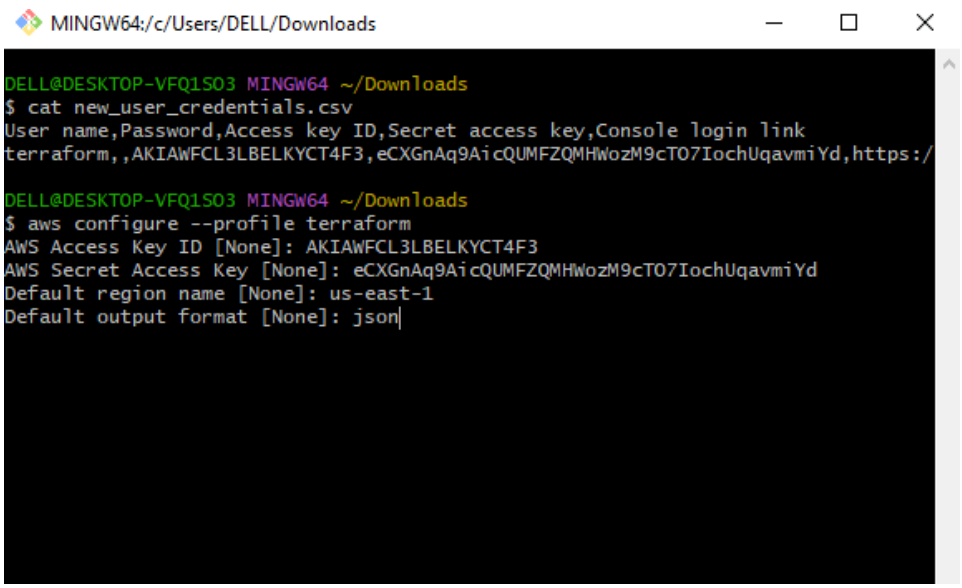
Terraform scripts to Provision AWS EKS

Steps to be followed:

1. Create an IAM (Identity Access Management) user in AWS and add user to the user_group
    - Sign in into AWS console with your crendentials
    - IAM -> Add user -> name -> add to Group -> add tags -> ok and save.
    - After adding user ,Download **new_user_credentials.csv** file .
    - Go to the file location and copy the credentials
    - Open the terminal

      $ cd Downloads/
      $ aws configure --profile <profile name>
      $ AWS Access Key ID : <paste from the csv file>
      $ AWS Secret Access Key: <paste from the csv file>
      $ Default region name: us-east-1
      $ Default output format: json



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2. Create the following Terraform Scripts:

    - provider.tf
    - vpc.tf
    - internet-gateway.tf
    - subnets.tf
    - eips.tf
    - nat-gateways,tf

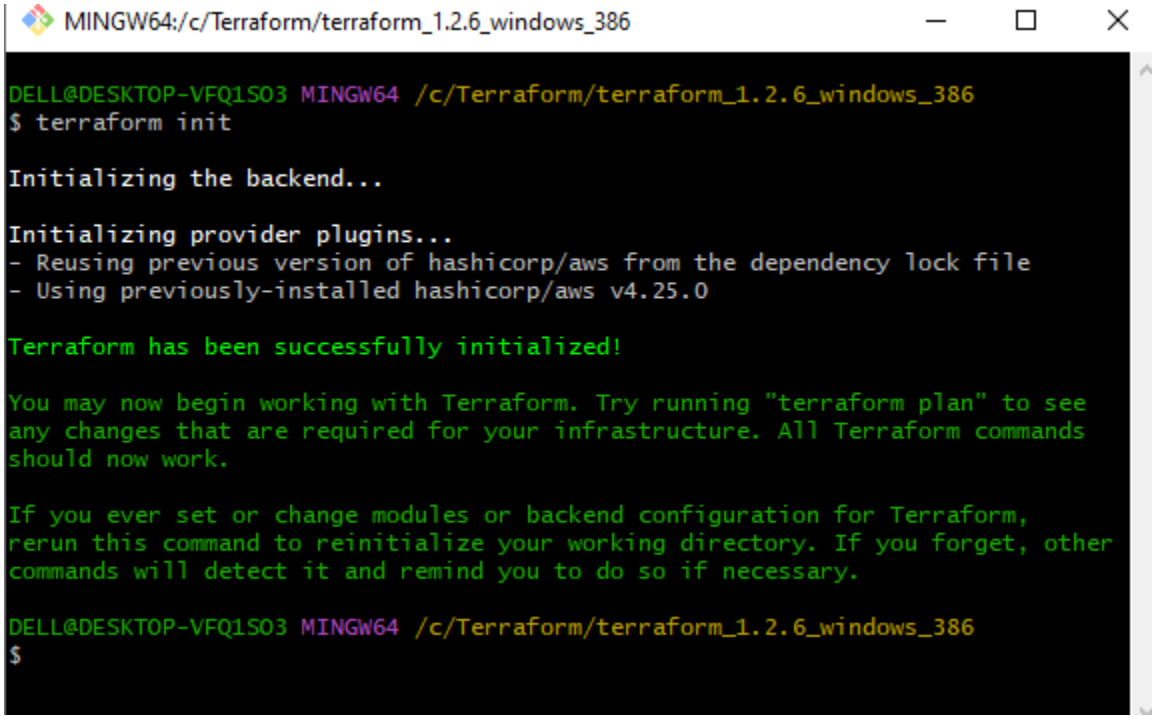
- route-tables.tf
- route-table-association.tf
- eks.tf
- eks-nodegroup.tf

3. Please find below url of my Github Repository for the Source code , where you can find all the Terraform Scripts as mentioned above.

   https://github.com/akshaykumart/two-tier.git

4. Go to the Terminal :

   - **$ cd Terraform** //Location where your Terraform files are located in local
   - **$ terraform version** //validate the terraform version
   - **$ aws –version** // Validate the AWS version
   - **$ terraform init** // Initialize the terraform Environment



