	i-02c0f9c449d005455	Running	t2.micro	2/2 checks passec	View alarms	us-east-1b	–
□	ins-pri-2	i-0f16e035720f77935	Running	t2.micro	2/2 checks passec	View alarms	us-east-1b	–
□	ins-pub-1b	i-0d164f47c777dadda	Running	t2.micro	2/2 checks passec	View alarms	us-east-1b	–
□	ins-pri-3	i-063f8be57cd5b78cc	Running	t2.micro	2/2 checks passec	View alarms	us-east-1a	–
□	ins-pub-1a	i-0a8e4a87078fa5fb8	Running	t2.micro	2/2 checks passec	View alarms	us-east-1a	–

i-0b49f3d0b726245a6 (ec1)

Instance summary Info

Instance ID: i-0b49f3d0b726245a6 (ec1)

Public IPv4 address: 54.242.86.205 | open address

Private IPv4 addresses: 10.0.1.221

IPv6 address: –

Instance state: Running

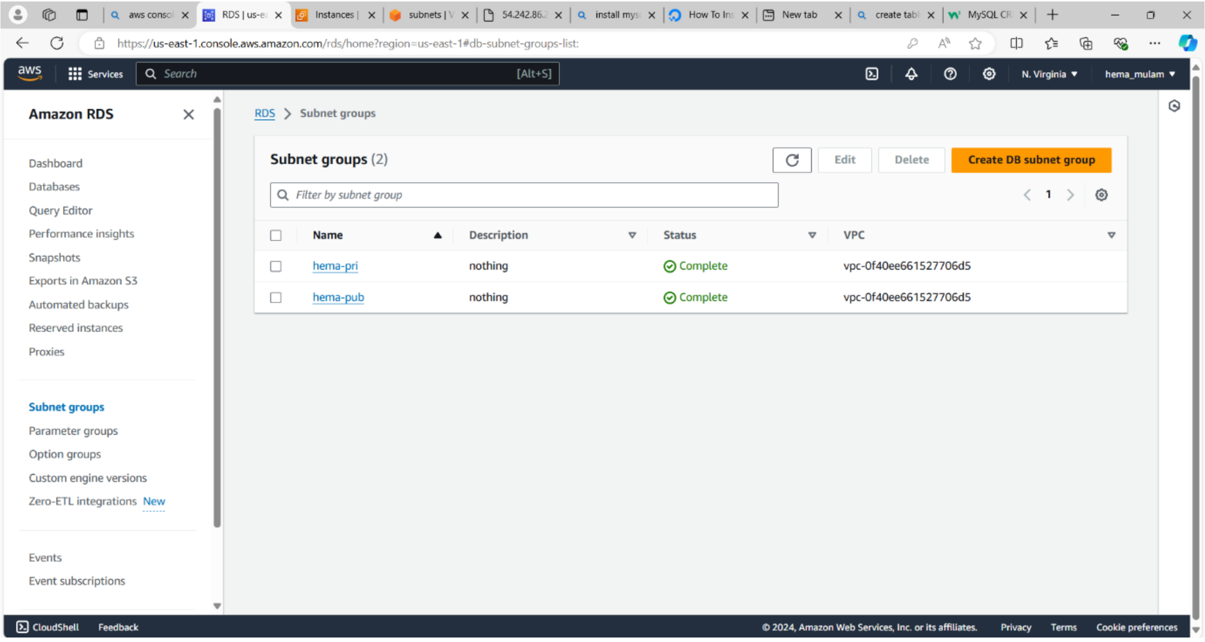
Public IPv4 DNS: –

Hostname type: IP name: ip-10-0-1-221.ec2.internal

Private IP DNS name (IPv4 only): ip-10-0-1-221.ec2.internal

Create subnet groups

- Give name as project-1-su-grp and description nothing.
- Select created VPC .
- Give availability zones and select private subnets from each zone.
- Create the DB subnet group.



