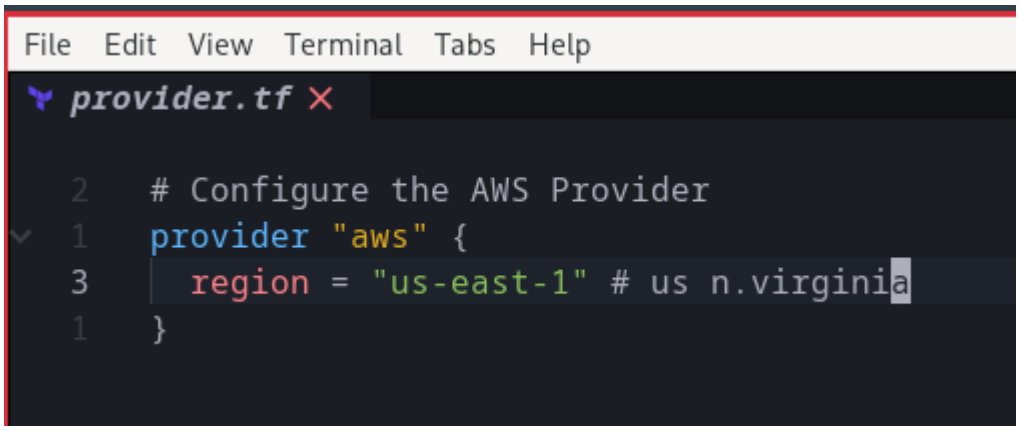
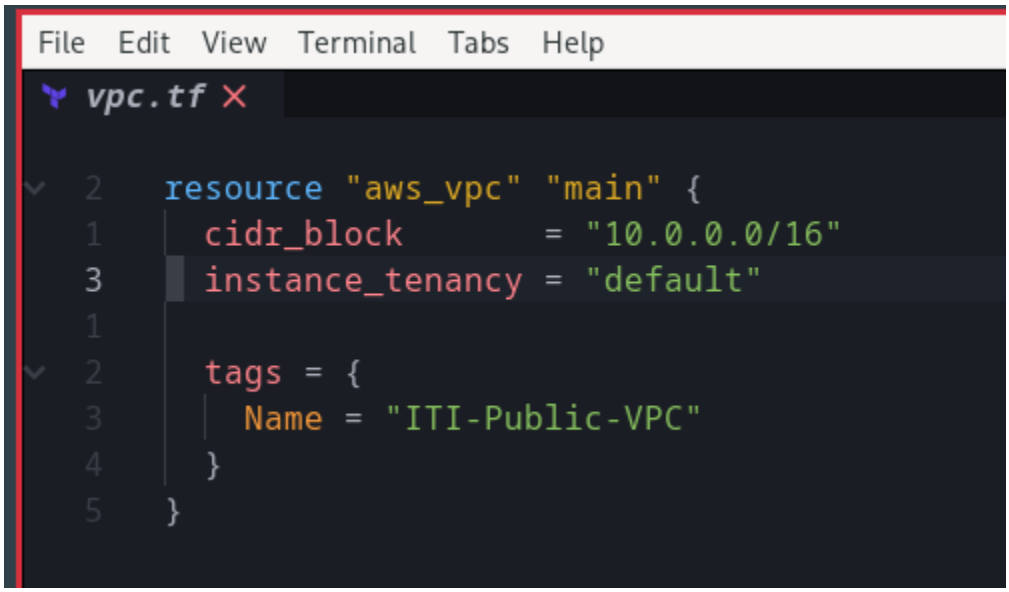
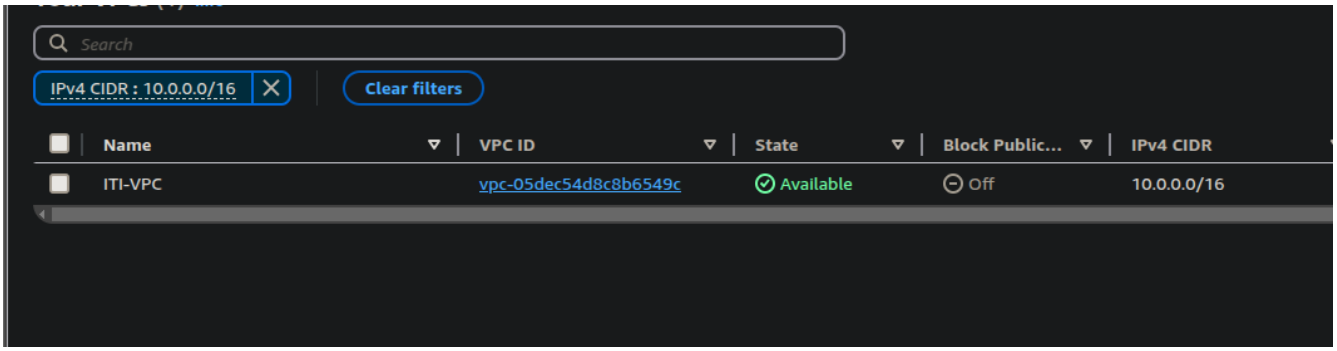
Networking
1- create vpc



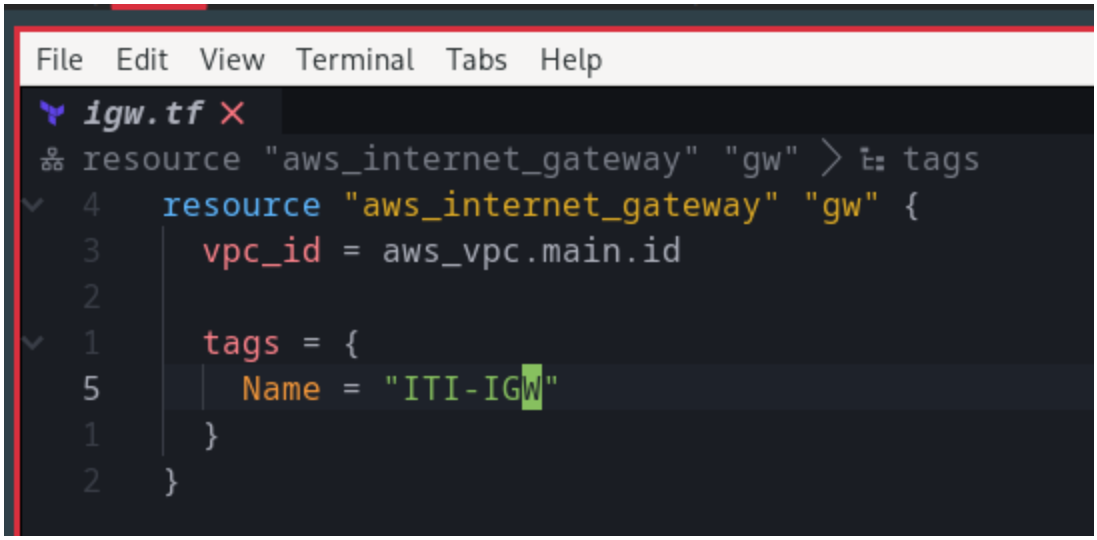


```
lab1.text
[mahmoud@hestia lab1]$ nvim provider.tf
[mahmoud@hestia lab1]$ nvim vpc.tf
[mahmoud@hestia lab1]$ terraform init
Initializing the backend...
Initializing provider plugins...
- Finding latest version of hashicorp/aws...
- Installing hashicorp/aws v5.89.0...
- Installed hashicorp/aws v5.89.0 (signed by HashiCorp)
Terraform has created a lock file .terraform.lock.hcl to record the provider
selections it made above. Include this file in your version control repository
so that Terraform can guarantee to make the same selections by default when
you run "terraform init" in the future.

Terraform has been successfully initialized!

You may now begin working with Terraform. Try running "terraform plan" to see
any changes that are required for your infrastructure. All Terraform commands
should now work.

If you ever set or change modules or backend configuration for Terraform,
rerun this command to reinitialize your working directory. If you forget, other
commands will detect it and remind you to do so if necessary.
```

```
File  Edit  View  Terminal  Tabs  Help
[mahmoud@hestia lab1]$ terraform apply

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)
      + 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_dns_hostnames                 = (known after apply)
      + enable_dns_support                   = true
      + enable_network_address_usage_metrics = (known after apply)
      + 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" = "ITI-Public-VPC"
        }
      + tags_all                             = {
          + "Name" = "ITI-Public-VPC"
        }
    }

Plan: 1 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_vpc.main: Creating...
aws_vpc.main: Creation complete after 3s [id=vpc-05dec54d8c8b6549c]
```

