DEPLOY THREE -TIER ARCHITECTURE IN AWS USING TERRAFORM

Prepared by,
T.AJAY

Deploy three -tier architecture in AWS using Terraform

WHAT IS TERRAFORM?

- Terraform is an open-source infrastructure as code (IAC) tool developed by HashiCorp. It allows you to define and manage your infrastructure using declarative configuration files.
- With Terraform, you can create, modify, and manage various cloud resources and infrastructure components across different cloud providers in a consistent and repeatable manner.

Prerequisites:-

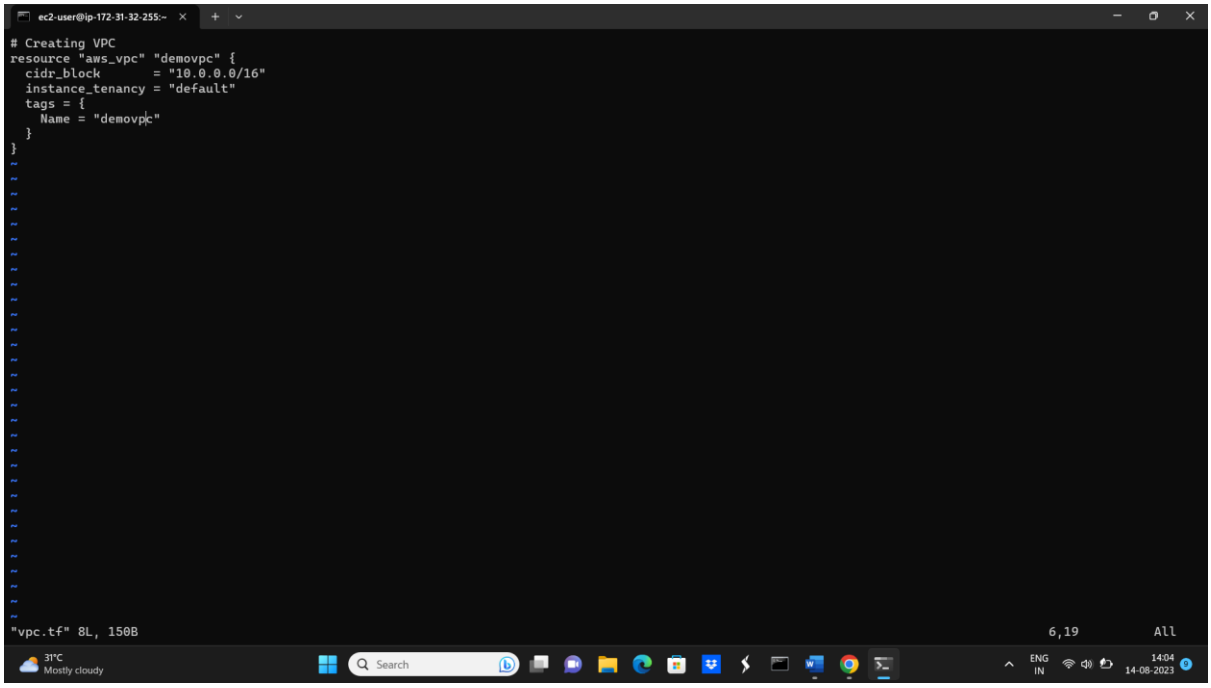
- Basic knowledge of AWS&Terraform
- AWS account
- IAM user
- GitHub account
- AWS access key& secret key

List of Steps :-

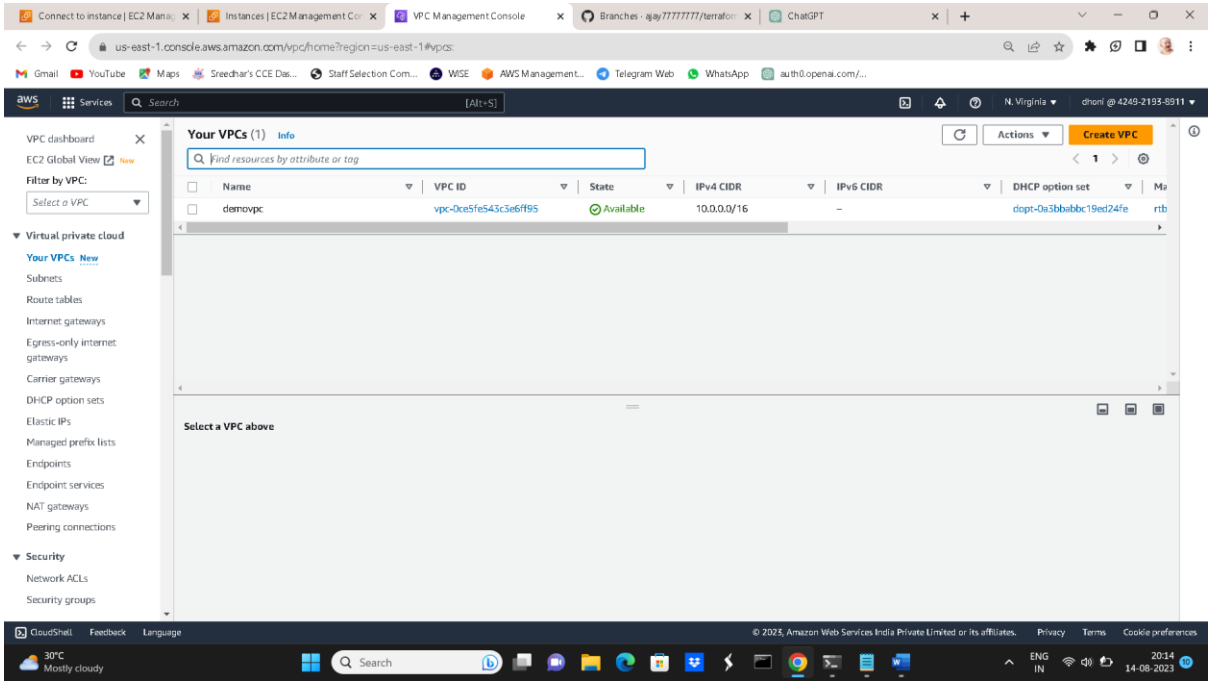
1. Create a file for the vpc
2. Create a file for the subnet
3. Create a file for the IGW
4. Create a file for the Route table
5. Create a file for the keypair
6. Create a file for the userdata
7. Create a file for the security group for the frontend
8. Create a file for the EC2 instance
9. Create a file for the security group for the database
10. Create a file for the Application load balancer
11. Create a file for the RDS instance
12. Create a file for the outputs
13. Verify the resources

Step-1:- create a file for the vpc

- Create vpc.tf file and add the below code to it.

