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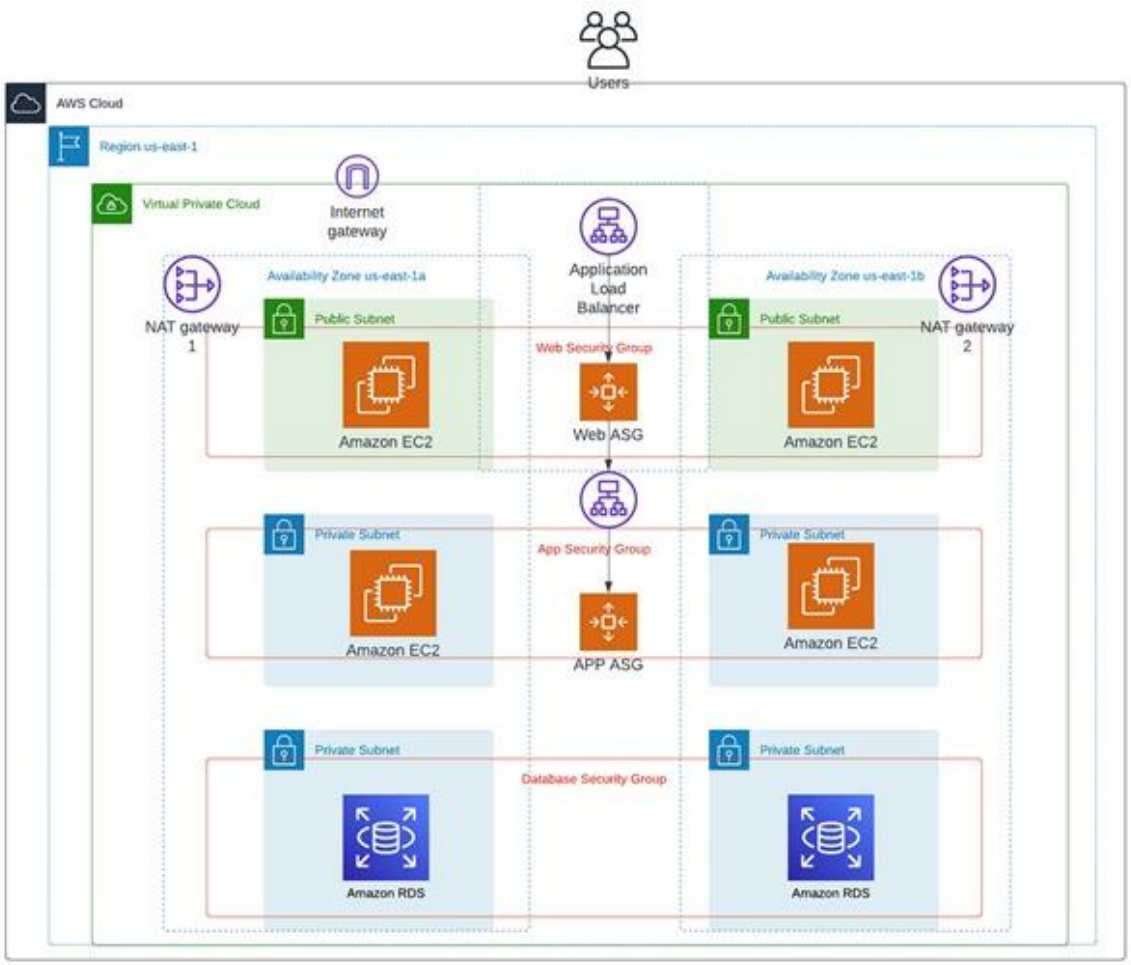
Creating a Highly Available 3-Tier Architecture for Web Applications in AWS

Architecture:



AWS provides a wide range of resources for developing and managing cloud applications, which can be customized to construct highly dependable and resilient cloud infrastructures. Suppose you are tasked with developing a three-tier architecture that is readily available for your

organization’s new web application. This tutorial is extensive but comprehensive. You may want to bookmark this guide for future reference on creating web, application, and data tiers.

What is a 3-Tier Architecture?

A three-tier architecture comprises three layers, namely the presentation tier, the application tier, and the data tier. The presentation tier serves as the front end, hosting the user interface, such as the website that users or clients interact with. The application tier, commonly referred to as the back-end, processes the data. Finally, the data tier is responsible for data storage and management.

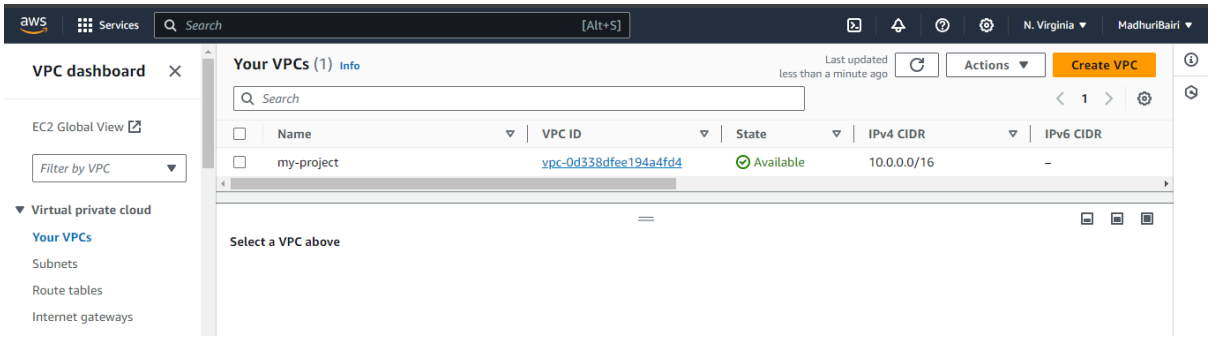
Create Virtual Private Network :

1.Login to your AWS Account & search for vpc in the search box.