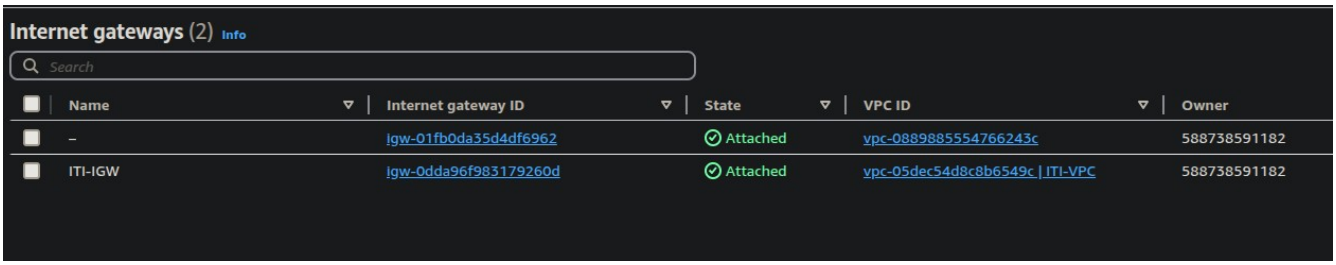


2- create internet gateway

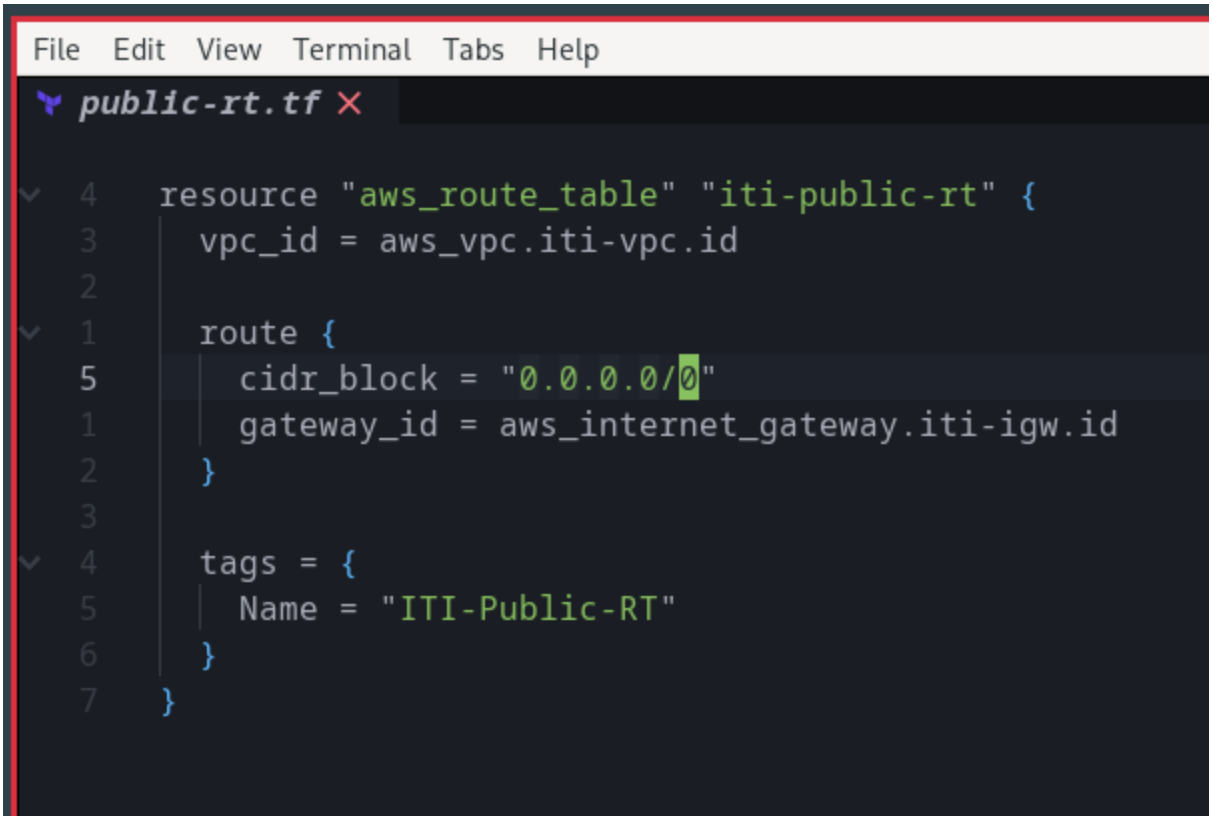


Terraform is attaching this to the needed vpc directly through the vpc_id

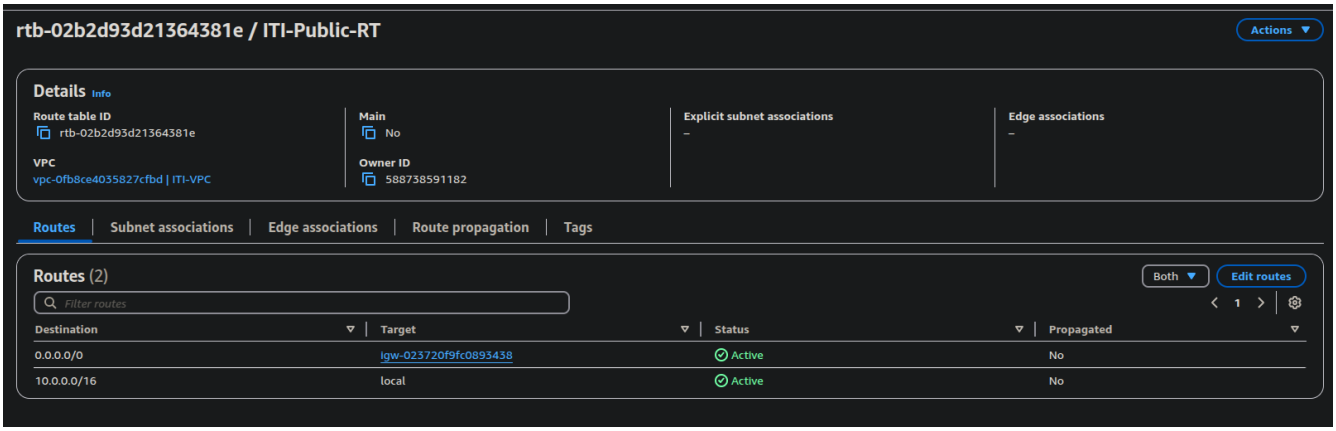
```
[mahmoud@hestia lab1]$ terraform apply
aws_vpc.main: Refreshing state... [id=vpc-05dec54d8c8b6549c]

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.gw will be created
  + resource "aws_internet_gateway" "gw" {
      + arn      = (known after apply)
      + id       = (known after apply)
      + owner_id = (known after apply)
      + tags     = {
          + "Name" = "main"
        }
      + tags_all = {
          + "Name" = "main"
        }
      + vpc_id   = "vpc-05dec54d8c8b6549c"
    }

Plan: 1 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_internet_gateway.gw: Creating...
aws_internet_gateway.gw: Creation complete after 1s [id=igw-0dda96f983179260d]

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



3- create public route table



```
File  Edit  View  Terminal  Tabs  Help
aws_vpc.iti-vpc: Refreshing state... [id=vpc-0fb8ce4035827cfbd]
aws_internet_gateway.iti-igw: Refreshing state... [id=igw-023720f9fc0893438]

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_route_table.iti-public-rt will be created
  + resource "aws_route_table" "iti-public-rt" {
      + arn              = (known after apply)
      + id               = (known after apply)
      + owner_id         = (known after apply)
      + propagating_vgws = (known after apply)
      + route            = [
          + {
              + cidr_block                = "0.0.0.0/0"
              + gateway_id                = "igw-023720f9fc0893438"
                # (11 unchanged attributes hidden)
            },
        ]
      + tags             = {
          + "Name" = "ITI-Public-RT"
        }
      + tags_all         = {
          + "Name" = "ITI-Public-RT"
        }
      + vpc_id           = "vpc-0fb8ce4035827cfbd"
    }