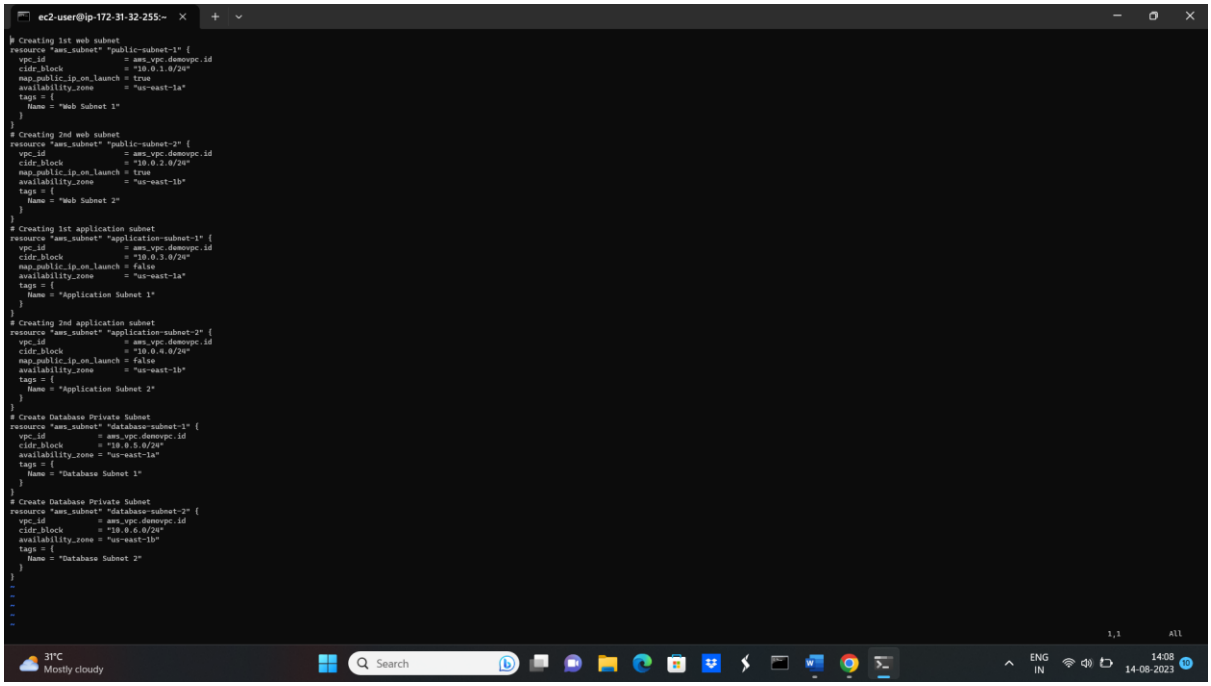


- Vpc is created with name demovpc.