2.Click on create vpc .

3. Create vpc in Virginia region.

4. Follow the steps mentioned in the below snapshots.



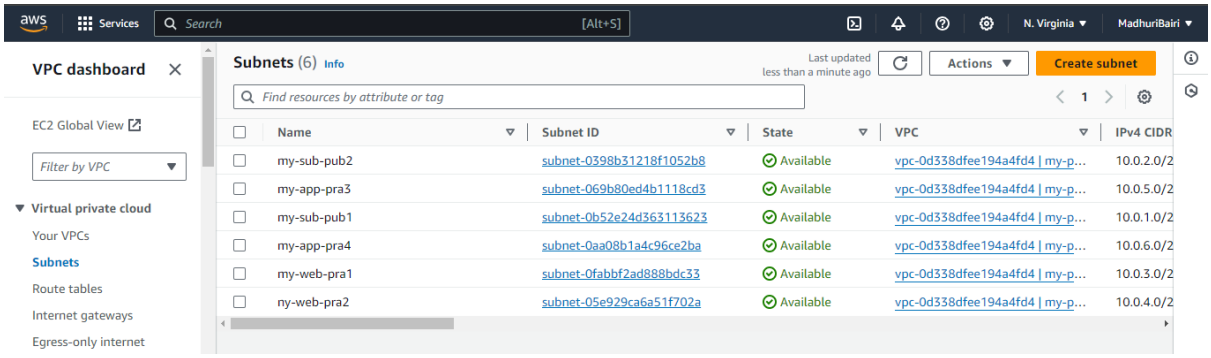
Create SUBNETS (2- Public & 4 - Private):

1.Click on SUBNETS & Click on create subnet& Choose VPC ID (Own not Default)

2. give subnet name & select availability zone (2a or 2b) & give IPv4 subnet CIDR BLOCK.

3. click on create subnet.

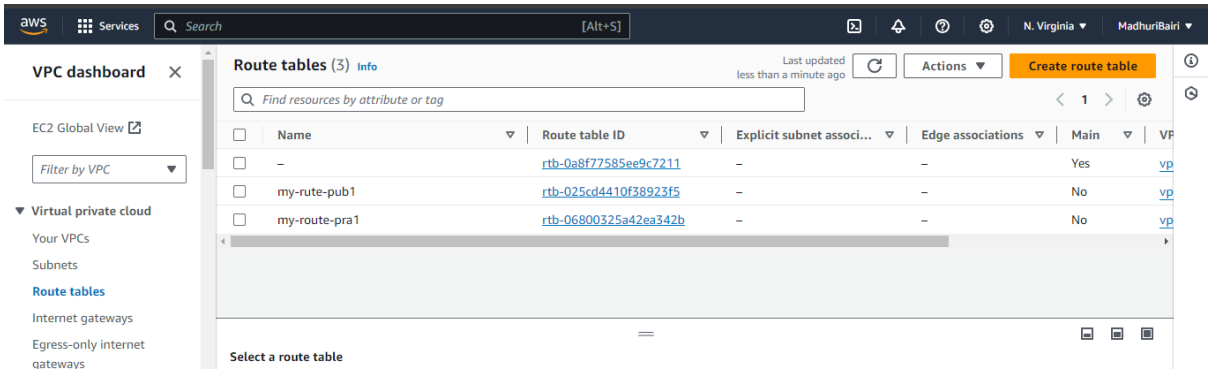
4. like that create 6 subnets – 2 public subnets in 2a & 2b zone and 4 private subnets – take 2 private subnets in 2a & remaining 2 private subnets in 2b zone. some snapshots of subnets are added below.



Create Route Tables:

1.Go to Route table.

2.Create route table 1 for public & 1 for private.



Create INTERNET GATEWAY:

1.click on internet gateway &create internet gateway.

2. after the creation of internet gateway ,click on actions and attach it to VPC.

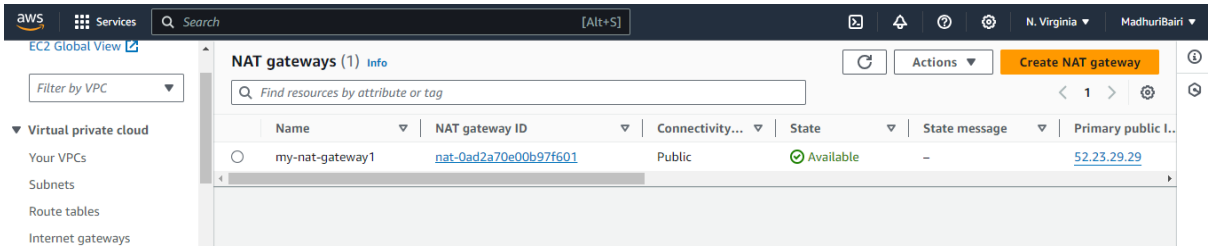
Create NATGATEWAY:

1.click on Nat gateway.