   - **$ terraform plan**
   - **$ terraform apply**

MINGW64:/c/Terraform/terraform_1.2.6_windows_386

```
DELL@DESKTOP-VFQ1SO3 MINGW64 /c/Terraform/terraform_1.2.6_windows_386
$ terraform plan
aws_instance.example: Refreshing state... [id=i-05fd333384fd34f84]

Terraform used the selected providers to generate the following execution
plan. Resource actions are indicated with the following symbols:
  + create

Terraform will perform the following actions:

  # aws_vpc.main will be created
  + resource "aws_vpc" "main" {
      + arn                                  = (known after apply)
      + assign_generated_ipv6_cidr_block     = false
      + cidr_block                           = "10.0.0.0/16"
      + default_network_acl_id               = (known after apply)
      + default_route_table_id               = (known after apply)
      + default_security_group_id            = (known after apply)
      + dhcp_options_id                      = (known after apply)
      + enable_classiclink                   = false
      + enable_classiclink_dns_support       = false
      + enable_dns_hostnames                 = true
      + enable_dns_support                   = true
      + id                                   = (known after apply)
      + instance_tenancy                     = "default"
      + ipv6_association_id                  = (known after apply)
      + ipv6_cidr_block                      = (known after apply)
      + ipv6_cidr_block_network_border_group = (known after apply)
      + main_route_table_id                  = (known after apply)
      + owner_id                             = (known after apply)
      + tags                                 = {
          + "Name" = "main"
        }
      + tags_all                             = {
          + "Name" = "main"
        }
    }

Plan: 1 to add, 0 to change, 0 to destroy.

Changes to Outputs:
  + vpc_id = (known after apply)

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Note: You didn't use the -out option to save this plan, so Terraform can't
guarantee to take exactly these actions if you run "terraform apply" now.

DELL@DESKTOP-VFQ1SO3 MINGW64 /c/Terraform/terraform_1.2.6_windows_386
$
```

MINGW64:/c/Terraform/terraform_1.2.6_windows_386

```
  + resource "aws_vpc" "main" {
      + arn                                  = (known after apply)
      + assign_generated_ipv6_cidr_block     = false
      + cidr_block                           = "10.0.0.0/16"
      + default_network_acl_id               = (known after apply)
      + default_route_table_id               = (known after apply)
      + default_security_group_id            = (known after apply)
      + dhcp_options_id                      = (known after apply)
      + enable_classiclink                   = false
      + enable_classiclink_dns_support       = false
      + enable_dns_hostnames                 = true
      + enable_dns_support                   = true
      + id                                   = (known after apply)
      + instance_tenancy                     = "default"
      + ipv6_association_id                  = (known after apply)
      + ipv6_cidr_block                      = (known after apply)
      + ipv6_cidr_block_network_border_group = (known after apply)
      + main_route_table_id                  = (known after apply)
      + owner_id                             = (known after apply)
      + tags                                 = {
          + "Name" = "main"
        }
      + tags_all                             = {
          + "Name" = "main"
        }
    }

Plan: 1 to add, 0 to change, 0 to destroy.

Changes to Outputs:
  + vpc_id = (known after apply)

Do you want to perform these actions?
  Terraform will perform the actions described above.
  Only 'yes' will be accepted to approve.

  Enter a value: yes

aws_vpc.main: Creating...
aws_vpc.main: Still creating... [10s elapsed]
aws_vpc.main: Creation complete after 15s [id=vpc-036b565f3f25adbc3]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.

Outputs:

vpc_id = "vpc-036b565f3f25adbc3"

DELL@DESKTOP-VFQ1SO3 MINGW64 /c/Terraform/terraform_1.2.6_windows_386
$
```

MINGW64:/c/Terraform/terraform_1.2.6_windows_386

```
DELL@DESKTOP-VFQ1SO3 MINGW64 /c/Terraform/terraform_1.2.6_windows_386
$ terraform fmt

DELL@DESKTOP-VFQ1SO3 MINGW64 /c/Terraform/terraform_1.2.6_windows_386
$ terraform plan
aws_vpc.main: Refreshing state... [id=vpc-036b565f3f25adbc3]

Terraform used the selected providers to generate the following execution
plan. Resource actions are indicated with the following symbols:
  + create

Terraform will perform the following actions:

  # aws_internet_gateway.main will be created
  + resource "aws_internet_gateway" "main" {
      + arn      = (known after apply)
      + id       = (known after apply)
      + owner_id = (known after apply)
      + tags     = {
          + "Name" = "main"
        }
      + tags_all = {
          + "Name" = "main"
        }
      + vpc_id   = "vpc-036b565f3f25adbc3"
    }

Plan: 1 to add, 0 to change, 0 to destroy.

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Note: You didn't use the -out option to save this plan, so Terraform can't
guarantee to take exactly these actions if you run "terraform apply" now.

DELL@DESKTOP-VFQ1SO3 MINGW64 /c/Terraform/terraform_1.2.6_windows_386
$ |
```

MINGW64:/c/Terraform/terraform_1.2.6_windows_386

```
          + "Name"                      = "public-us-east-1a"
          + "kubernetes.io/cluster/eks" = "shared"
          + "kubernetes.io/role/elb"    = "1"
        }
      + tags_all                                           = {
          + "Name"                      = "public-us-east-1a"
          + "kubernetes.io/cluster/eks" = "shared"
          + "kubernetes.io/role/elb"    = "1"
        }
      + vpc_id                                             = "vpc-036b565f3f25adbc3"
    }

  # aws_subnet.public_2 will be created
  + resource "aws_subnet" "public_2" {
      + arn                                            = (known after apply)
      + assign_ipv6_address_on_creation                = false
      + availability_zone                              = "us-east-1b"
      + availability_zone_id                           = (known after apply)
      + cidr_block                                     = "192.168.64.0/18"
      + enable_dns64                                   = false
      + enable_resource_name_dns_a_record_on_launch    = false
      + enable_resource_name_dns_aaaa_record_on_launch = false
      + id                                             = (known after apply)
      + ipv6_cidr_block_association_id                 = (known after apply)
      + ipv6_native                                    = false
      + map_public_ip_on_launch                        = true
      + owner_id                                       = (known after apply)
      + private_dns_hostname_type_on_launch            = (known after apply)
      + tags                                           = {
          + "Name"                      = "public-us-east-1b"
          + "kubernetes.io/cluster/eks" = "shared"
          + "kubernetes.io/role/elb"    = "1"
        }
      + tags_all                                       = {
          + "Name"                      = "public-us-east-1b"
          + "kubernetes.io/cluster/eks" = "shared"
          + "kubernetes.io/role/elb"    = "1"
        }
      + vpc_id                                         = "vpc-036b565f3f25adbc3"
    }

Plan: 4 to add, 0 to change, 0 to destroy.

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Note: You didn't use the -out option to save this plan, so Terraform can't
guarantee to take exactly these actions if you run "terraform apply" now.

DELL@DESKTOP-VFQ1SO3 MINGW64 /c/Terraform/terraform_1.2.6_windows_386
$ |
```