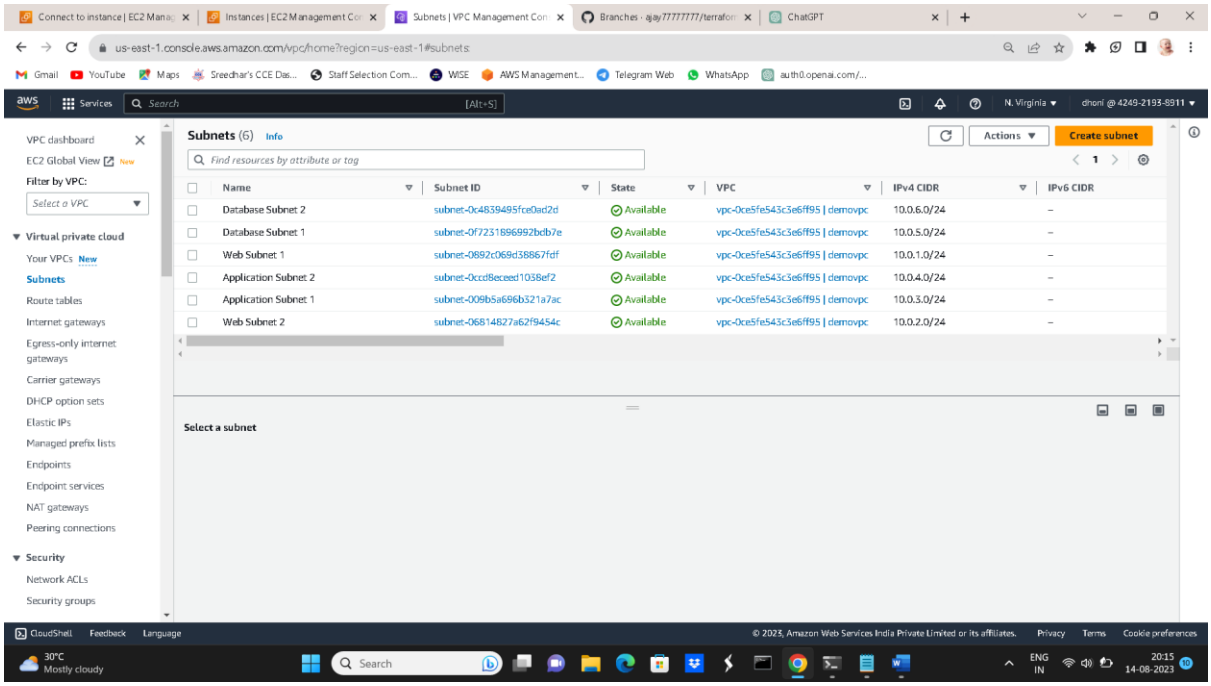
Step 2:- Create a file for the Subnet

- For this project, I will create total 6 subnets for the front-end and back-end with a mixture of public & private subnet
- Create subnet.tf file and add the below code to it



```
# Creating 1st web subnet
resource "aws_subnet" "public-subnet-1" {
  vpc_id                  = aws_vpc.demovpc.id
  cidr_block              = "10.0.1.0/24"
  map_public_ip_on_launch = true
  availability_zone       = "us-east-1a"
  tags = {
    Name = "Web Subnet 1"
  }
}
# Creating 2nd web subnet
resource "aws_subnet" "public-subnet-2" {
  vpc_id                  = aws_vpc.demovpc.id
  cidr_block              = "10.0.2.0/24"
  map_public_ip_on_launch = true
  availability_zone       = "us-east-1b"
  tags = {
    Name = "Web Subnet 2"
  }
}
# Creating 1st application subnet
resource "aws_subnet" "application-subnet-1" {
  vpc_id                  = aws_vpc.demovpc.id
  cidr_block              = "10.0.3.0/24"
  map_public_ip_on_launch = false
  availability_zone       = "us-east-1a"
  tags = {
    Name = "Application Subnet 1"
  }
}
# Creating 2nd application subnet
resource "aws_subnet" "application-subnet-2" {
  vpc_id                  = aws_vpc.demovpc.id
  cidr_block              = "10.0.4.0/24"
  map_public_ip_on_launch = false
  availability_zone       = "us-east-1b"
  tags = {
    Name = "Application Subnet 2"
  }
}
# Create Database Private Subnet
resource "aws_subnet" "database-subnet-1" {
  vpc_id            = aws_vpc.demovpc.id
  cidr_block        = "10.0.5.0/24"
  availability_zone = "us-east-1a"
  tags = {
    Name = "Database Subnet 1"
  }
}
# Create Database Private Subnet
resource "aws_subnet" "database-subnet-2" {
  vpc_id            = aws_vpc.demovpc.id
  cidr_block        = "10.0.6.0/24"
  availability_zone = "us-east-1b"
  tags = {
    Name = "Database Subnet 2"
  }
}
```

- Created 6 subnets.

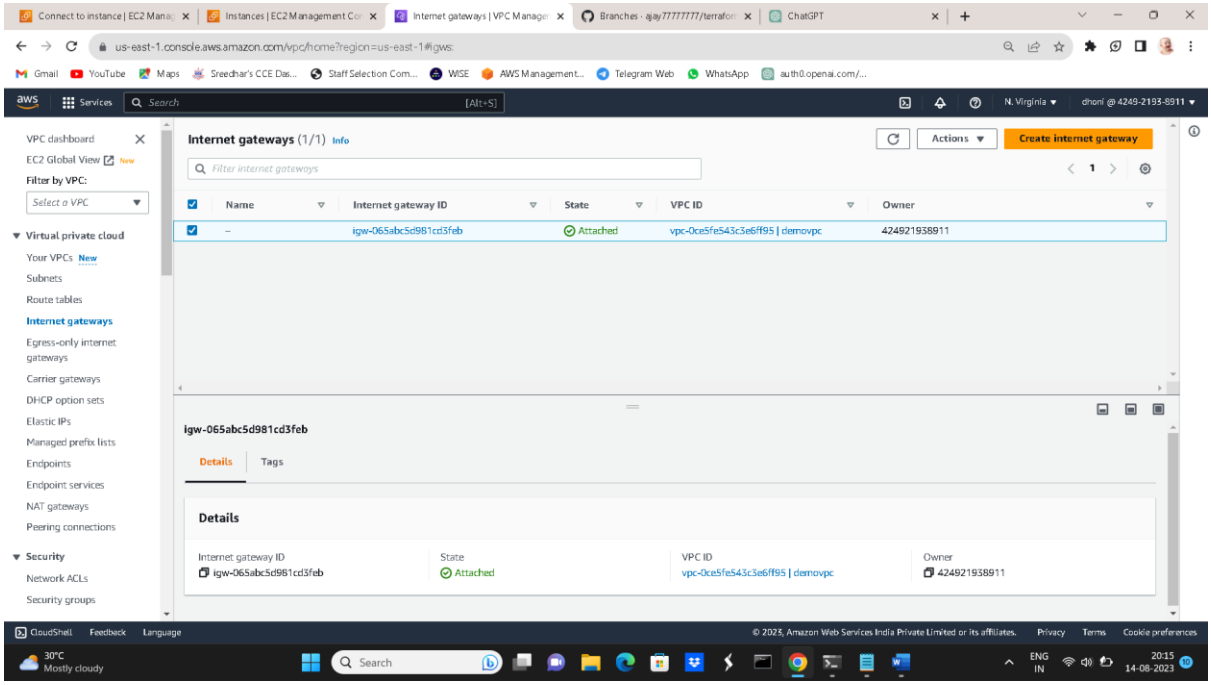


Step 3:- Create a file for the Internet Gateway

- Create igw.tf file and add the below code to it

```
# Creating Internet Gateway
resource "aws_internet_gateway" "demogateway" {
  vpc_id = aws_vpc.demovpc.id
}
```