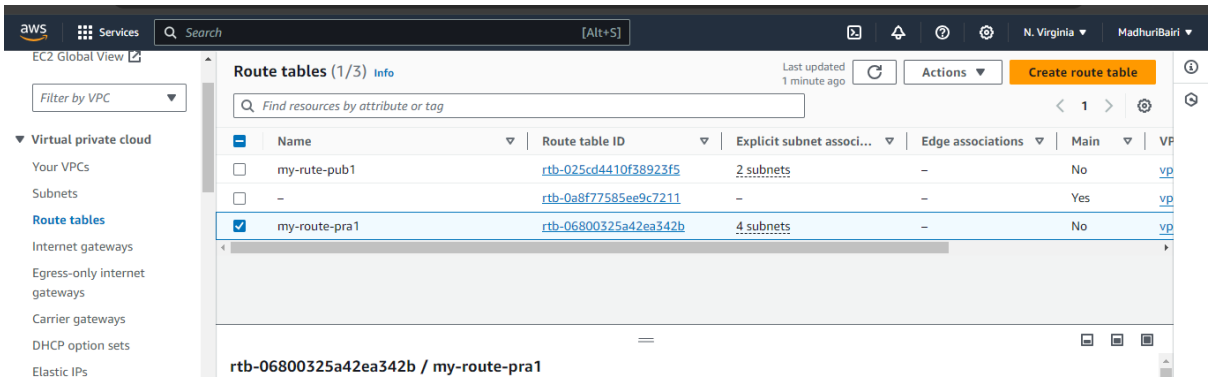
& click on create.

2.select Public SUBNET & choose connect.

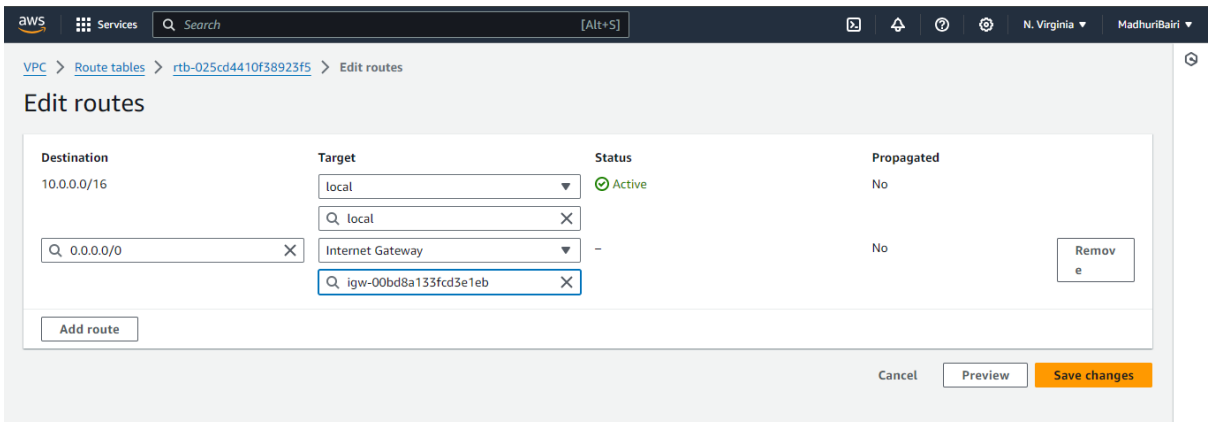
3.Click on create NAT GATEWAY.



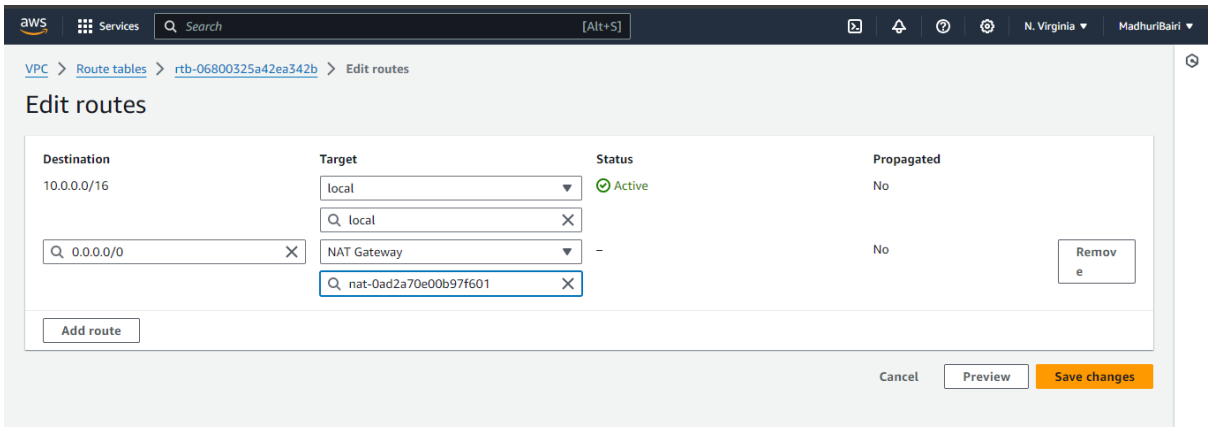
1.Go to route table and edit subnet associations & save association.