Plan: 1 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.iti-public-rt: Creating...
aws_route_table.iti-public-rt: Creation complete after 3s [id=rtb-02b2d93d21364381e]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
[mahmoud@hestia lab1]$
```



4- create private route table

File Edit View Terminal Tabs Help

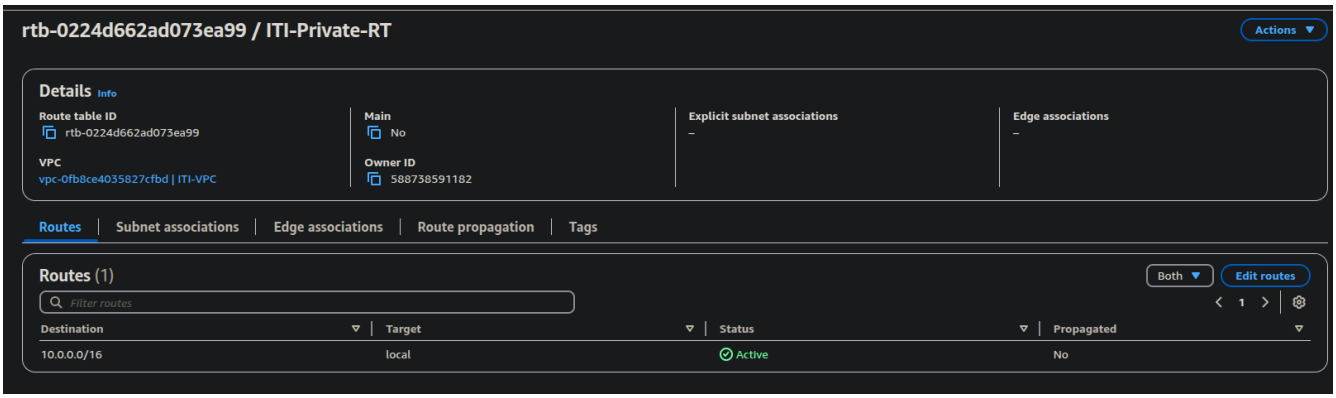
private-rt.tf

```
resource "aws_route_table" "iti-private-rt" {
  vpc_id = aws_vpc.iti-vpc.id

  tags = {
    Name = "ITI-Private-RT"
  }
}
```

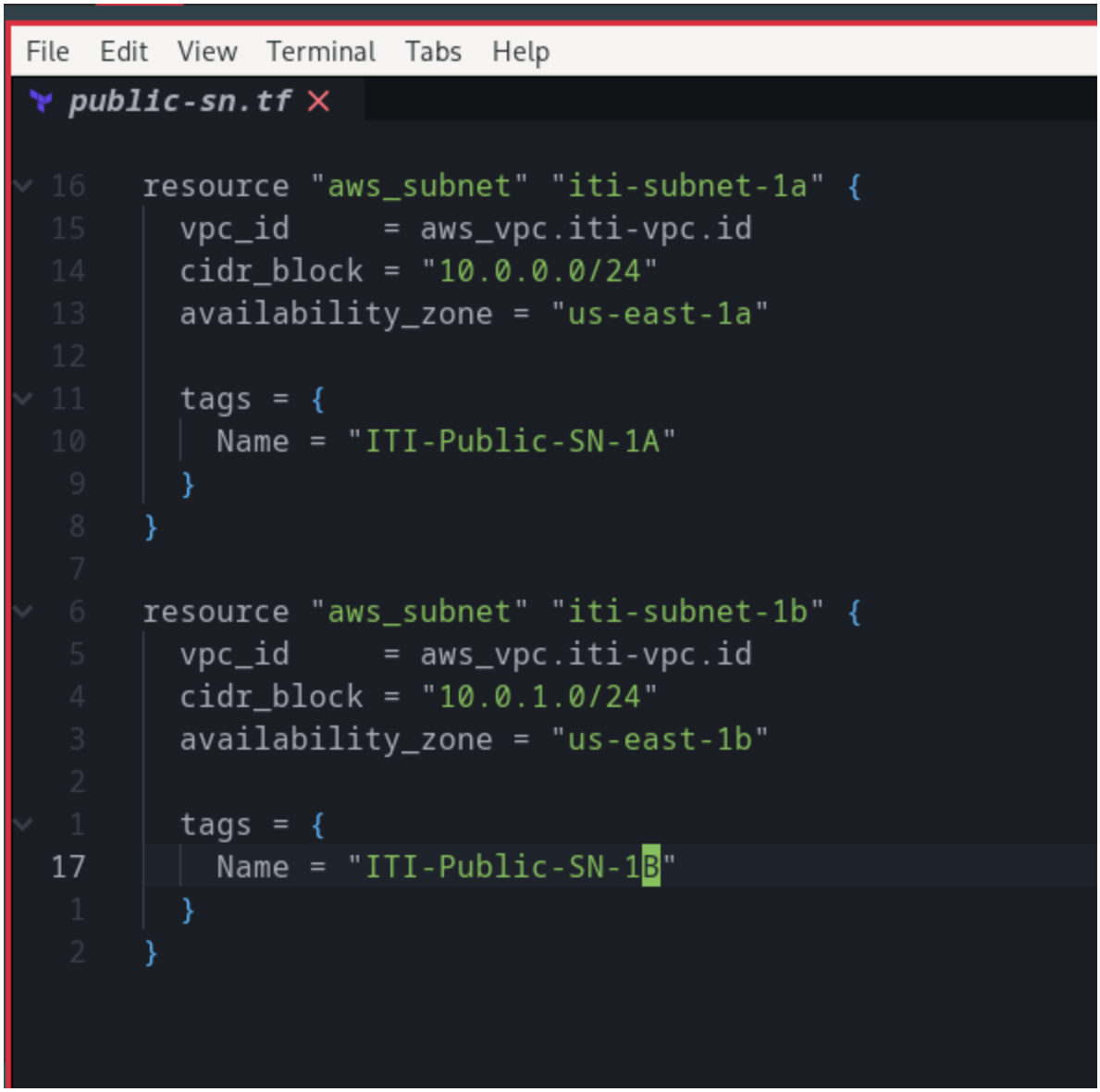
```
[mahmoud@hestia lab1]$ terraform apply
aws_vpc.iti-vpc: Refreshing state... [id=vpc-0fb8ce4035827cfbd]
aws_internet_gateway.iti-igw: Refreshing state... [id=igw-023720f9fc0893438]
aws_route_table.iti-public-rt: Refreshing state... [id=rtb-02b2d93d21364381e]

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_route_table.iti-private-rt will be created
  + resource "aws_route_table" "iti-private-rt" {
      + arn              = (known after apply)
      + id               = (known after apply)
      + owner_id         = (known after apply)
      + propagating_vgws = (known after apply)
      + route            = (known after apply)
      + tags             = {
          + "Name" = "ITI-Private-RT"
        }
      + tags_all         = {
          + "Name" = "ITI-Private-RT"
        }
      + vpc_id           = "vpc-0fb8ce4035827cfbd"
    }

Plan: 1 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.iti-private-rt: Creating...
aws_route_table.iti-private-rt: Creation complete after 2s [id=rtb-0224d662ad073ea99]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
[mahmoud@hestia lab1]$
```

5- create public route

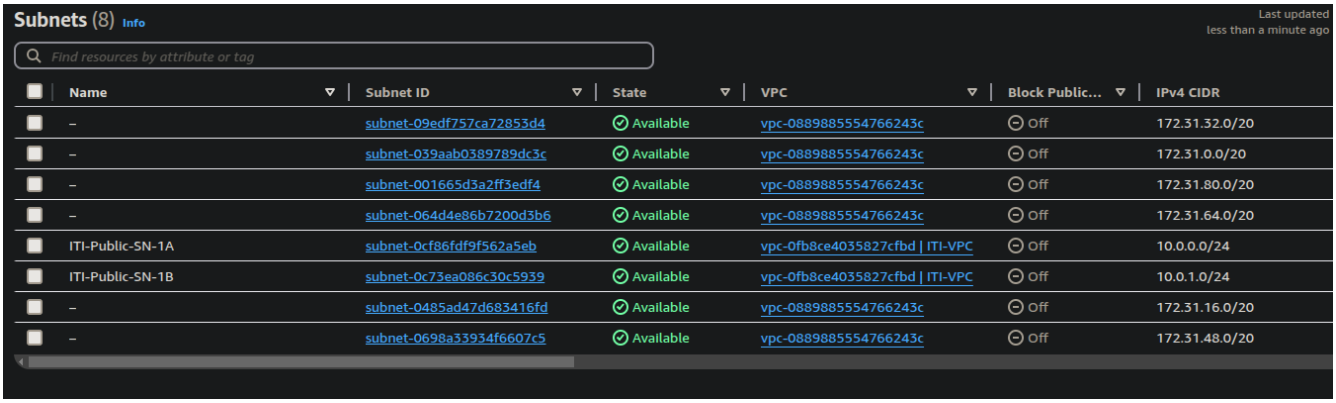
and the route table is connecting the local network by default



6- attach public route table to subnets