- Created internet gateway

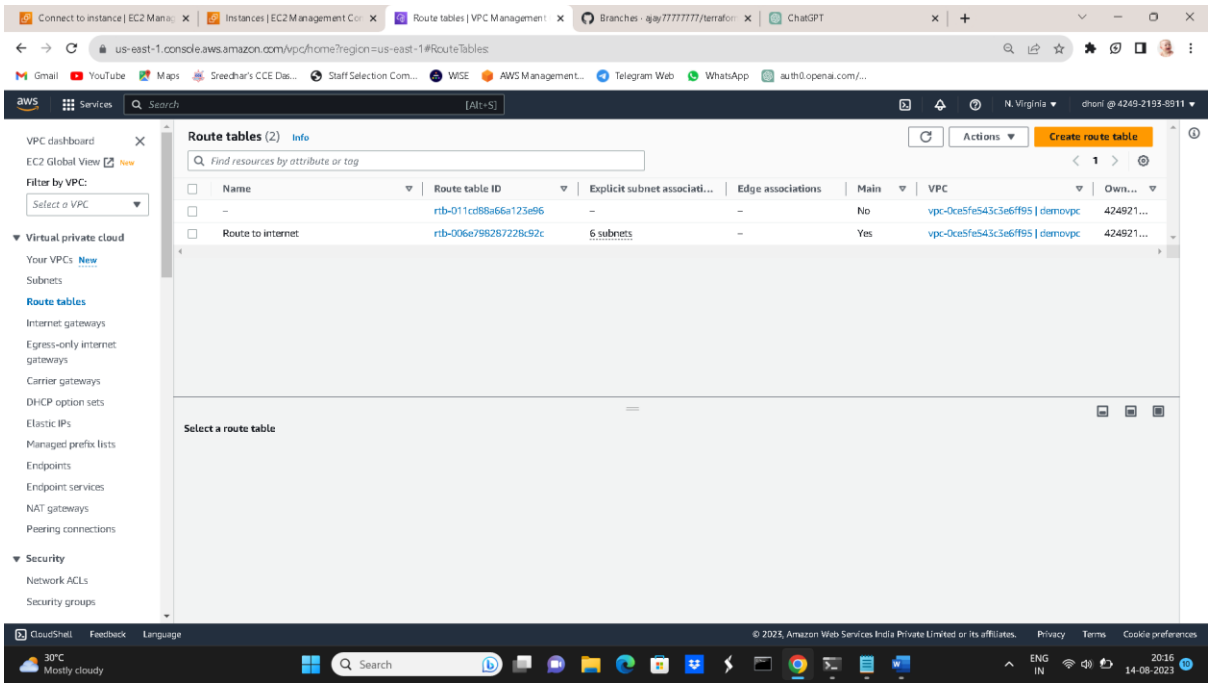


Step 4:- Create a file for the Route table

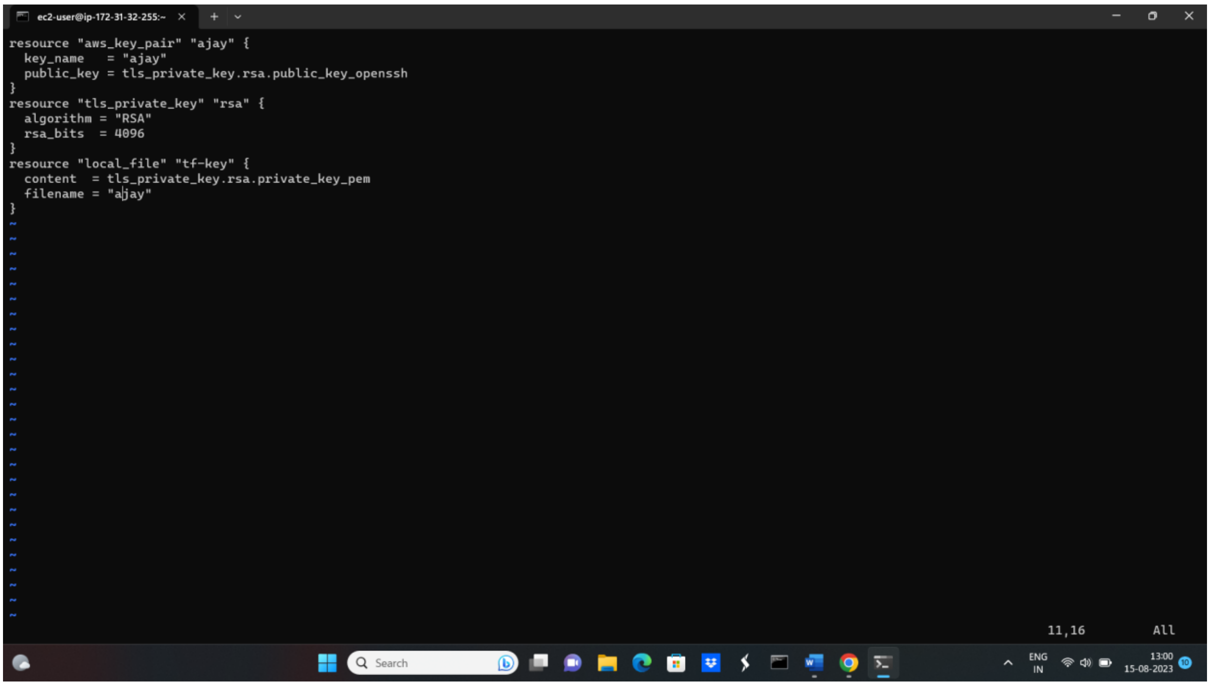
- Create route_table_public.tf file and add the below code to it

```
resource "aws_route_table" "route" {
  vpc_id = aws_vpc.demovpc.id
  route {
    cidr_block = "0.0.0.0/0"
    gateway_id = aws_internet_gateway.demogateway.id
  }
  tags = {
    Name = "Route to internet"
  }
}
# Associating Route Table
resource "aws_route_table_association" "rt1" {
  subnet_id      = aws_subnet.public-subnet-1.id
  route_table_id = aws_route_table.route.id
}
# Associating Route Table
resource "aws_route_table_association" "rt2" {
  subnet_id      = aws_subnet.public-subnet-2.id
  route_table_id = aws_route_table.route.id
}
# Associating Route Table
resource "aws_route_table_association" "rt3" {
  subnet_id      = aws_subnet.application-subnet-1.id
  route_table_id = aws_route_table.route.id
}
# Associating Route Table
resource "aws_route_table_association" "rt4" {
  subnet_id      = aws_subnet.application-subnet-2.id
  route_table_id = aws_route_table.route.id
}
# Associating Route Table
resource "aws_route_table_association" "rt5" {
  subnet_id      = aws_subnet.database-subnet-1.id
  route_table_id = aws_route_table.route.id
}
# Associating Route Table
resource "aws_route_table_association" "rt6"
  subnet_id      = aws_subnet.database-subnet-2.id
  route_table_id = aws_route_table.route.id
                                                          41,1          Bot
```

- Created route table with name route to internet.