MINGW64:/c/Terraform/terraform_1.2.6_windows_386

```
      + cidr_block                                       = "10.0.64.0/24"
      + enable_dns64                                     = false
      + enable_resource_name_dns_a_record_on_launch      = false
      + enable_resource_name_dns_aaaa_record_on_launch = false
      + id                                               = (known after apply)
      + ipv6_cidr_block_association_id                   = (known after apply)
      + ipv6_native                                      = false
      + map_public_ip_on_launch                          = true
      + owner_id                                         = (known after apply)
      + private_dns_hostname_type_on_launch              = (known after apply)
      + tags                                             = {
          + "Name"                    = "public-us-east-1b"
          + "kubernetes.io/cluster/eks" = "shared"
          + "kubernetes.io/role/elb"    = "1"
        }
      + tags_all                                         = {
          + "Name"                    = "public-us-east-1b"
          + "kubernetes.io/cluster/eks" = "shared"
          + "kubernetes.io/role/elb"    = "1"
        }
      + vpc_id                                           = "vpc-036b565f3f25adbc3"
    }

Plan: 4 to add, 0 to change, 0 to destroy.

Do you want to perform these actions?
  Terraform will perform the actions described above.
  Only 'yes' will be accepted to approve.

  Enter a value: yes

aws_subnet.public_2: Creating...
aws_subnet.private_1: Creating...
aws_subnet.public_1: Creating...
aws_subnet.private_2: Creating...
aws_subnet.private_2: Creation complete after 2s [id=subnet-05bdca032100a1ca4]
aws_subnet.private_1: Creation complete after 2s [id=subnet-0c9221c4cf96dc3c3]
aws_subnet.public_2: Still creating... [10s elapsed]
aws_subnet.public_1: Still creating... [10s elapsed]
aws_subnet.public_2: Creation complete after 12s [id=subnet-0ca656bc5290f05a0]
aws_subnet.public_1: Creation complete after 13s [id=subnet-06e817fcdce6fde02]

Apply complete! Resources: 4 added, 0 changed, 0 destroyed.

Outputs:

vpc_id = "vpc-036b565f3f25adbc3"

DELL@DESKTOP-VFQ1SO3 MINGW64 /c/Terraform/terraform_1.2.6_windows_386
$
```

```
Terraform used the selected providers to generate the following execution
plan. Resource actions are indicated with the following symbols:
  + create

Terraform will perform the following actions:

  # aws_eip.nat1 will be created
  + resource "aws_eip" "nat1" {
      + allocation_id        = (known after apply)
      + association_id       = (known after apply)
      + carrier_ip           = (known after apply)
      + customer_owned_ip    = (known after apply)
      + domain               = (known after apply)
      + id                   = (known after apply)
      + instance             = (known after apply)
      + network_border_group = (known after apply)
      + network_interface    = (known after apply)
      + private_dns          = (known after apply)
      + private_ip           = (known after apply)
      + public_dns           = (known after apply)
      + public_ip            = (known after apply)
      + public_ipv4_pool     = (known after apply)
      + tags_all             = (known after apply)
      + vpc                  = (known after apply)
    }

  # aws_eip.nat2 will be created
  + resource "aws_eip" "nat2" {
      + allocation_id        = (known after apply)
      + association_id       = (known after apply)
      + carrier_ip           = (known after apply)
      + customer_owned_ip    = (known after apply)
      + domain               = (known after apply)
      + id                   = (known after apply)
      + instance             = (known after apply)
      + network_border_group = (known after apply)
      + network_interface    = (known after apply)
      + private_dns          = (known after apply)
      + private_ip           = (known after apply)
      + public_dns           = (known after apply)
      + public_ip            = (known after apply)
      + public_ipv4_pool     = (known after apply)
      + tags_all             = (known after apply)
      + vpc                  = (known after apply)
    }

  # aws_nat_gateway.gw1 will be created
  + resource "aws_nat_gateway" "gw1" {
      + allocation_id        = (known after apply)
```

MINGW64:/c/Terraform/terraform_1.2.6_windows_386

```
      + public_dns            = (known after apply)
      + public_ip             = (known after apply)
      + public_ipv4_pool      = (known after apply)
      + tags_all              = (known after apply)
      + vpc                   = (known after apply)
    }

  # aws_nat_gateway.gw1 will be created
  + resource "aws_nat_gateway" "gw1" {
      + allocation_id        = (known after apply)
      + connectivity_type    = "public"
      + id                   = (known after apply)
      + network_interface_id = (known after apply)
      + private_ip           = (known after apply)
      + public_ip            = (known after apply)
      + subnet_id            = "subnet-06e817fcdce6fde02"
      + tags                 = {
          + "Name" = "NAT 1"
        }
      + tags_all             = {
          + "Name" = "NAT 1"
        }
    }

  # aws_nat_gateway.gw2 will be created
  + resource "aws_nat_gateway" "gw2" {
      + allocation_id        = (known after apply)
      + connectivity_type    = "public"
      + id                   = (known after apply)
      + network_interface_id = (known after apply)
      + private_ip           = (known after apply)
      + public_ip            = (known after apply)
      + subnet_id            = "subnet-0ca656bc5290f05a0"
      + tags                 = {
          + "Name" = "NAT 2"
        }
      + tags_all             = {
          + "Name" = "NAT 2"
        }
    }

Plan: 4 to add, 0 to change, 0 to destroy.

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Note: You didn't use the -out option to save this plan, so Terraform can't
guarantee to take exactly these actions if you run "terraform apply" now.

DELL@DESKTOP-VFQ1SO3 MINGW64 /c/Terraform/terraform_1.2.6_windows_386
$
```
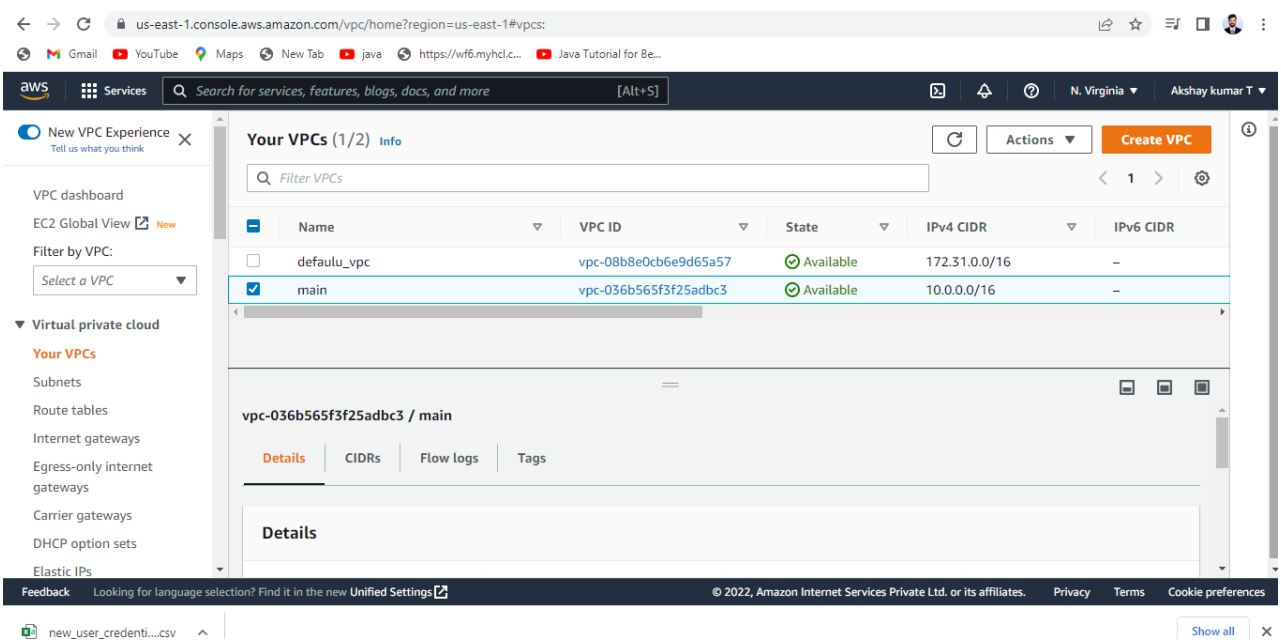