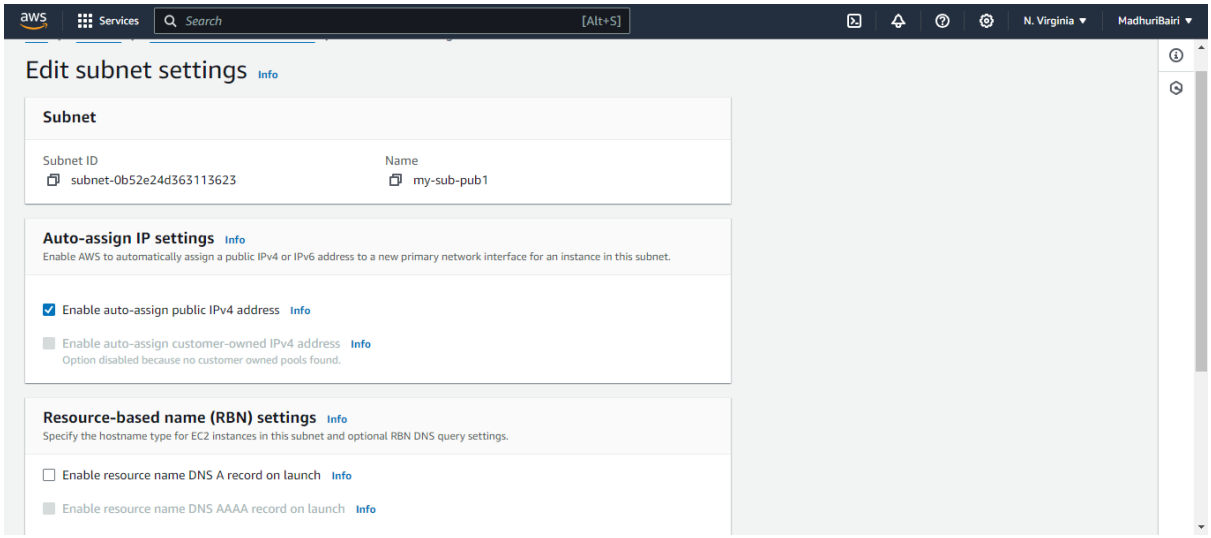
2.Edit route tables and add route to internet gateway.



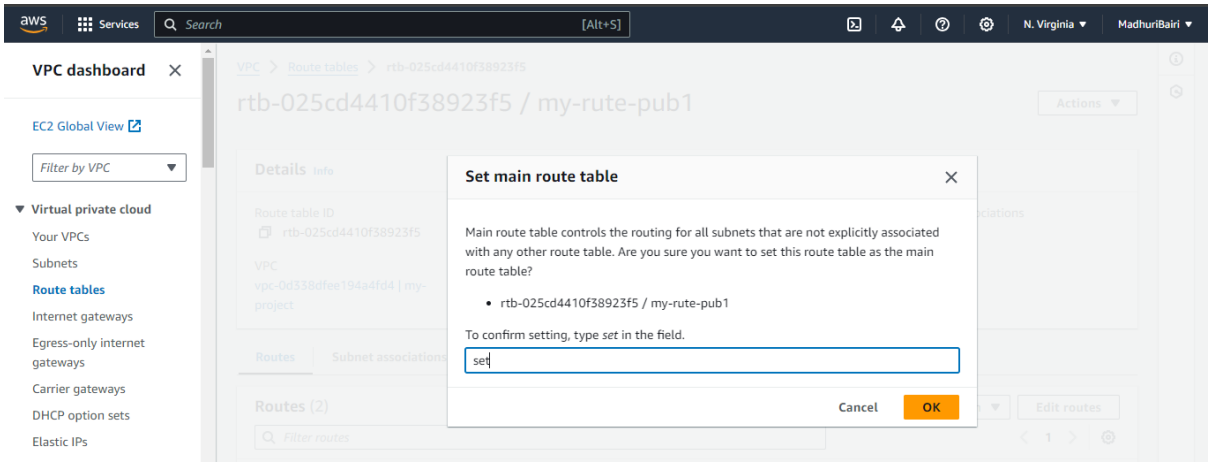
3.Edit route tables and add route to Natgateway Gateway.



4.Go to all subnet and click on edit subnets settings to auto assign IPV4.



5. And also set the public route tables as main route tables.

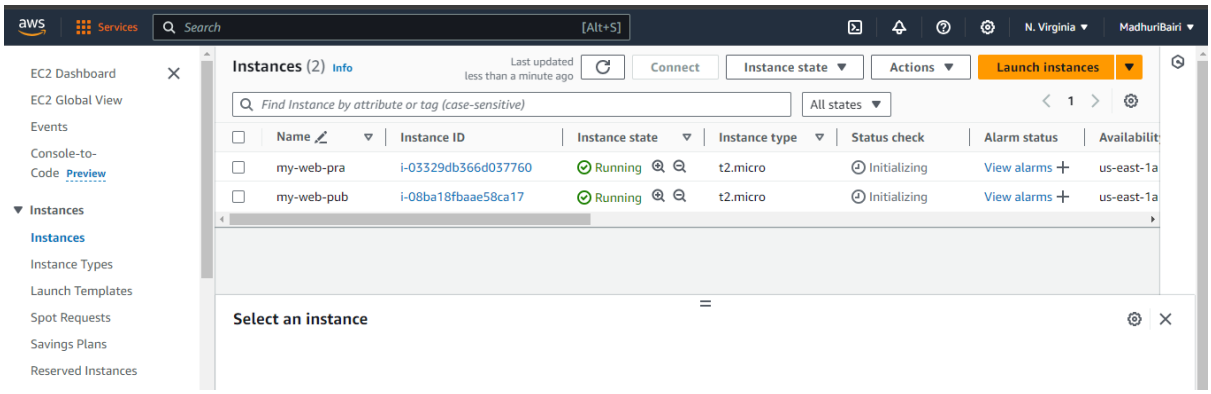


Create EC2 Instance:

1.Create EC2 instance for vpc.