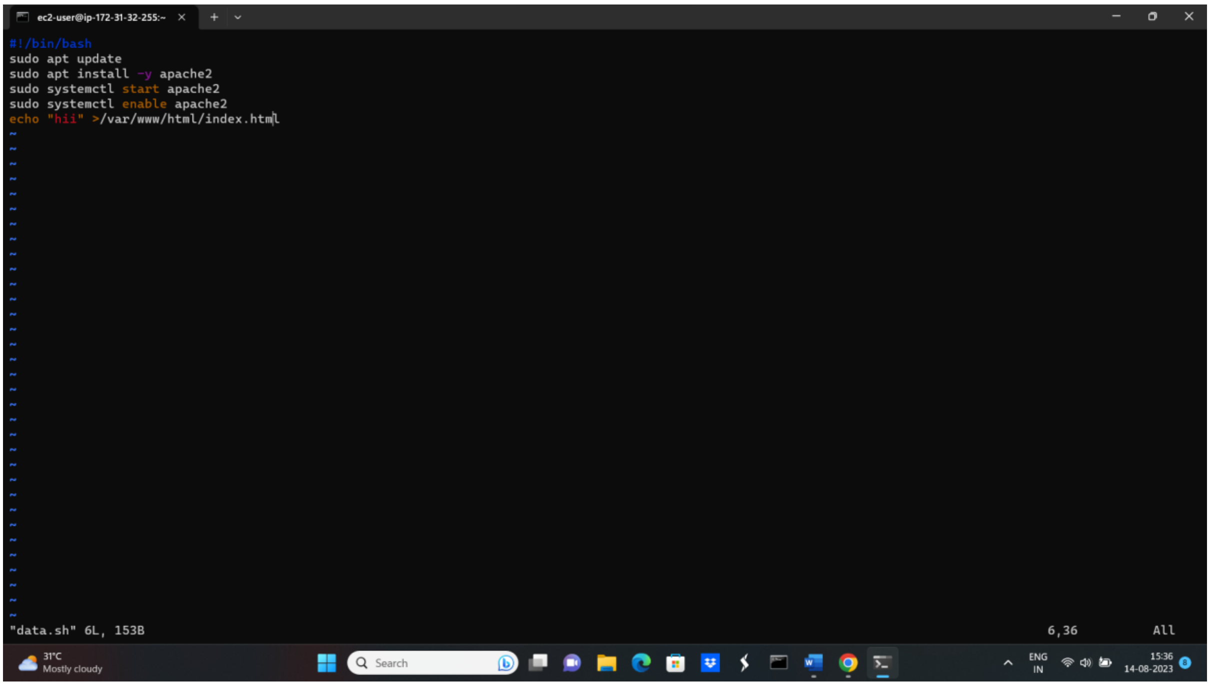
Step-5:- Create a file for the keypair



```
resource "aws_key_pair" "ajay" {
  key_name   = "ajay"
  public_key = tls_private_key.rsa.public_key_openssh
}
resource "tls_private_key" "rsa" {
  algorithm = "RSA"
  rsa_bits  = 4096
}
resource "local_file" "tf-key" {
  content  = tls_private_key.rsa.private_key_pem
  filename = "ajay"
}
                                                                                    11,16         All
```

Step 6:- Create a file for user data

- Create data.sh file and add the below code to it



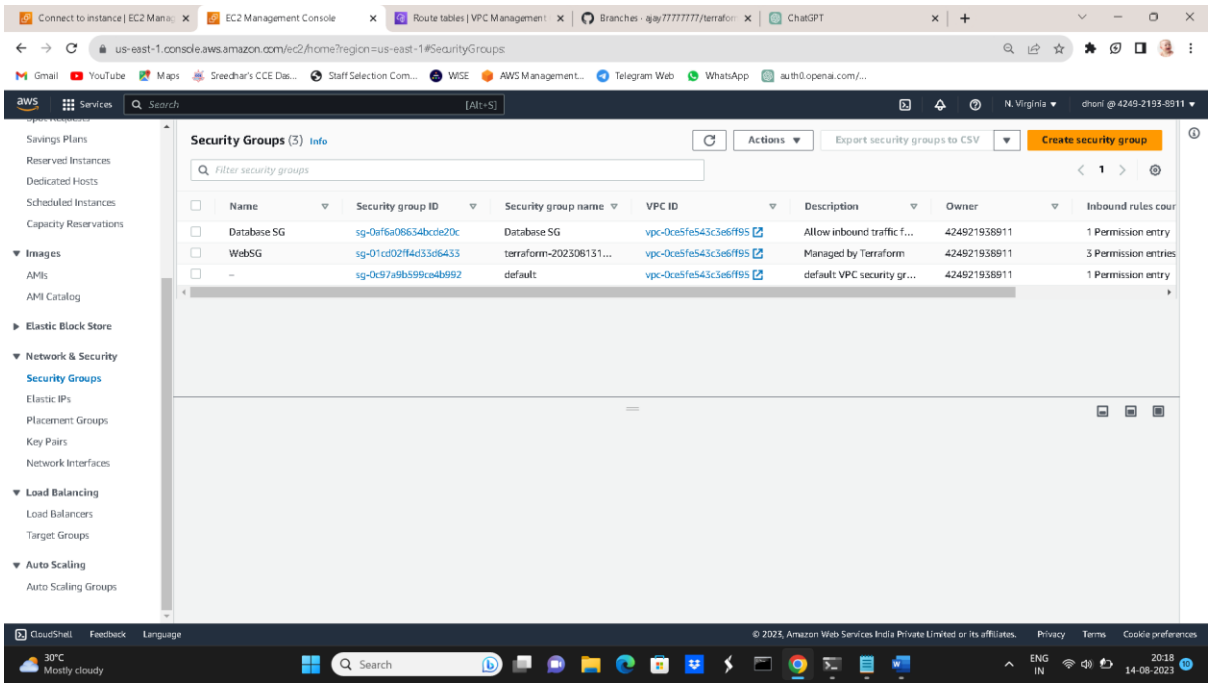
```
#!/bin/bash
sudo apt update
sudo apt install -y apache2
sudo systemctl start apache2
sudo systemctl enable apache2
echo "hii" >/var/www/html/index.html
"data.sh" 6L, 153B                                                                 6,36          All
```