RDS > Subnet groups

Subnet groups (2)

Name	Description	Status	VPC
hema-pri	nothing	Complete	vpc-0f40ee661527706d5
hema-pub	nothing	Complete	vpc-0f40ee661527706d5

Create Database(RDS)

- Click on create database, select standard create, select engine type as MySQL.

- Select templates as production and select multi-AZ DB cluster.

- Select on self-managed, give password and confirm the password.

- Select memory optimized class.

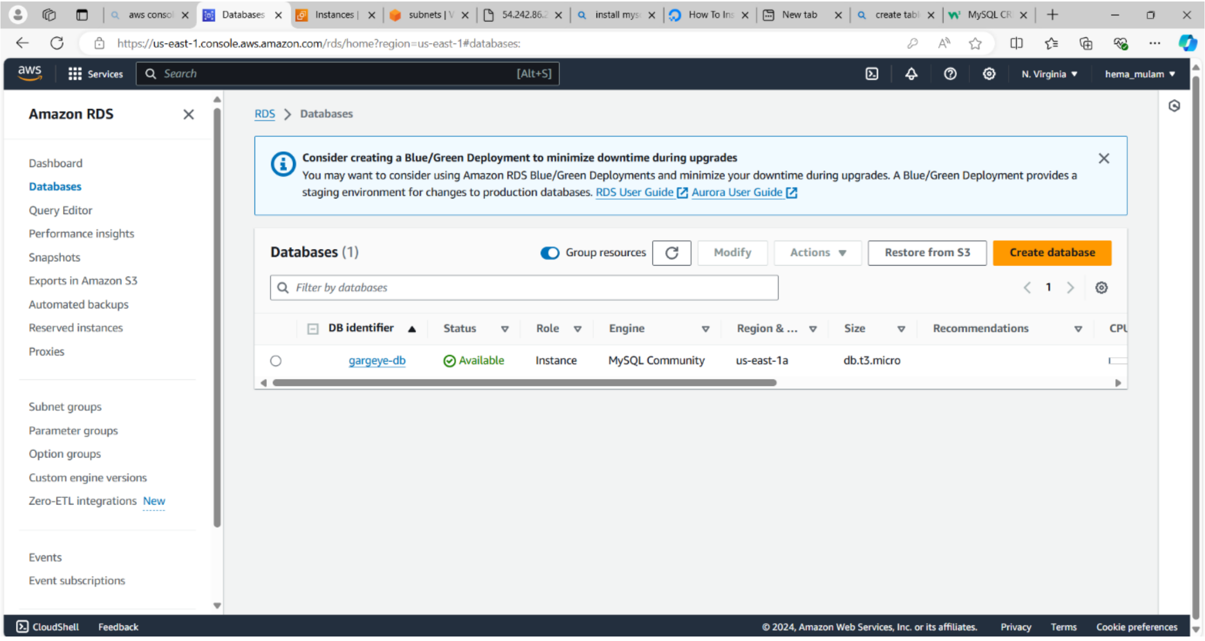
- In connectivity, click on Don’t connect to the EC2 compute resource and select created vpc (my-project-1).

- Select subnet group (extra) and give public access as yes.

- Choose existing security group (PUBLIC).

- Go to VPC dashboard, click on VPC, click on actions, go to edit VPC settings and click on the enable DNS hostnames.

- Create the database.



https://us-east-1.console.aws.amazon.com/rds/home?region=us-east-1#databases:

RDS > Databases

Consider creating a Blue/Green Deployment to minimize downtime during upgrades
You may want to consider using Amazon RDS Blue/Green Deployments and minimize your downtime during upgrades. A Blue/Green Deployment provides a staging environment for changes to production databases. RDS User Guide Aurora User Guide

Databases (1)

DB identifier	Status	Role	Engine	Region & ...	Size	Recommendations	CPU
gargeye-db	Available	Instance	MySQL Community	us-east-1a	db.t3.micro		

Establish connection

• Go to EC2 instance, click on public-east-1a, through public instance we will connect to private instance through pem file and connect to private instance and after that .