2.Go to instance-Lanch instance-Name-create key pair-network-vpc & subnet-public ip-select security group- add inbound security rules-Lanch instance.

3.Some EC2 screenshoots are attached below.

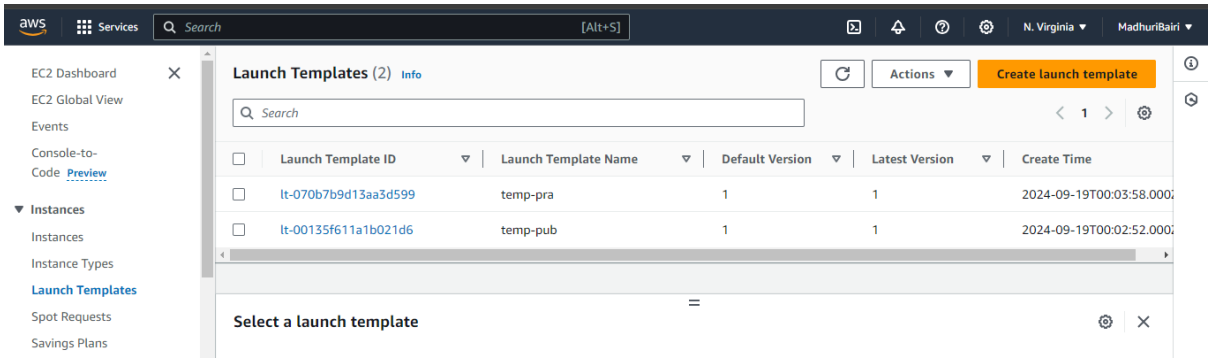


Web tier:

1.Create a web tier launch Templates.

2.NOW LAUNCH TWO TEMPLATES (Public &Private)

4.Search EC2 – Click on LAUNCH TEMPLATES – Click on CREATE LAUNCH TEMPLATES.



CREATE TWO AUTOSCALING GROUPS (Public & Private):

1.In EC2, go to autoscaling group – click on create autoscaling group.

2.give name – Select PUBLIC TEMPLATE& PRAVITE TEMPLATE (which is already created).

3.In network settings-choose VPC-choose 2 public subnets& 4 private subnets.

4. After that click on Next.

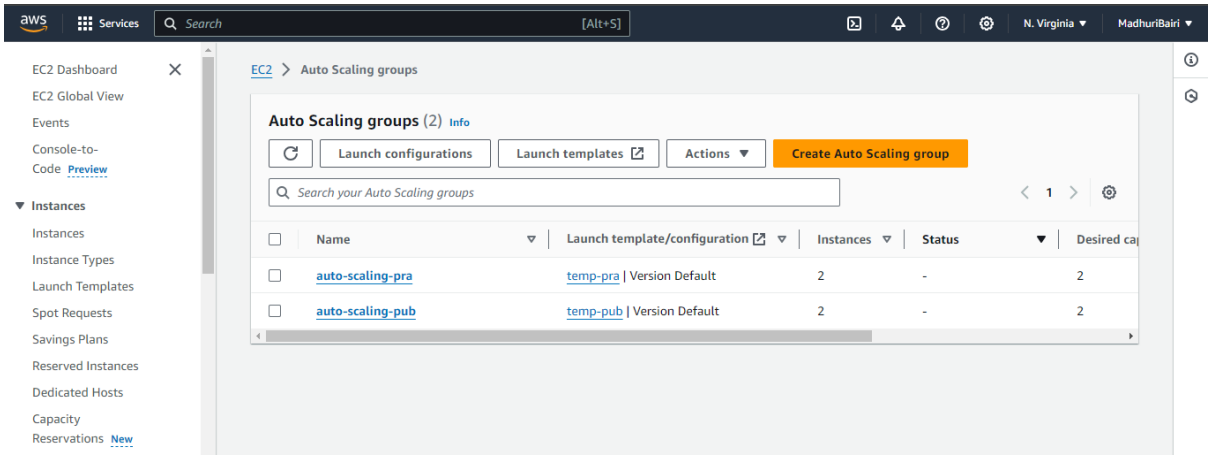
5. We have to attach Load balancer to ASG

6.Attach load balancer- choosing application load balancer-LB name should be same as ASG. if you want to edit it you can edit the name.

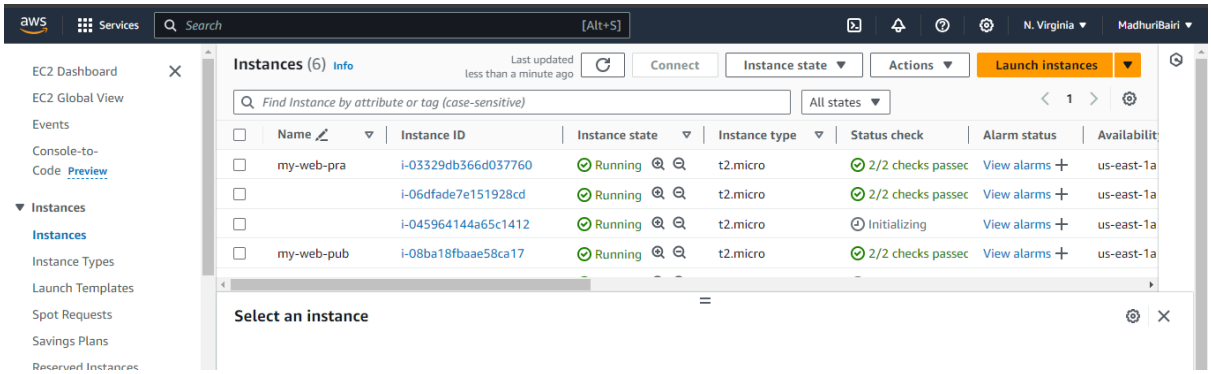
7.select subnets – give PORT NO: 80 for HTTP – Select TARGET GROUP (new or existing).