MINGW64:/c/Terraform/terraform_1.2.6_windows_386

```
          + "Name" = "NAT 2"
        }
      + tags_all             = {
          + "Name" = "NAT 2"
        }
    }

Plan: 4 to add, 0 to change, 0 to destroy.

Do you want to perform these actions?
  Terraform will perform the actions described above.
  Only 'yes' will be accepted to approve.

  Enter a value: yes

aws_eip.nat2: Creating...
aws_eip.nat1: Creating...
aws_eip.nat1: Creation complete after 1s [id=eipalloc-05c93923b158742c0]
aws_eip.nat2: Creation complete after 1s [id=eipalloc-08238c12f96f259e9]
aws_nat_gateway.gw1: Creating...
aws_nat_gateway.gw2: Creating...
aws_nat_gateway.gw1: Still creating... [10s elapsed]
aws_nat_gateway.gw2: Still creating... [10s elapsed]
aws_nat_gateway.gw1: Still creating... [20s elapsed]
aws_nat_gateway.gw2: Still creating... [20s elapsed]
aws_nat_gateway.gw1: Still creating... [30s elapsed]
aws_nat_gateway.gw2: Still creating... [30s elapsed]
aws_nat_gateway.gw1: Still creating... [40s elapsed]
aws_nat_gateway.gw2: Still creating... [40s elapsed]
aws_nat_gateway.gw1: Still creating... [50s elapsed]
aws_nat_gateway.gw2: Still creating... [50s elapsed]
aws_nat_gateway.gw1: Still creating... [1m0s elapsed]
aws_nat_gateway.gw2: Still creating... [1m0s elapsed]
aws_nat_gateway.gw1: Still creating... [1m10s elapsed]
aws_nat_gateway.gw2: Still creating... [1m10s elapsed]
aws_nat_gateway.gw1: Still creating... [1m20s elapsed]
aws_nat_gateway.gw2: Still creating... [1m20s elapsed]
aws_nat_gateway.gw1: Creation complete after 1m28s [id=nat-0f89a25c82c413b05]
aws_nat_gateway.gw2: Still creating... [1m30s elapsed]
aws_nat_gateway.gw2: Still creating... [1m40s elapsed]
aws_nat_gateway.gw2: Creation complete after 1m49s [id=nat-08ec15eec07ca9709]

Apply complete! Resources: 4 added, 0 changed, 0 destroyed.

Outputs:

vpc_id = "vpc-036b565f3f25adbc3"

DELL@DESKTOP-VFQ1SO3 MINGW64 /c/Terraform/terraform_1.2.6_windows_386
$
```