Step 7:- Create a file for Security Group for the FrontEnd tier

- Create web_sg.tf file and add the below code to it

```
# Creating Security Group
resource "aws_security_group" "demosg" {
  vpc_id = aws_vpc.demovpc.id
  # Inbound Rules
  # HTTP access from anywhere
  ingress {
    from_port   = 80
    to_port     = 80
    protocol    = "tcp"
    cidr_blocks = ["0.0.0.0/0"]
  }
  # HTTPS access from anywhere
  ingress {
    from_port   = 443
    to_port     = 443
    protocol    = "tcp"
    cidr_blocks = ["0.0.0.0/0"]
  }
  # SSH access from anywhere
  ingress {
    from_port   = 22
    to_port     = 22
    protocol    = "tcp"
    cidr_blocks = ["0.0.0.0/0"]
  }
  # Outbound Rules
  # Internet access to anywhere
  egress {
    from_port   = 0
    to_port     = 0
    protocol    = "-1"
    cidr_blocks = ["0.0.0.0/0"]
  }
  tags = {
    Name = "WebSG"
  }
}
"web_sg.tf" 37L, 747B                                    35,15          All
```

- Created security group with name websg.



Step 8:- Create a file for EC2 instances

- Create ec2.tf file and add the below code to it

```
# Creating 1st EC2 instance in Public Subnet
resource "aws_instance" "demoinstance1" {
  ami                         = "ami-053b0d53c279acc90"
  instance_type               = "t2.micro"
  key_name                    = "ajay"
  vpc_security_group_ids      = ["${aws_security_group.demosg.id}"]
  subnet_id                   = aws_subnet.public-subnet-1.id
  associate_public_ip_address = true
  user_data                   = "${file("data.sh")}"
  tags = {
    Name = "My Public Instance1"
  }
}
# Creating 2nd EC2 instance in Public Subnet
resource "aws_instance" "demoinstance2" {
  ami                         = "ami-053b0d53c279acc90"
  instance_type               = "t2.micro"
  key_name                    = "ajay"
  vpc_security_group_ids      = ["${aws_security_group.demosg.id}"]
  subnet_id                   = aws_subnet.public-subnet-2.id
  associate_public_ip_address = true
  user_data                   = "${file("data.sh")}"
  tags = {
    Name = "My Public Instance 2"
  }
}
~
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~
"ec2.tf" 26L, 991B                                                    20,49         All
```
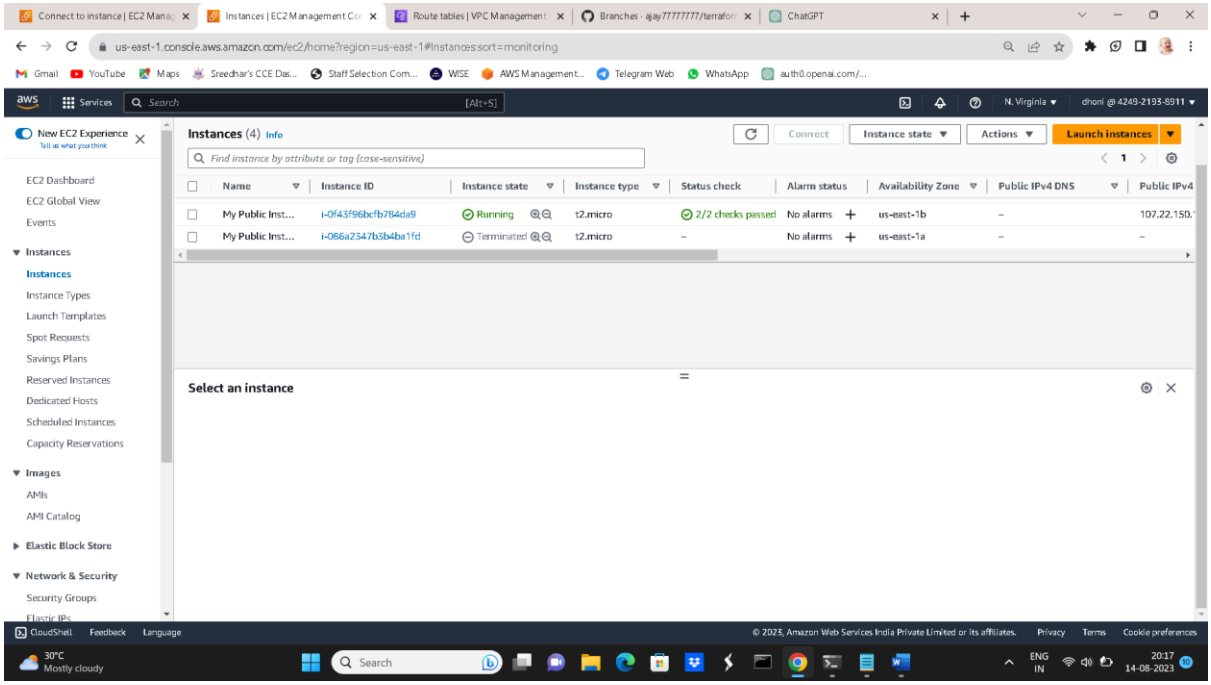

- Created 2 instances successfully.