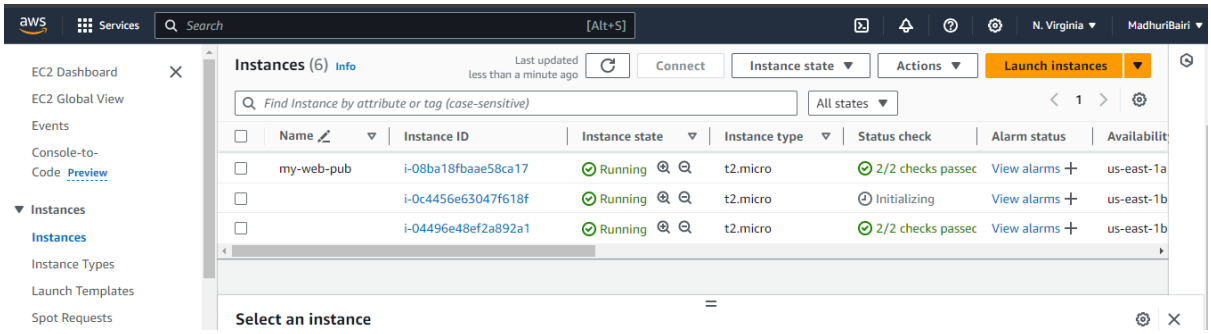
8. Select Group size We want to set a minimum and maximum number of instances the ASG can provision: Desired capacity: 2 Minimum capacity: 2 Maximum capacity: 5

9.After that,click on next-next-create auto scaling group.



10. After creating auto scaling groups for Public & Private, we get 4 EC2's automatically.





EC2 instance connections:

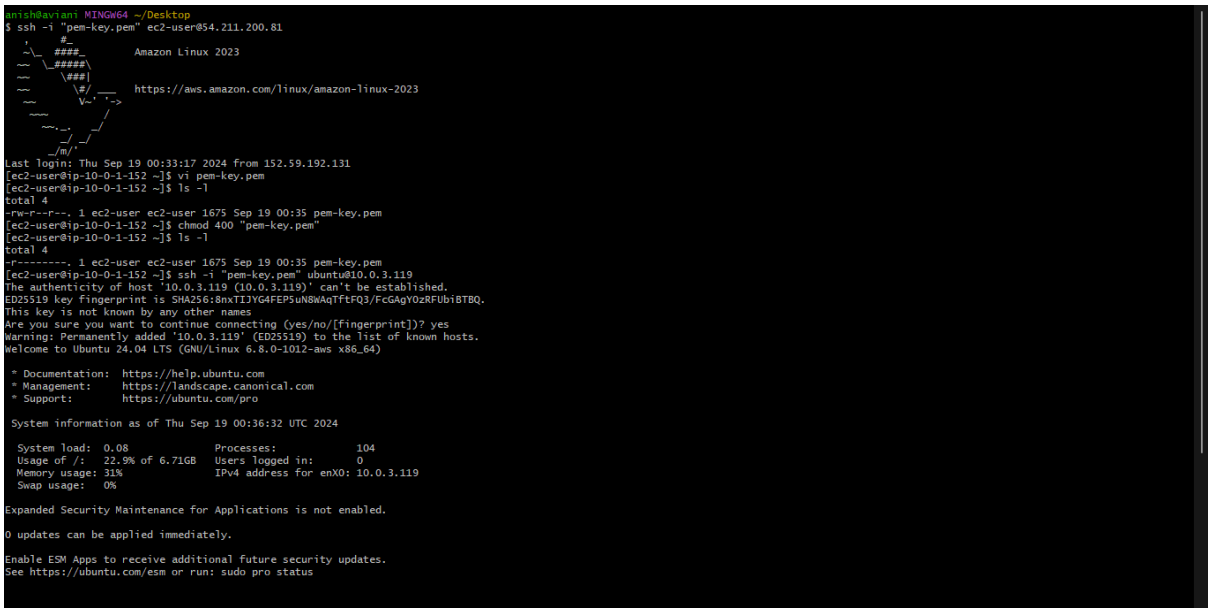
1.Connect Public EC2 instance and then connection Private Ec2 instance from public ec2 instance as below.

2.Connect to Public EC2 by SSH

3.Copy key pair data --> create same key pair name in public ec2.

4.Change permissions by $chmod 400 key-pair.pem 4.Connect Private EC2 by SSH.

OUTPUT:



Create RDS:

1.Go to RDS & select databases.

2.create database.