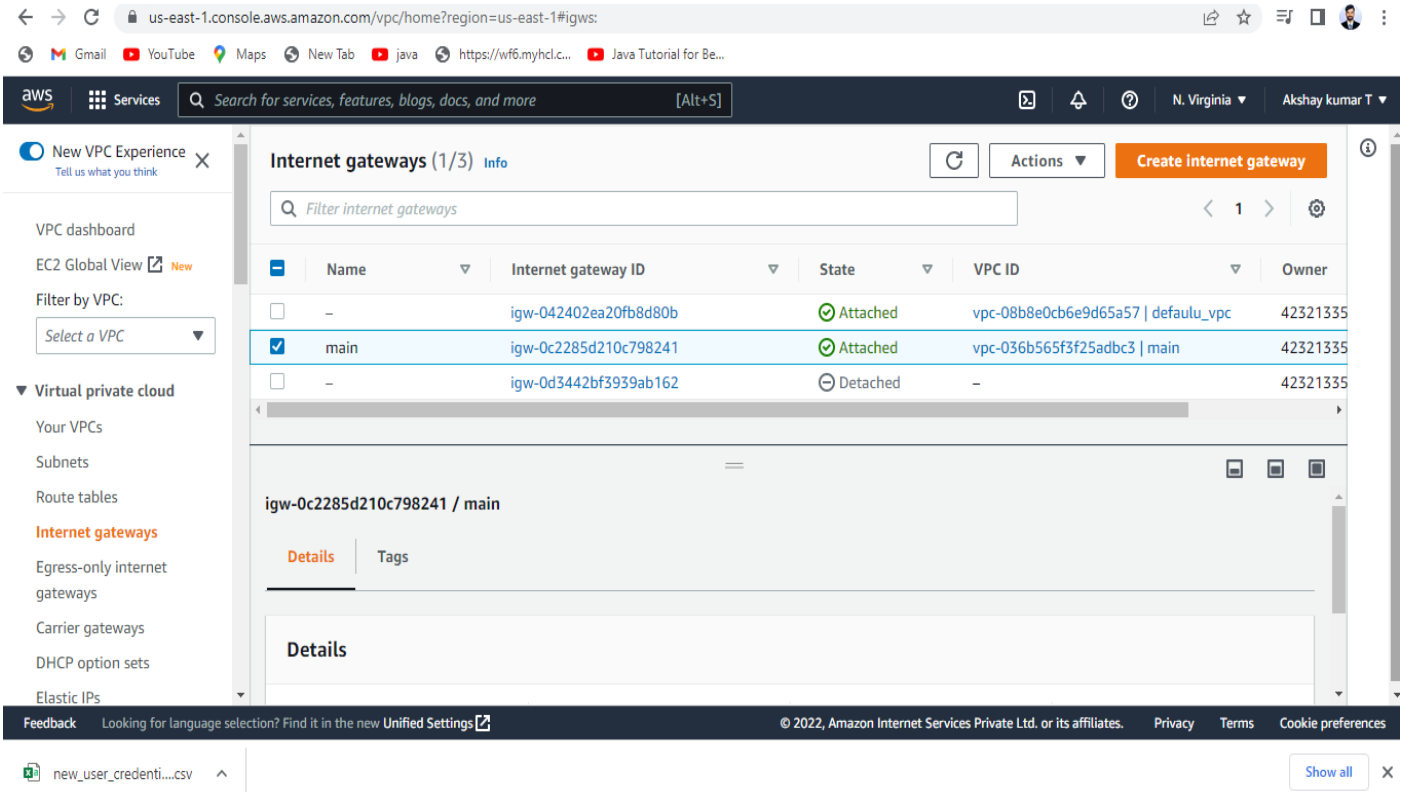
```
MINGW64:/c/Terraform/terraform_1.2.6_windows_386
      + id             = (known after apply)
      + route_table_id = (known after apply)
      + subnet_id      = "subnet-05bdca032100a1ca4"
    }

  # aws_route_table_association.public1 will be created
  + resource "aws_route_table_association" "public1" {
      + id             = (known after apply)
      + route_table_id = (known after apply)
      + subnet_id      = "subnet-06e817fcdce6fde02"
    }

  # aws_route_table_association.public2 will be created
  + resource "aws_route_table_association" "public2" {
      + id             = (known after apply)
      + route_table_id = (known after apply)
      + subnet_id      = "subnet-0ca656bc5290f05a0"
    }

Plan: 7 to add, 0 to change, 0 to destroy.

Do you want to perform these actions?
  Terraform will perform the actions described above.
  Only 'yes' will be accepted to approve.

  Enter a value: yes

aws_route_table.private1: Creating...
aws_route_table.public: Creating...
aws_route_table.private2: Creating...
aws_route_table.public: Creation complete after 3s [id=rtb-0e96b6fa60a0d8434]
aws_route_table_association.public2: Creating...
aws_route_table_association.public1: Creating...
aws_route_table.private1: Creation complete after 3s [id=rtb-02fe4186172ac28c5]
aws_route_table_association.private1: Creating...
aws_route_table.private2: Creation complete after 4s [id=rtb-05d94f975a6177b6e]
aws_route_table_association.private2: Creating...
aws_route_table_association.public2: Creation complete after 1s [id=rtbassoc-0dbf12dc5afc75ebc]
aws_route_table_association.public1: Creation complete after 1s [id=rtbassoc-0c57a096dc7b34f71]
aws_route_table_association.private1: Creation complete after 1s [id=rtbassoc-0006b48cbc9ed1bfc]
aws_route_table_association.private2: Creation complete after 1s [id=rtbassoc-0ea10c4816fc611e7]

Apply complete! Resources: 7 added, 0 changed, 0 destroyed.

Outputs:

vpc_id = "vpc-036b565f3f25adbc3"

DELL@DESKTOP-VFQ1SO3 MINGW64 /c/Terraform/terraform_1.2.6_windows_386
$ |
```

5. *Validations:*

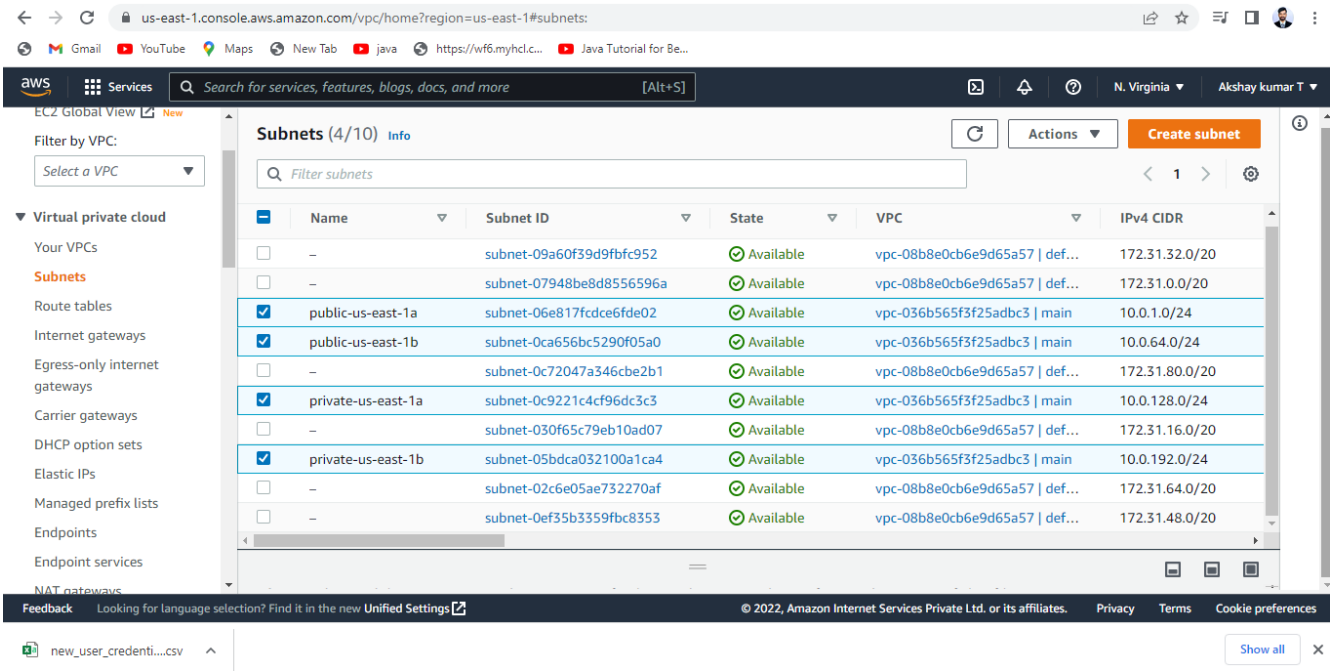
- Login to AWS console and check whether the following things are created or not.