```
# aws_subnet.iti-subnet-1a will be created
+ resource "aws_subnet" "iti-subnet-1a" {
    + arn                                            = (known after apply)
    + assign_ipv6_address_on_creation                = false
    + availability_zone                              = "us-east-1a"
    + availability_zone_id                           = (known after apply)
    + cidr_block                                     = "10.0.0.0/24"
    + 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                        = false
    + owner_id                                       = (known after apply)
    + private_dns_hostname_type_on_launch            = (known after apply)
    + tags                                           = {
        + "Name" = "ITI-Public-SN-1A"
      }
    + tags_all                                       = {
        + "Name" = "ITI-Public-SN-1A"
      }
    + vpc_id                                         = "vpc-0fb8ce4035827cfbd"
  }

# aws_subnet.iti-subnet-1b will be created
+ resource "aws_subnet" "iti-subnet-1b" {
    + arn                                            = (known after apply)
    + assign_ipv6_address_on_creation                = false
    + availability_zone                              = "us-east-1b"
    + availability_zone_id                           = (known after apply)
    + cidr_block                                     = "10.0.1.0/24"
    + 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                        = false
    + owner_id                                       = (known after apply)
    + private_dns_hostname_type_on_launch            = (known after apply)
```



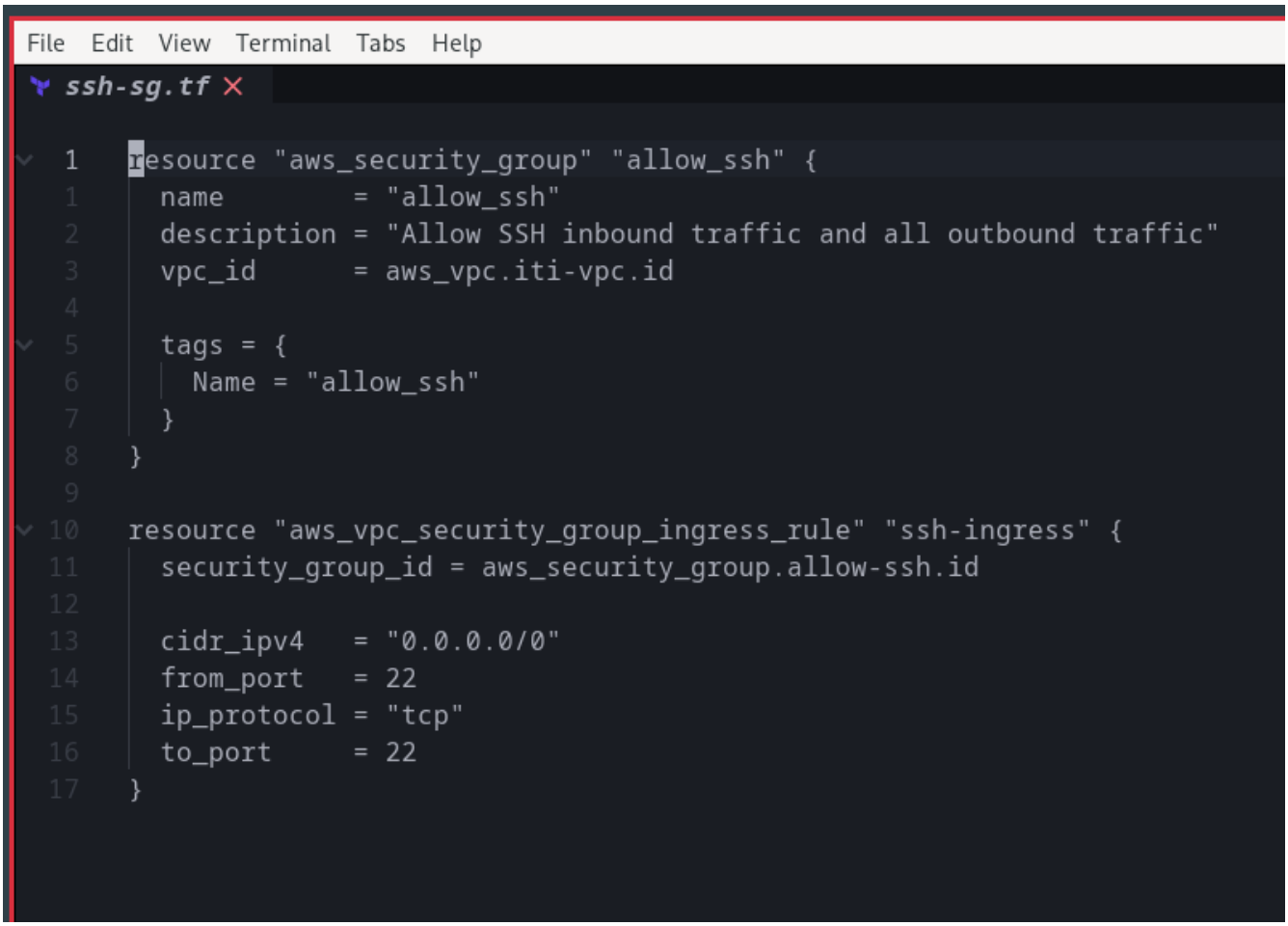
Subnets (8) Info

Last updated
less than a minute ago

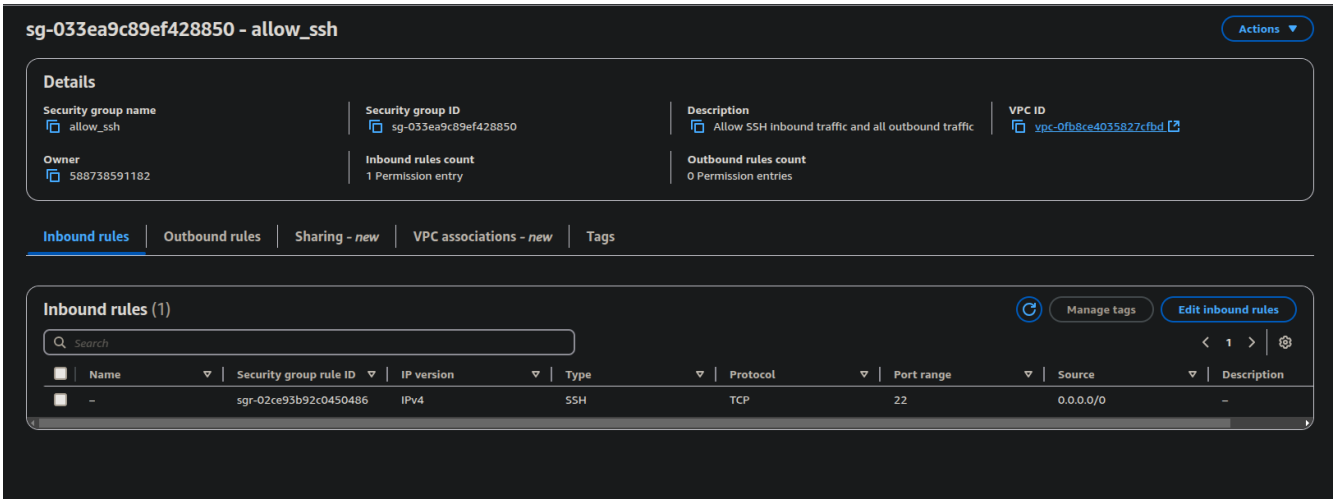
Find resources by attribute or tag

Name	Subnet ID	State	VPC	Block Public...	IPv4 CIDR
–	subnet-09edf757ca72853d4	Available	vpc-0889885554766243c	Off	172.31.32.0/20
–	subnet-039aab0389789dc3c	Available	vpc-0889885554766243c	Off	172.31.0.0/20
–	subnet-001665d3a2ff3edf4	Available	vpc-0889885554766243c	Off	172.31.80.0/20
–	subnet-064d4e86b7200d3b6	Available	vpc-0889885554766243c	Off	172.31.64.0/20
ITI-Public-SN-1A	subnet-0cf86fdf9f562a5eb	Available	vpc-0fb8ce4035827cfbd | ITI-VPC	Off	10.0.0.0/24
ITI-Public-SN-1B	subnet-0c73ea086c30c5939	Available	vpc-0fb8ce4035827cfbd | ITI-VPC	Off	10.0.1.0/24
–	subnet-0485ad47d683416fd	Available	vpc-0889885554766243c	Off	172.31.16.0/20
–	subnet-0698a33934f6607c5	Available	vpc-0889885554766243c	Off	172.31.48.0/20

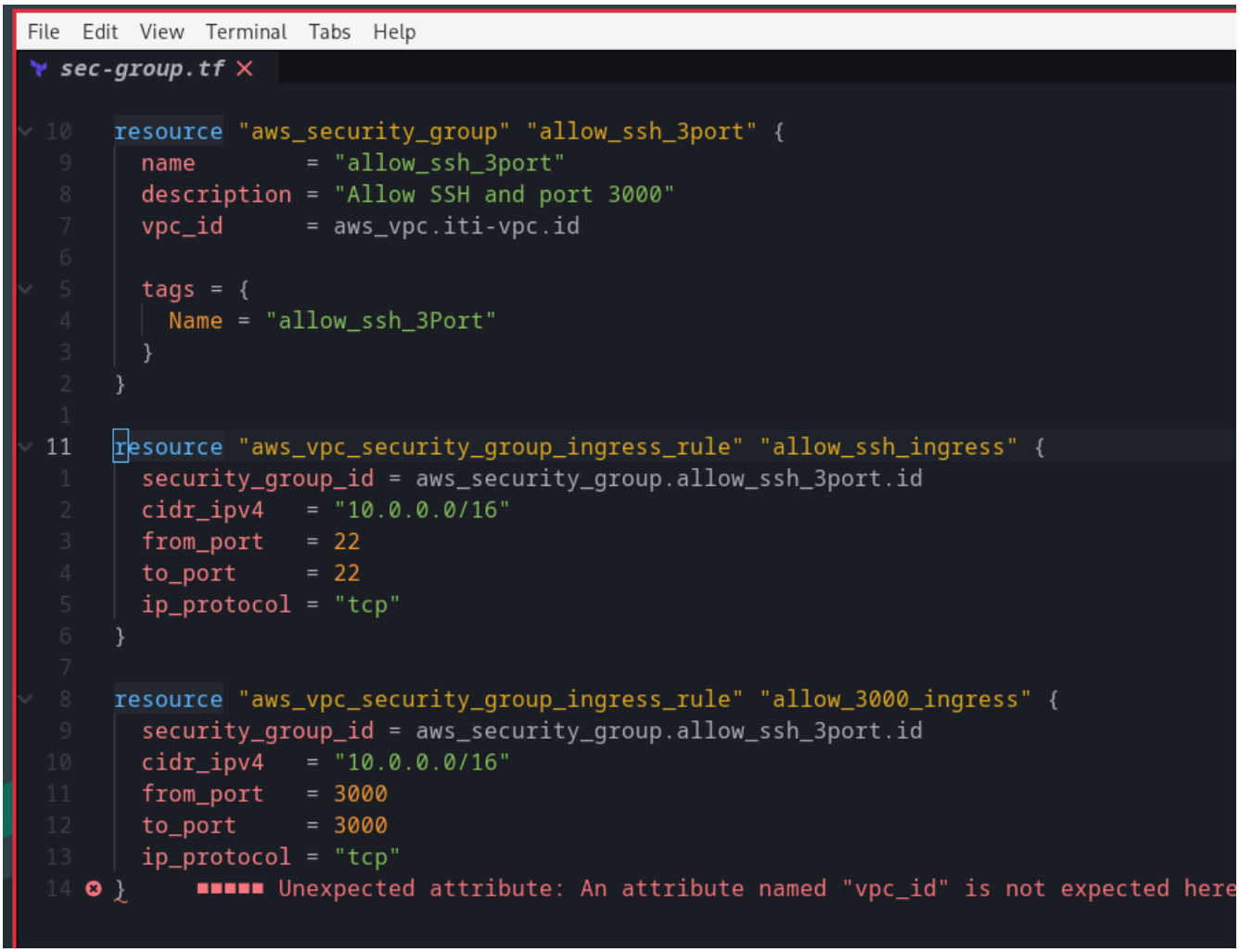
- Compute
7- create security group which allow ssh from 0.0.0.0/0

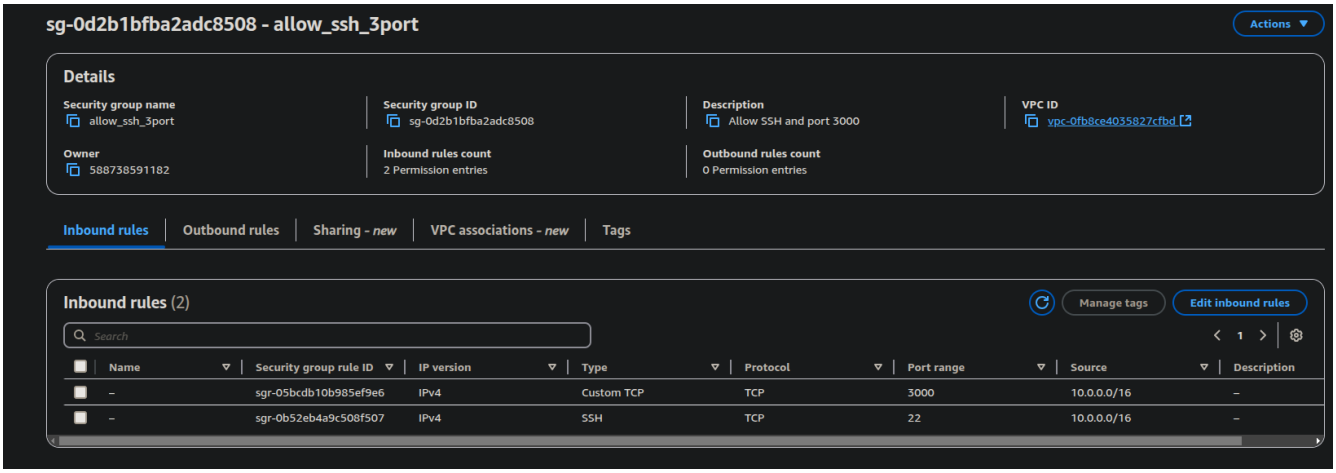