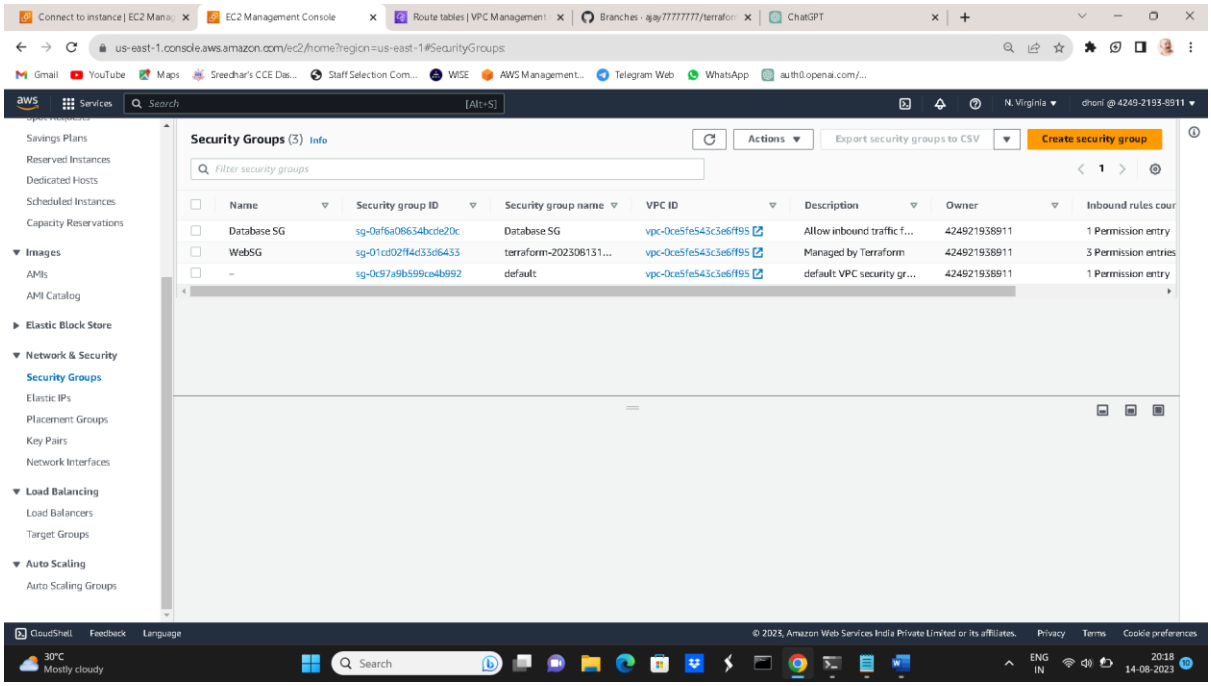


Step 9:- Create a file for Security Group for the Database tier

- Create database_sg.tf file and add the below code to it

```
# Create Database Security Group
resource "aws_security_group" "database-sg" {
  name        = "Database SG"
  description = "Allow inbound traffic from application layer"
  vpc_id      = aws_vpc.demovpc.id
  ingress {
    description     = "Allow traffic from application layer"
    from_port       = 3306
    to_port         = 3306
    protocol        = "tcp"
    security_groups = [aws_security_group.demosg.id]
  }
  egress {
    from_port   = 32768
    to_port     = 65535
    protocol    = "tcp"
    cidr_blocks = ["0.0.0.0/0"]
  }
  tags = {
    Name = "Database SG"
  }
}
"databasesg.tf" 22L, 580B                                    11,1          All
```

- Created one database security group with name databasesg and allowed the port number 3306.