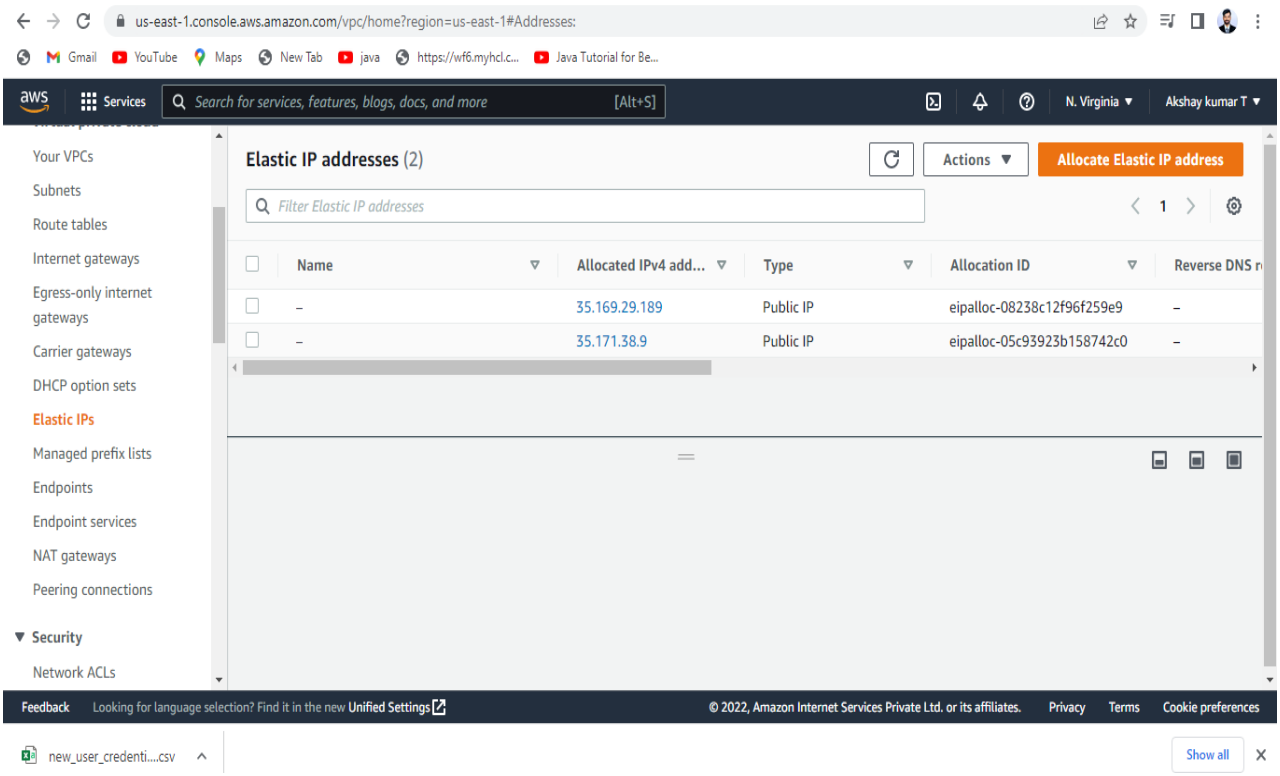
- Validate own VPC created as per the Terraform script as shown above



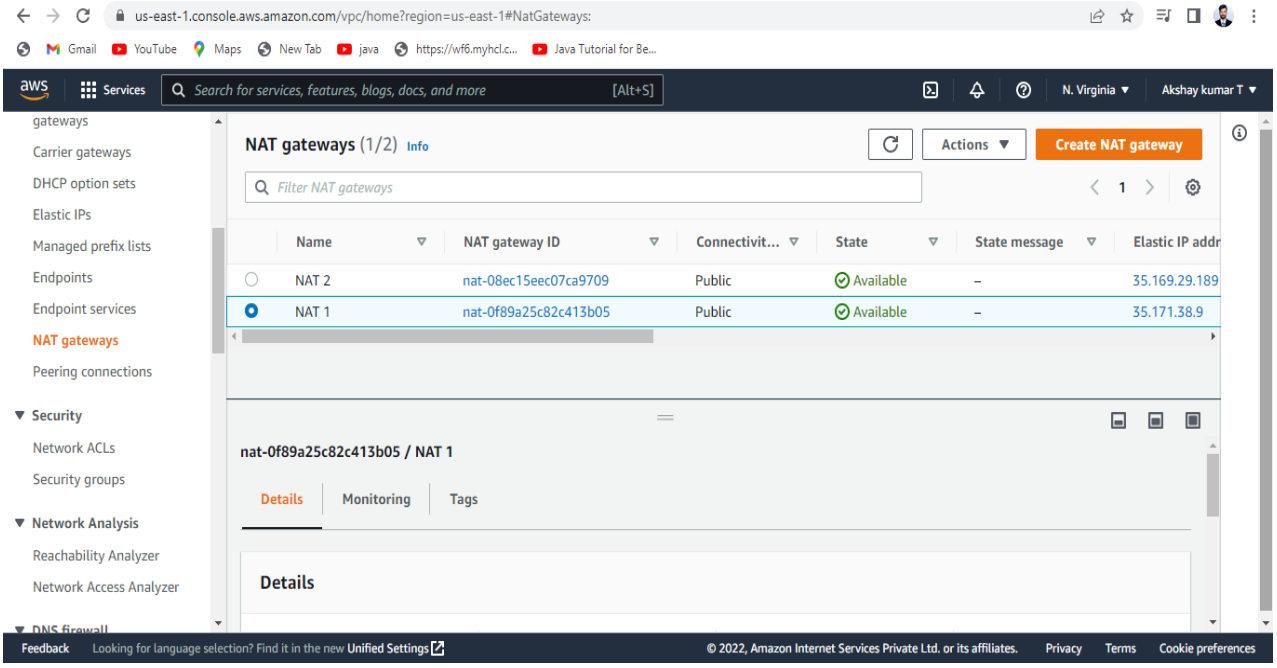
- Validate IGW (Internet Gate Way) created as per the Terraform script as shown above