```
[mahmoud@hestia lab1]$ terraform apply
aws_vpc.iti-vpc: Refreshing state... [id=vpc-0fb8ce4035827cfbd]
aws_internet_gateway.iti-igw: Refreshing state... [id=igw-023720f9fc0893438]
aws_route_table.iti-private-rt: Refreshing state... [id=rtb-0224d662ad073ea99]
aws_subnet.iti-subnet-1a: Refreshing state... [id=subnet-0cf86fdf9f562a5eb]
aws_subnet.iti-subnet-1b: Refreshing state... [id=subnet-0c73ea086c30c5939]
aws_security_group.allow_ssh: Refreshing state... [id=sg-033ea9c89ef428850]
aws_route_table.iti-public-rt: Refreshing state... [id=rtb-02b2d93d21364381e]

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_security_group_ingress_rule.ssh-ingress will be created
  + resource "aws_vpc_security_group_ingress_rule" "ssh-ingress" {
      + arn                    = (known after apply)
      + cidr_ipv4              = "0.0.0.0/0"
      + from_port              = 22
      + id                     = (known after apply)
      + ip_protocol            = "tcp"
      + security_group_id      = "sg-033ea9c89ef428850"
      + security_group_rule_id = (known after apply)
      + tags_all               = {}
      + to_port                = 22
    }