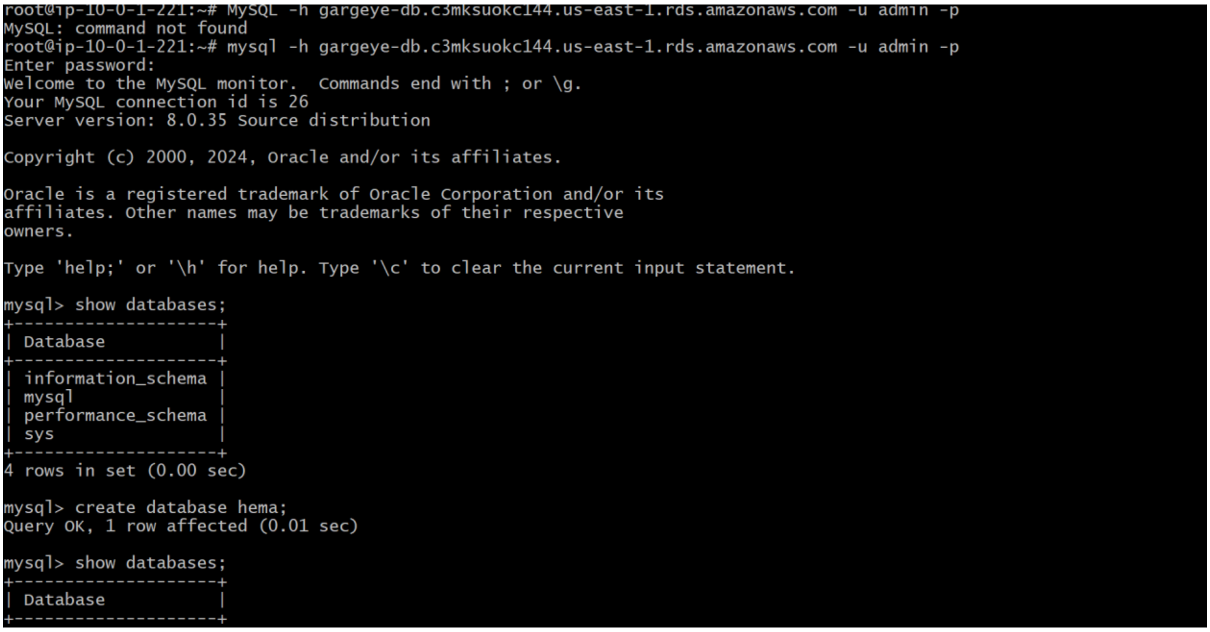
. Give commands as:

1. sudo -i (convert from normal user to root user).

2. apt update -y

3. sudo apt install mysql-server (to install mysql).

• after installig mysql connect to rds server through the RDS EndPoint and provide user name and password .



```
root@ip-10-0-1-221:~# MySQL -h gargeye-db.c3mksuokc144.us-east-1.rds.amazonaws.com -u admin -p
MySQL: command not found
root@ip-10-0-1-221:~# mysql -h gargeye-db.c3mksuokc144.us-east-1.rds.amazonaws.com -u admin -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 26
Server version: 8.0.35 Source distribution

Copyright (c) 2000, 2024, Oracle and/or its affiliates.

Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

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

mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
4 rows in set (0.00 sec)

mysql> create database hema;
Query OK, 1 row affected (0.01 sec)

mysql> show databases;
+--------------------+
| Database           |
+--------------------+
```

Now we can see that we are connected to MySQL server.