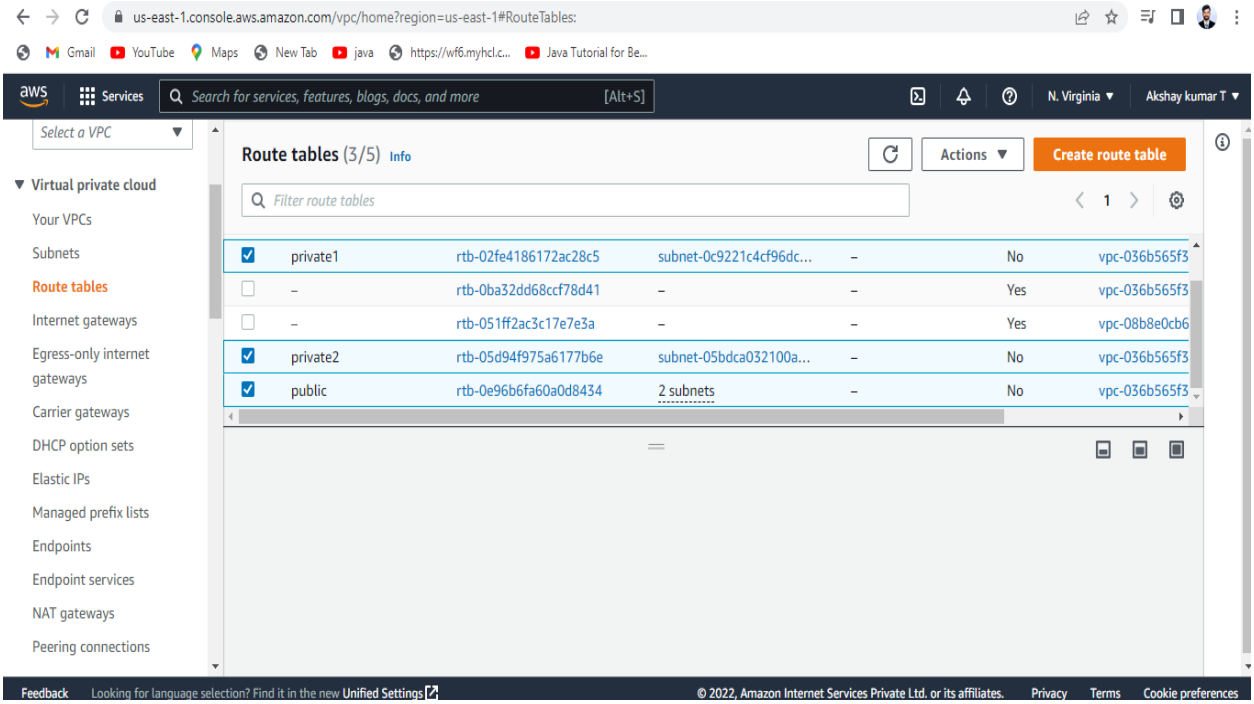
- Validate Subnets created as per the Terraform script as shown above.



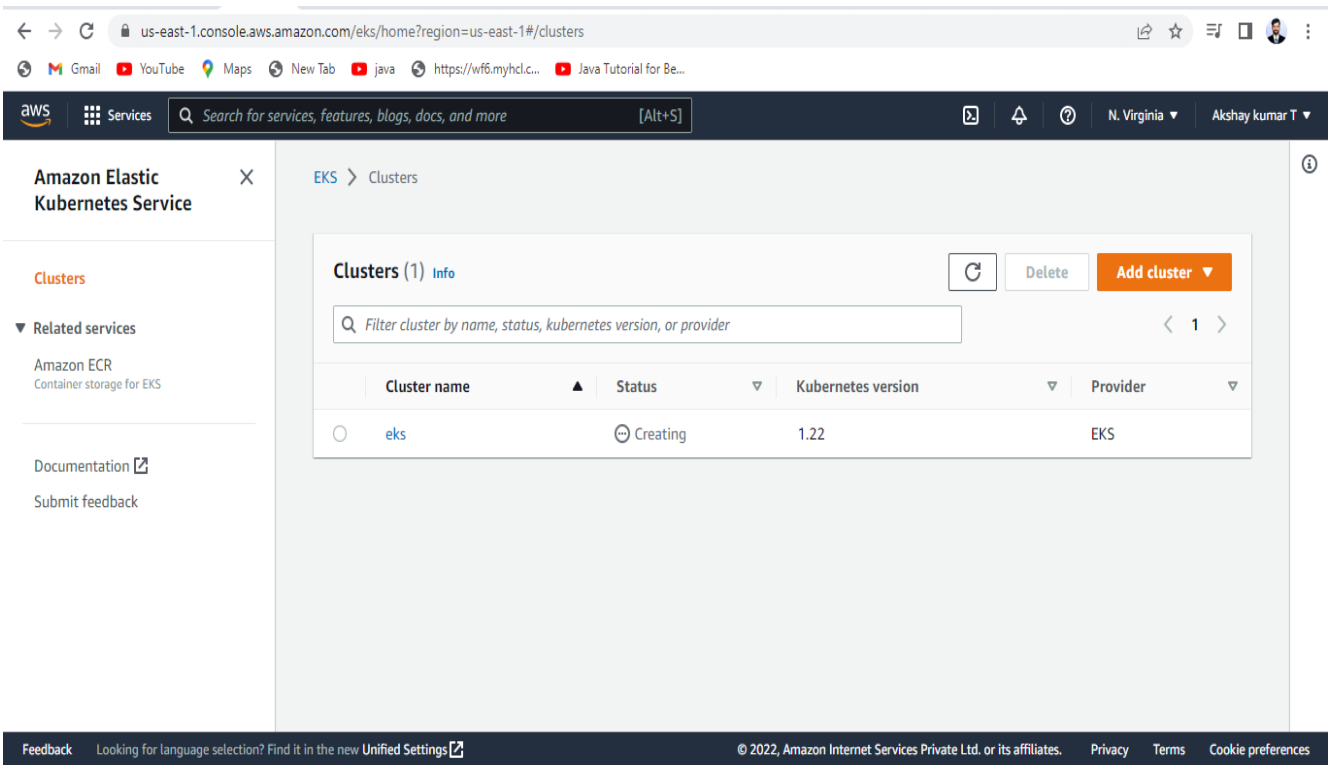
- Validate Elastic IP's created as per the Terraform Script as shown above.



- Validate NAT Gateways created as per the Terraform Script as shown above.



- Validate the Routing Tables as per the Terraform script as shown above.



- Validate the EKS Cluster as per the Terraform Script as shown above.

Deploying a Two Tier Application on EKS Cluster

Steps to be followed:

I. Install AWS CLI:

- **$ sudo apt-get update**
- **$ sudo apt install python3-pip -y**
- **$ sudo apt install awscli -y**
- **$ aws configure**
  access key id: <provide your IAM user access key>
  secret key id: <provide your IAM user secret key>
  region: <region of aws resources>
  format: <file format>

II. Install AWS Authenticator :

- **$ curl -Lo aws-iam-authenticator https://github.com/kubernetes-sigs/aws-iam-authenticator/releases/download/v0.5.9/aws-iam-authenticator_0.5.9_linux_amd64**
- **$ chmod +x ./aws-iam-authenticator**
- **$ mkdir -p $HOME/bin && cp ./aws-iam-authenticator $HOME/bin/aws-iam-authenticator && export PATH=$PATH:$HOME/bin**

III. Install Kubectl to communicate with EKS Cluster :

- **$ curl -o kubectl https://s3.us-west-2.amazonaws.com/amazon-eks/1.23.7/2022-06-29/bin/linux/amd64/kubectl**
- **$ chmod +x ./kubectl**
- **$ mkdir -p $HOME/bin && cp ./kubectl $HOME/bin/kubectl && export PATH=$PATH:$HOME/bin**