Plan: 1 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_vpc_security_group_ingress_rule.ssh-ingress: Creating...
aws_vpc_security_group_ingress_rule.ssh-ingress: Creation complete after 1s [id=sgr-02ce93b92c0450486]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
[mahmoud@hestia lab1]$
```

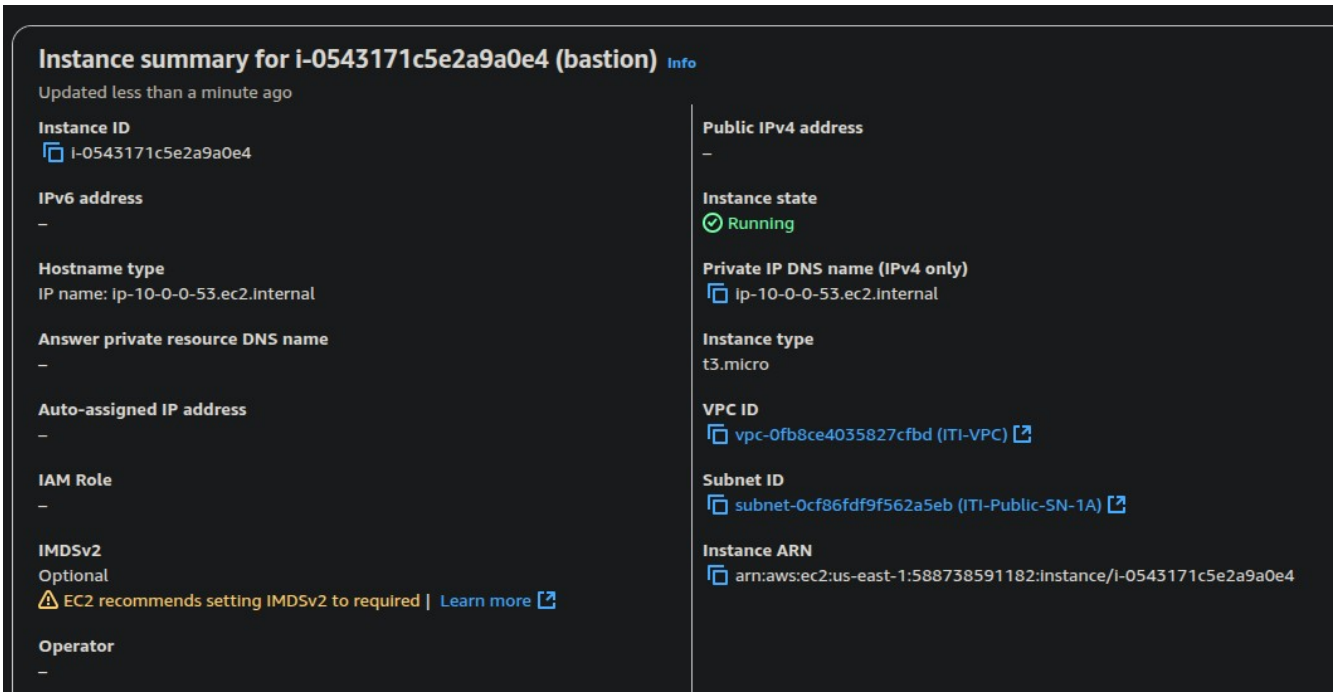


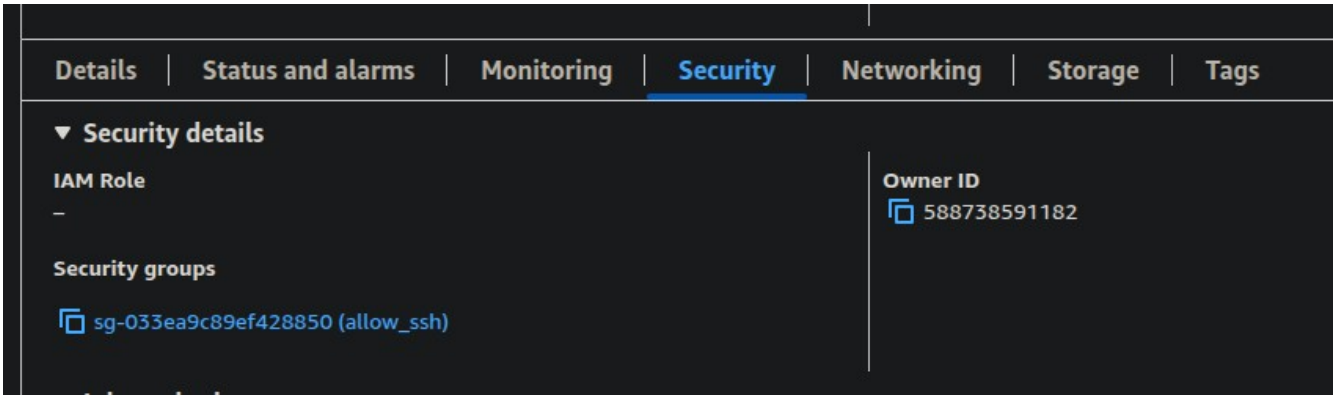
8- create security group that allow ssh and port 3000 from vpc cidr only




sg-0d2b1bfba2adc8508 - allow_ssh_3port
Actions
Details
Security group name
allow_ssh_3port
Security group ID
sg-0d2b1bfba2adc8508
Description
Allow SSH and port 3000
VPC ID
vpc-0fb8ce4035827cfbd
Owner
588738591182
Inbound rules count
2 Permission entries
Outbound rules count
0 Permission entries
Inbound rules
Outbound rules
Sharing - new