Use commands like:

- show databases; (to show the list of databases are there)
- create database project; (to create a new database)
- use project (database).
- create a table using this command

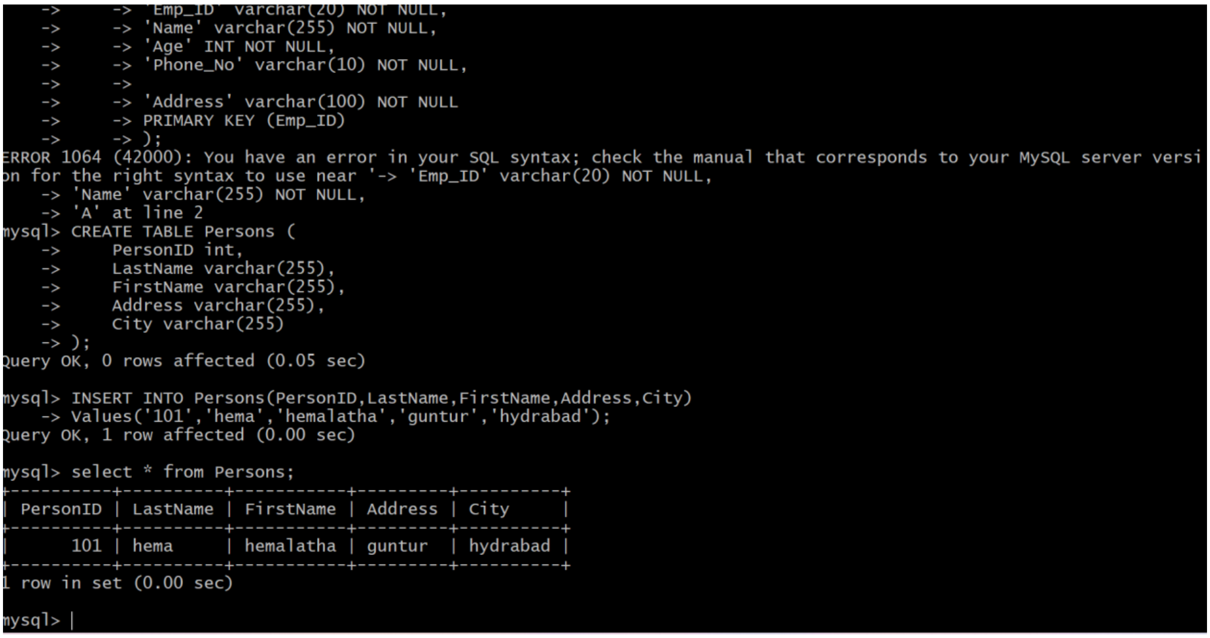
```
CREATE TABLE Reddy (
    PersonID int,
    LastName varchar(255),
    FirstName varchar(255),
    Address varchar(255),
    City varchar(255)
);
```

Insert the fiels and the values

INSERT INTO Reddy (PersonID, LastName, FirstName, Address, City)

Values ('101', 'Pakkireddy', 'palla', 'cherukucherla', 'nandikotkur');

- to the content in the table
- use command select * from Persons; (to check the content in table)



```
    ->      -> 'Emp_ID' varchar(20) NOT NULL,
    ->      -> 'Name' varchar(255) NOT NULL,
    ->      -> 'Age' INT NOT NULL,
    ->      -> 'Phone_No' varchar(10) NOT NULL,
    ->      ->
    ->      -> 'Address' varchar(100) NOT NULL
    ->      -> PRIMARY KEY (Emp_ID)
    ->      -> );
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MySQL server versi
on for the right syntax to use near '-> 'Emp_ID' varchar(20) NOT NULL,
    -> 'Name' varchar(255) NOT NULL,
    -> 'A' at line 2
mysql> CREATE TABLE Persons (
    ->     PersonID int,
    ->     LastName varchar(255),
    ->     FirstName varchar(255),
    ->     Address varchar(255),
    ->     City varchar(255)
    -> );
Query OK, 0 rows affected (0.05 sec)

mysql> INSERT INTO Persons(PersonID,LastName,FirstName,Address,City)
    -> Values('101','hema','hemalatha','guntur','hydrabad');
Query OK, 1 row affected (0.00 sec)

mysql> select * from Persons;
+----------+----------+-----------+---------+----------+
| PersonID | LastName | FirstName | Address | City     |
+----------+----------+-----------+---------+----------+
|      101 | hema     | hemalatha | guntur  | hydrabad |
+----------+----------+-----------+---------+----------+
1 row in set (0.00 sec)

mysql> |
```