IV. To communicate with EKS cluster :

- **$ aws eks --region <region> update-kubeconfig --name <EKS Cluster name>**
  [In region, mention your region where eks is created]
  [In name , mention your EKS Cluster name]
- **$ more /home/ubuntu/.kube/config**

- **$ export KUBECONFIG=~/.kube/config**
- **$ kubectl get svc** //verification

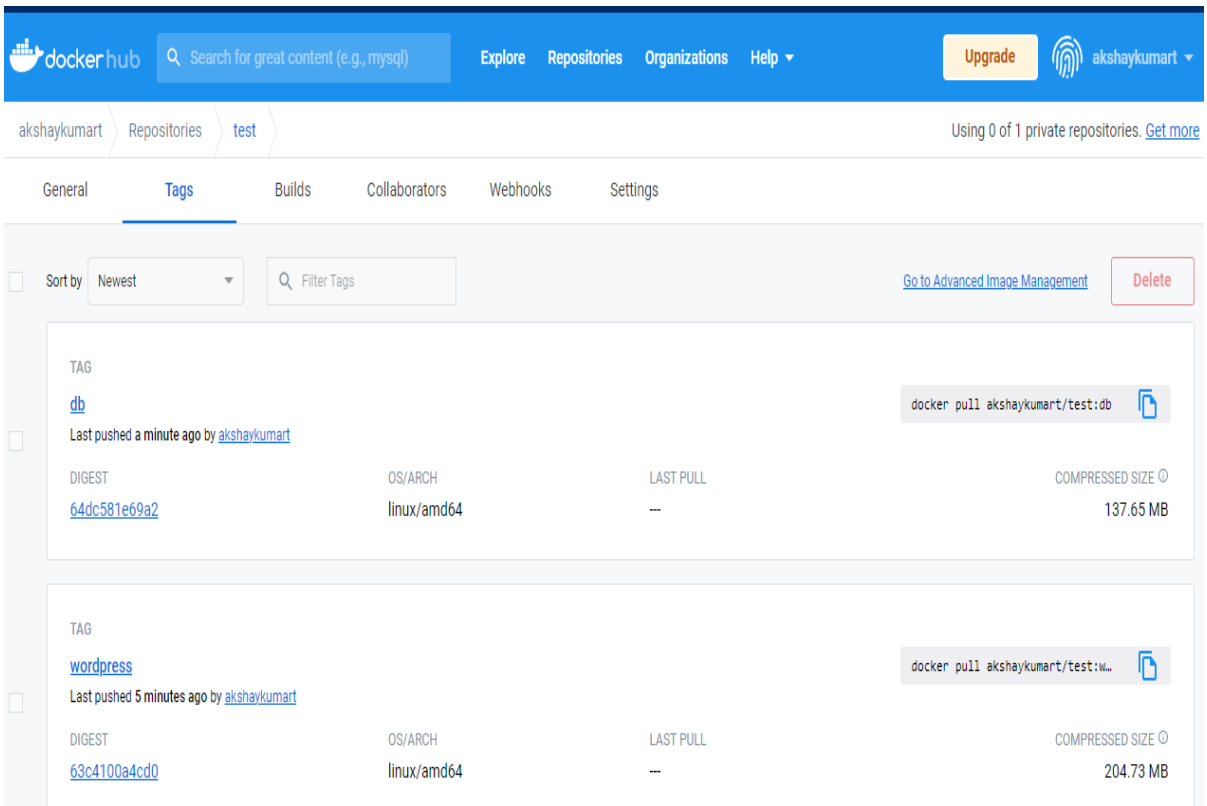
V. Deploying a Wordpress and Mysql tier on to EKS Cluster :

- Create a docker compose file called docker-compose.yml

  https://github.com/akshaykumart/two-tier/blob/main/docker-compose.yml

  [Refer the above Github Repository for the scripts and code]

  $ docker-compose up –d //creating an image from script
  $ docker ps //validate the image created
  $ docker login //docker hub login credentials
  username : <provide your dockerhub account username>
  Password: <provide your dockerhub account password>
  $ docker tag <image> <username/repo>:tag //tagging a image to username
  $ docker push <username/repo>:tag pushing image to dockerhub



- Create a deployment file and service file for wordpress app called deployment1.yml

  https://github.com/akshaykumart/two-tier/blob/main/deployment1.yml

  [Refer the above Github Repository for the scripts and code]

  $ kubectl apply -f deployment1.yml

- Create a deployment file and service file for database called deployment2.yml

  https://github.com/akshaykumart/two-tier/blob/main/deployment2.yml

  [Refer the above Github Repository for the scripts and code]

  $ kubectl apply -f deployment2.yml

- Verify that the deployments are created or not

  $ kubectl get deployments

```
ubuntu@ip-172-31-21-252:~/two-tier$ kubectl get deployments
NAME            READY   UP-TO-DATE   AVAILABLE   AGE
database        2/2     2            2           15s
wordpress-app   2/2     2            2           4m40s
ubuntu@ip-172-31-21-252:~/two-tier$
```

  $ kubectl get svc

```
ubuntu@ip-172-31-21-252:~/two-tier$ kubectl get svc
NAME            TYPE           CLUSTER-IP       EXTERNAL-IP
                                    PORT(S)        AGE
database        ClusterIP      172.20.125.145   <none>
                                    3306/TCP       48s
kubernetes      ClusterIP      172.20.0.1       <none>
                                    443/TCP        102m
wordpress-app   LoadBalancer   172.20.134.96    ab7c2e740ecd34efdafae1fdbe9213af-7042
28348.us-east-1.elb.amazonaws.com   80:30001/TCP   2m12s
ubuntu@ip-172-31-21-252:~/two-tier$
```

  $ kubectl get nodes

```
ubuntu@ip-172-31-21-252:~/two-tier$ kubectl get nodes
NAME                           STATUS   ROLES    AGE   VERSION
ip-10-0-128-111.ec2.internal   Ready    <none>   80m   v1.23.9-eks-ba74326
ip-10-0-192-130.ec2.internal   Ready    <none>   80m   v1.23.9-eks-ba74326
ubuntu@ip-172-31-21-252:~/two-tier$
```

$ kubectl get pods

```
ubuntu@ip-172-31-21-252:~/two-tier$ kubectl get pods
NAME                              READY   STATUS    RESTARTS   AGE
database-74497879cd-762dd         1/1     Running   0          87s
database-74497879cd-kt76m         1/1     Running   0          87s
wordpress-app-7848478467-kfn8s    1/1     Running   0          5m52s
wordpress-app-7848478467-rbg85    1/1     Running   0          5m52s
ubuntu@ip-172-31-21-252:~/two-tier$
```

- Access the application using external ip from service loadbalancer :

  <External Ip from svc>:<port>