VPC associations - new
Tags
Inbound rules (2)
Manage tags
Edit inbound rules
Search
1
Name
Security group rule ID
IP version
Type
Protocol
Port range
Source
Description
– sgr-05bcdb10b985ef9e6 IPv4 Custom TCP TCP 3000 10.0.0.0/16 –
– sgr-0b52eb4a9c508f507 IPv4 SSH TCP 22 10.0.0.0/16 –

9– create ec2(bastion) in public subnet with security group from 7





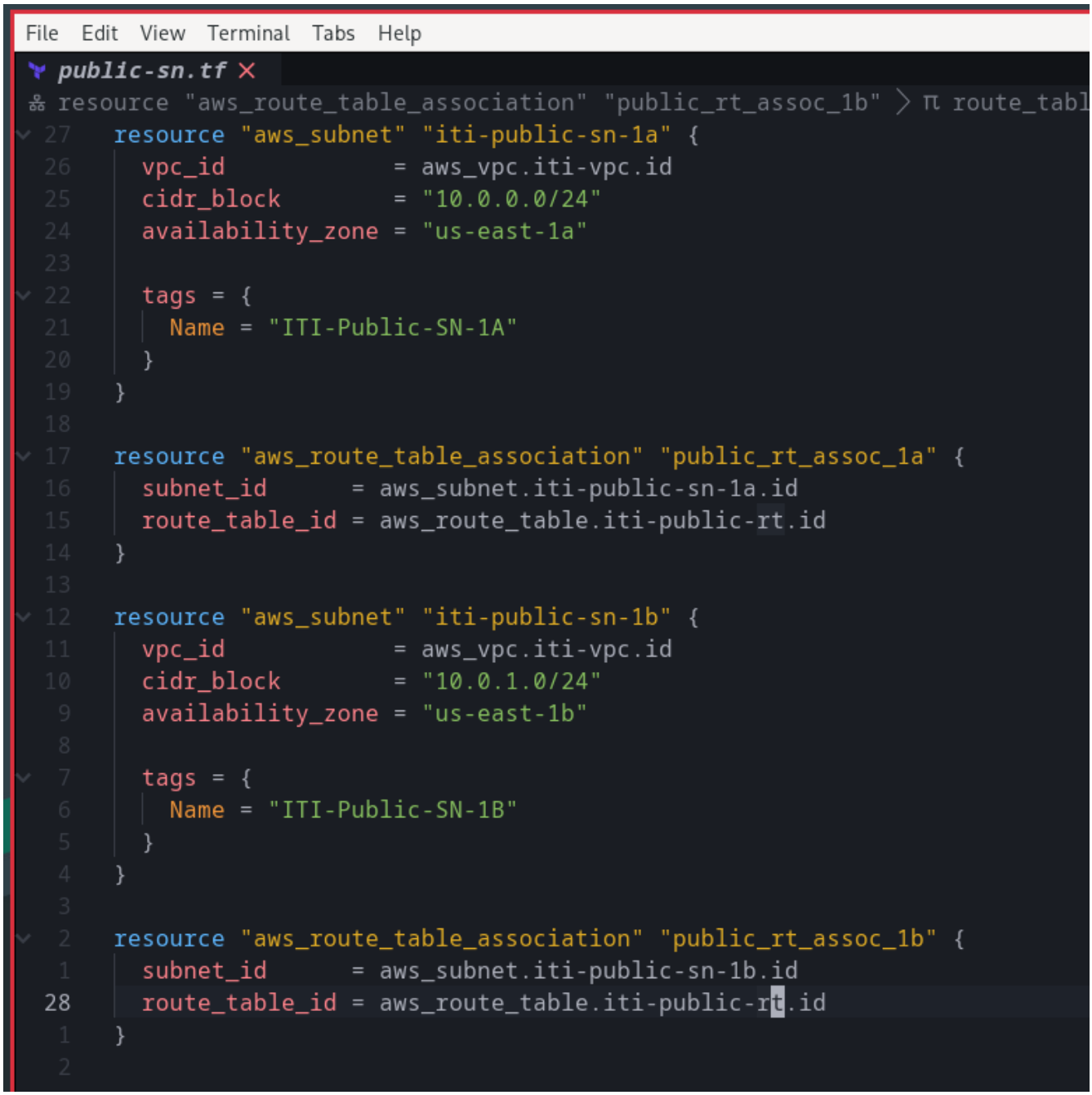
File Edit View Terminal Tabs Help

ec2public.tf

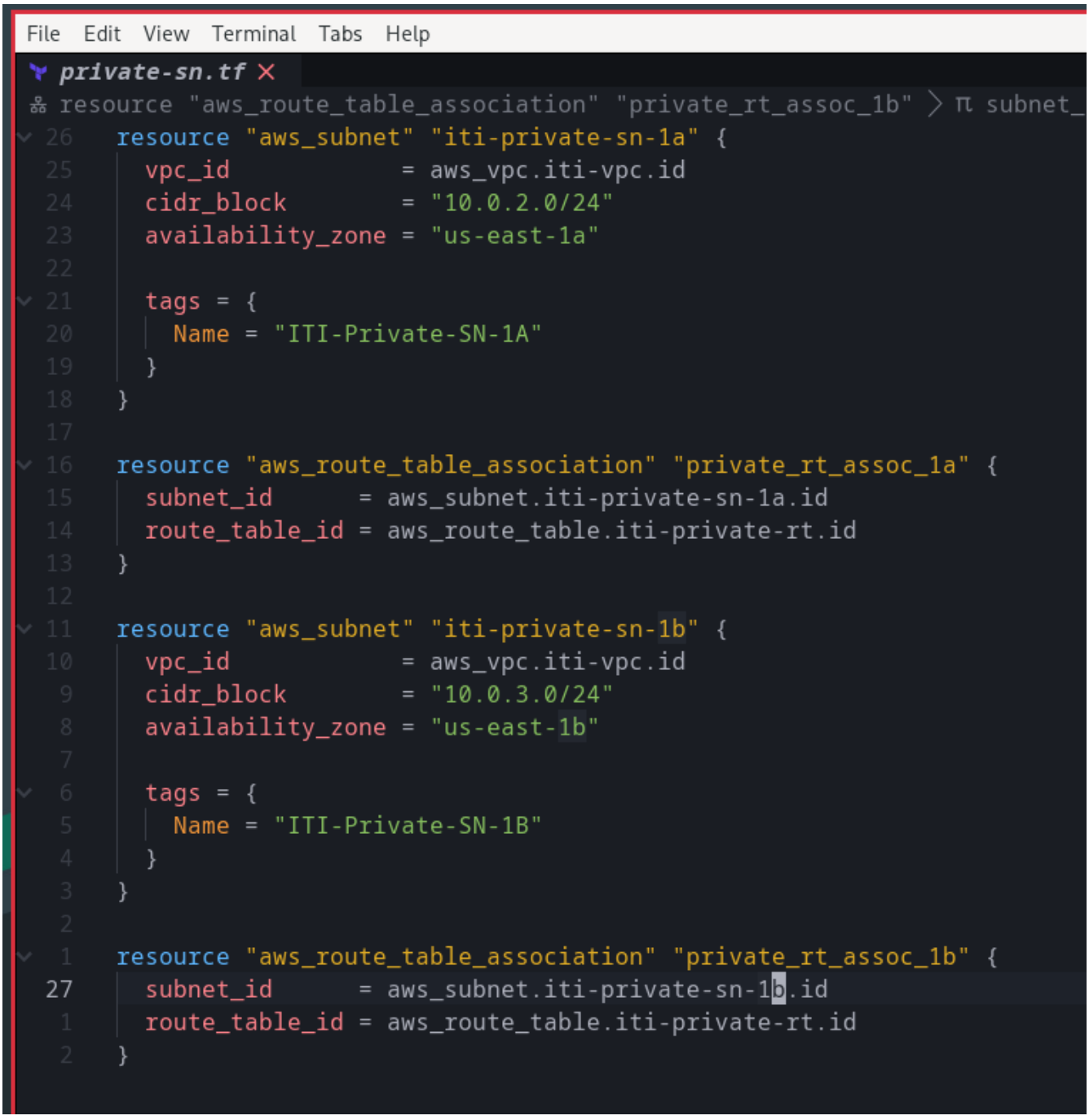
```
21  data "aws_ami" "ubuntu" {
20    most_recent = true
19
18    filter {
17      name   = "name"
16      values = ["ubuntu/images/hvm-ssd/ubuntu-jammy-22.04-amd64-server-*"]
15    }
14
13    filter {
12      name   = "virtualization-type"
11      values = ["hvm"]
10    }
 9
 8    owners = ["099720109477"] # Canonical