3.Choose Standard & Database Engine as “MY SQL”

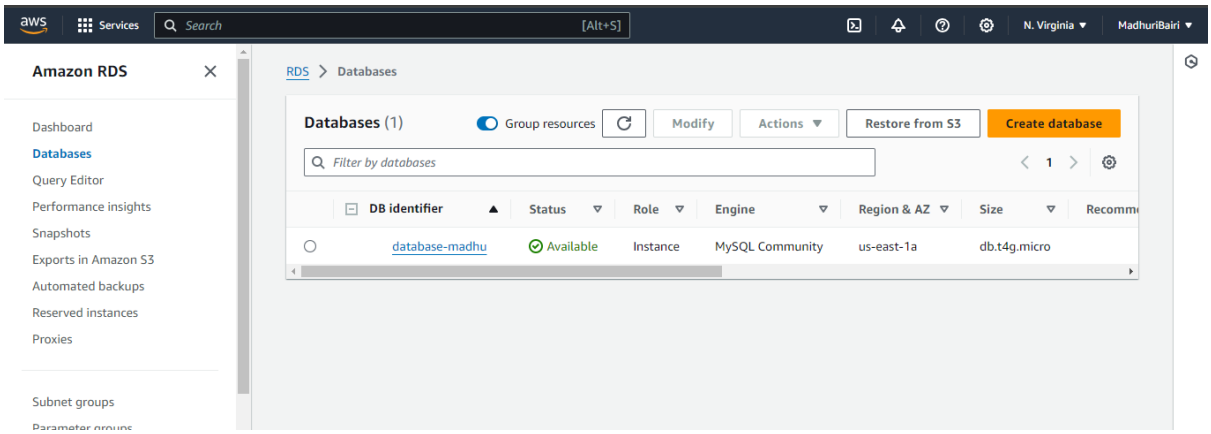
4.Under Templates choose Free Tier.

5.Under settings give DB Name& Select self-Managed & Give Password.

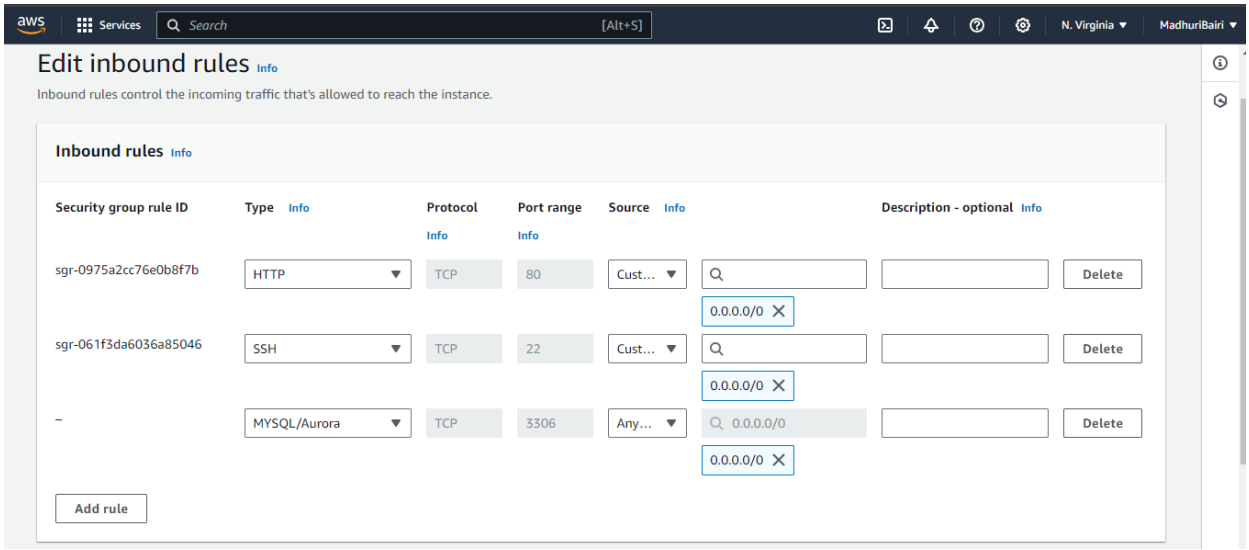
6.Connectivity- Don’t connect to EC2 -Choose VPC

7. Select DB Subnet group & Public access give “NO”

8.VPC Security group select&Availability Zone: “2a” for this RDS-->Create RDS.



9. Go to security groups& Edit inbound rules & mysql port numbers.



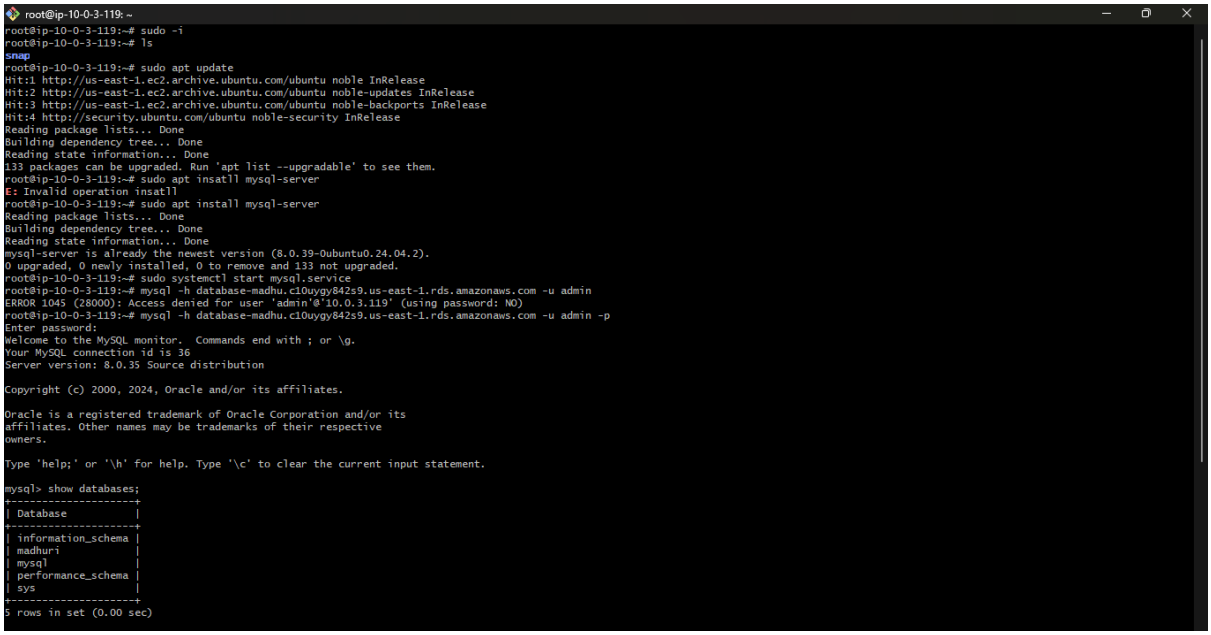
RDS connections:

5.Update packages in Private server $ apt update and $ apt install mysql-server.

6.Connect mysql RDS database by command $mysql –h -u admin –p

7.To see databases use “$show databases;” 8.Create databases “$create database ;” 9. Which database want to use “$use ;”

OUTPUT:


root@ip-10-0-3-119: ~
root@ip-10-0-3-119:~# sudo -i
root@ip-10-0-3-119:~# ls
snap
root@ip-10-0-3-119:~# sudo apt update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu noble-security InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
133 packages can be upgraded. Run 'apt list --upgradable' to see them.
root@ip-10-0-3-119:~# sudo apt insatll mysql-server
E: Invalid operation insatll
root@ip-10-0-3-119:~# sudo apt install mysql-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
mysql-server is already the newest version (8.0.39-0ubuntu0.24.04.2).
0 upgraded, 0 newly installed, 0 to remove and 133 not upgraded.
root@ip-10-0-3-119:~# sudo systemctl start mysql.service
root@ip-10-0-3-119:~# mysql -h database-madhu.c10uygy842s9.us-east-1.rds.amazonaws.com -u admin
ERROR 1045 (28000): Access denied for user 'admin'@'10.0.3.119' (using password: NO)
root@ip-10-0-3-119:~# mysql -h database-madhu.c10uygy842s9.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 36
Server version: 8.0.35 Source distribution
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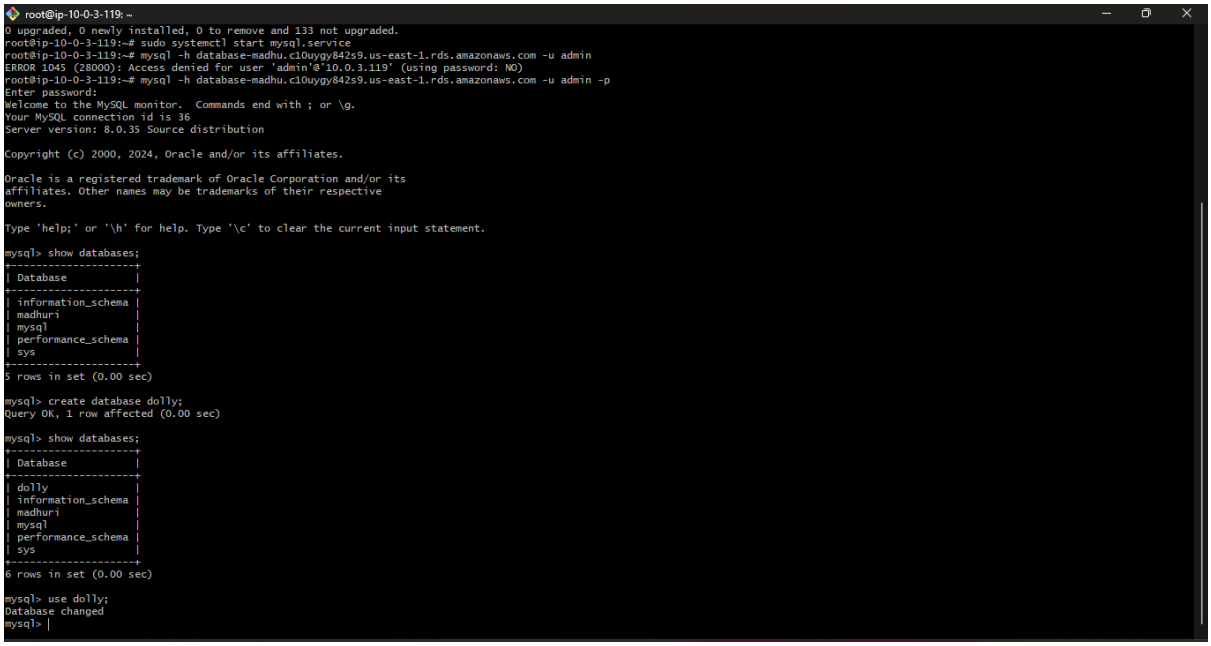
Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.
mysql> show databases;
+--------------------+
| Database |
+--------------------+
| information_schema |
| madhuri |
| mysql |
| performance_schema |
| sys |
+--------------------+
5 rows in set (0.00 sec)


root@ip-10-0-3-119: ~
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Enter password:
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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 |
| madhuri |
| mysql |
| performance_schema |
| sys |
+--------------------+
5 rows in set (0.00 sec)
mysql> create database dolly;
Query OK, 1 row affected (0.00 sec)
mysql> show databases;
+--------------------+
| Database |
+--------------------+
| dolly |
| information_schema |
| madhuri |
| mysql |
| performance_schema |
| sys |
+--------------------+
6 rows in set (0.00 sec)
mysql> use dolly;
Database changed
mysql>