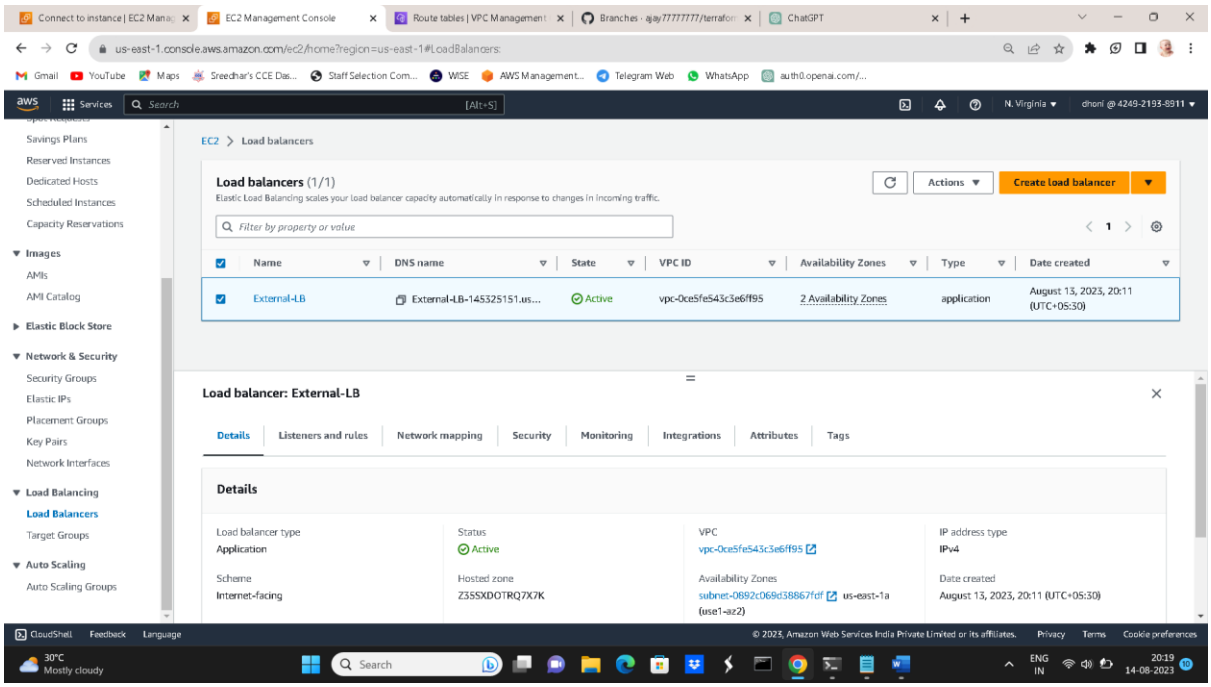


Step 10:- Create a file Application Load Balancer

- Create alb.tf file and add the below code to it

```
# Creating External LoadBalancer
resource "aws_lb" "external-alb" {
  name               = "External-LB"
  internal           = false
  load_balancer_type = "application"
  security_groups    = [aws_security_group.demosg.id]
  subnets            = [aws_subnet.public-subnet-1.id, aws_subnet.public-subnet-2.id]
}
resource "aws_lb_target_group" "target-elb" {
  name     = "ALB-TG"
  port     = 80
  protocol = "HTTP"
  vpc_id   = aws_vpc.demovpc.id
}
resource "aws_lb_target_group_attachment" "attachment1" {
  target_group_arn = aws_lb_target_group.target-elb.arn
  target_id        = aws_instance.demoinstance1.id
  port             = 80
  depends_on       = [aws_instance.demoinstance1]
}
resource "aws_lb_target_group_attachment" "attachment2" {
  target_group_arn = aws_lb_target_group.target-elb.arn
  target_id        = aws_instance.demoinstance2.id
  port             = 80
  depends_on       = [aws_instance.demoinstance2]
}
resource "aws_lb_listener" "externa-alb" {
  load_balancer_arn = aws_lb.external-alb.arn
  port              = "80"
  protocol          = "HTTP"
  default_action {
    type             = "forward"
    target_group_arn = aws_lb_target_group.target-elb.arn
  }
}
~
~
~
~
"alb.tf" 35L, 1194B                                          27,37          All
```

- load balancer created successfully with name external-lb and attached the target group target-elb and the http listener is port 80.



Step 11:- Create a file for the RDS instance

- Create a rds.tf file and add the below code to it

```
# Creating RDS Instance
resource "aws_db_subnet_group" "default" {
  name       = "main"
  subnet_ids = [aws_subnet.database-subnet-1.id, aws_subnet.database-subnet-2.id]
  tags = {
    Name = "My DB subnet group"
  }
}
resource "aws_db_instance" "demodb" {
  allocated_storage      = 10
  db_subnet_group_name   = aws_db_subnet_group.default.id
  engine                 = "MySQL"
  engine_version         = "8.0.33"
  instance_class         = "db.t2.micro"
  multi_az               = true
  username               = "admin"
  password               = "admin123"
  skip_final_snapshot    = true
  vpc_security_group_ids = [aws_security_group.database-sg.id]
}
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~
"rds.tf" 20L, 660B                                                    19,30         All
```
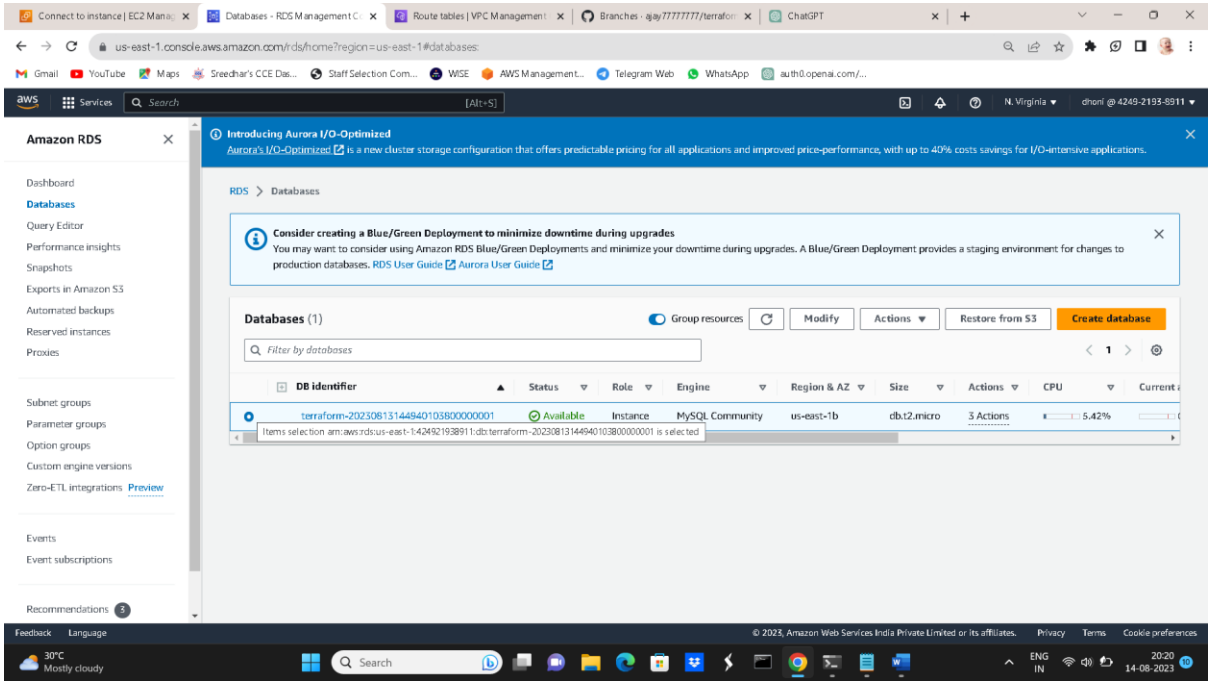

- Mysql Database created successfully.



Step 12:- Create a file for outputs

- Create outputs.tf file and add the below code to it
- In this step the load balencer DNS name is given as output.by using this dns you can access DNS through any browser.

```
# Getting the DNS of load balancer
output "lb_dns_name" {
  description = "The DNS name of the load balancer"
  value       = aws_lb.external-alb.dns_name
}
"outputs.tf" 5L, 157B                                          4,44          All
```

So, now our entire code is ready. We need to run the below steps to create infrastructure.

1. terraform init is to initialize the working directory and downloading plugins of the provider
2. terraform validate is to validate the code weather the code contains error or not.

1) terraform plan is to create the execution plan for our code
2) terraform apply is to create the actual infrastructure.

Step 13:- Verify the resources

- Terraform will create below resources

1. VPC
2. Application Load Balancer
3. Public & Private Subnets
4. EC2 instances
5. RDS instance
6. Route Table
7. Internet Gateway
8. Security Groups for Web & RDS instances
9. Route Table

Once the resource creation finishes you can get the DNS of a load balancer and paste it into the browser and you can see load balancer will send the request to two instances.