 7  }
 6
 5  resource "aws_instance" "web" {
 4    ami           = data.aws_ami.ubuntu.id
 3    instance_type = "t3.micro"
 2
 1    subnet_id              = aws_subnet.iti-subnet-1a.id
22    vpc_security_group_ids = [aws_security_group.allow_ssh.id]
 1
 2    tags = {
 3      Name = "bastion"
 4    }
 5  }
```

10- create ec2(application) private subnet with security group from 8

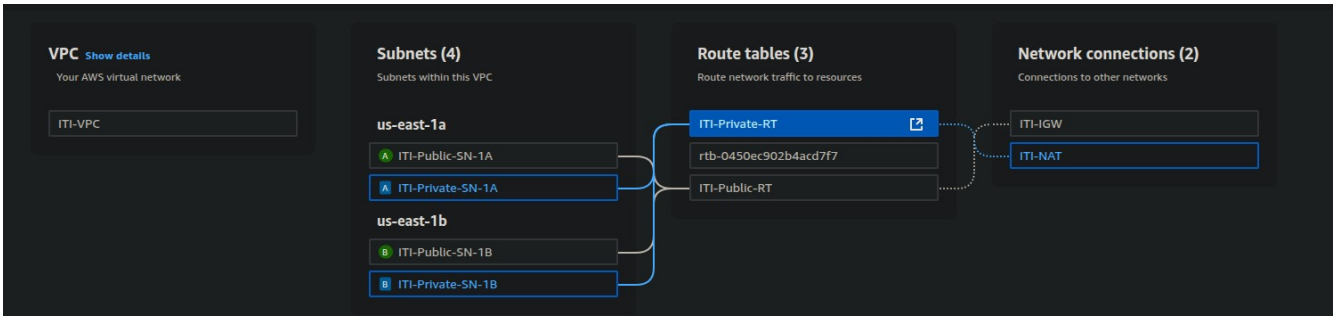
fixing the subnets to route to the correct route table



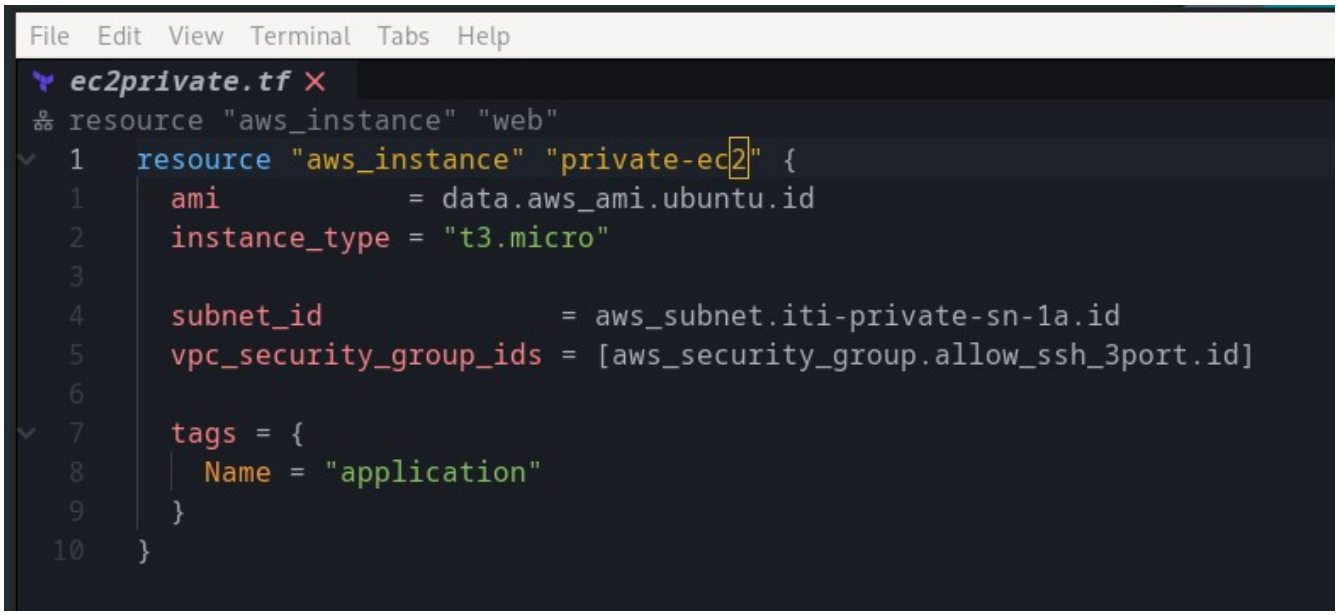
and also fixing the private one

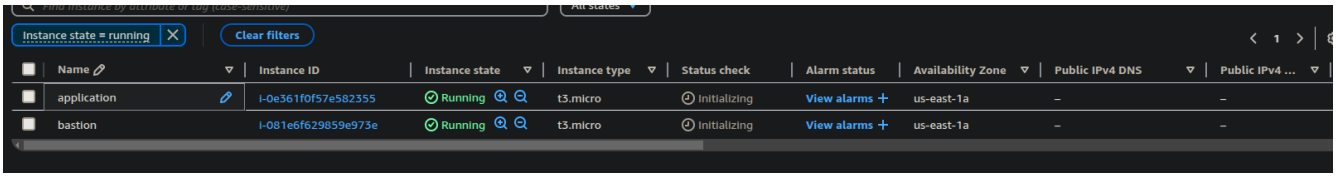


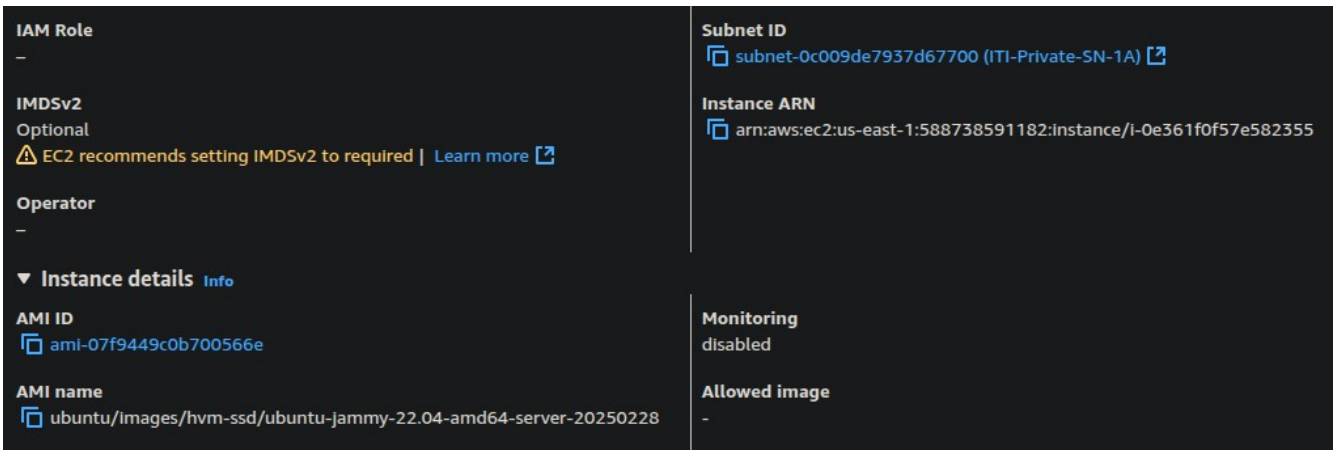
the ending result of the vpc

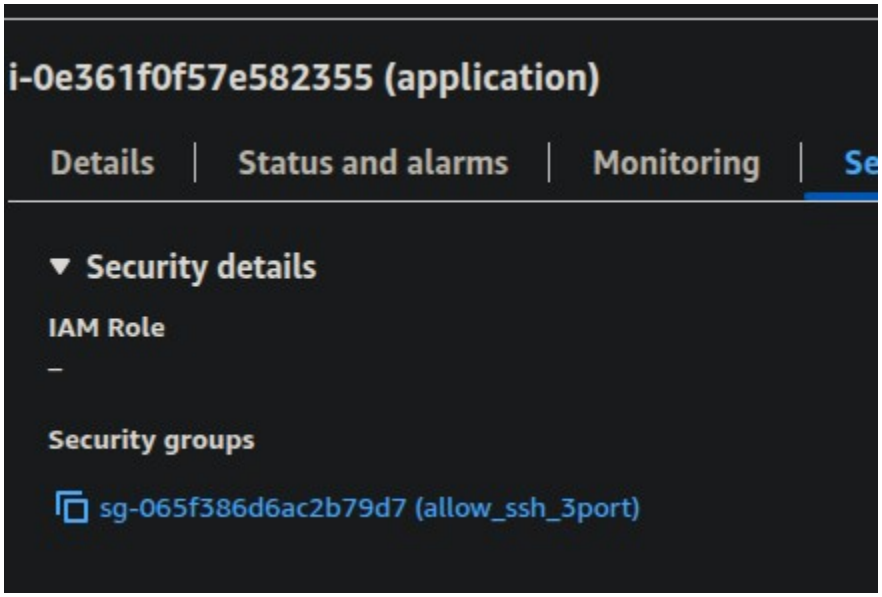


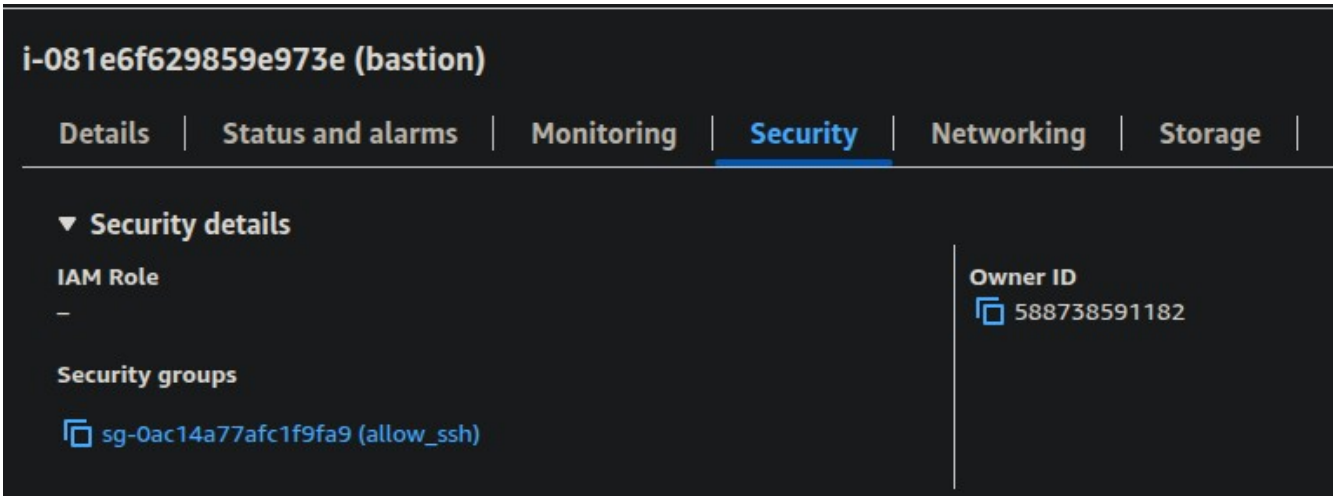
the ec2 terraform file

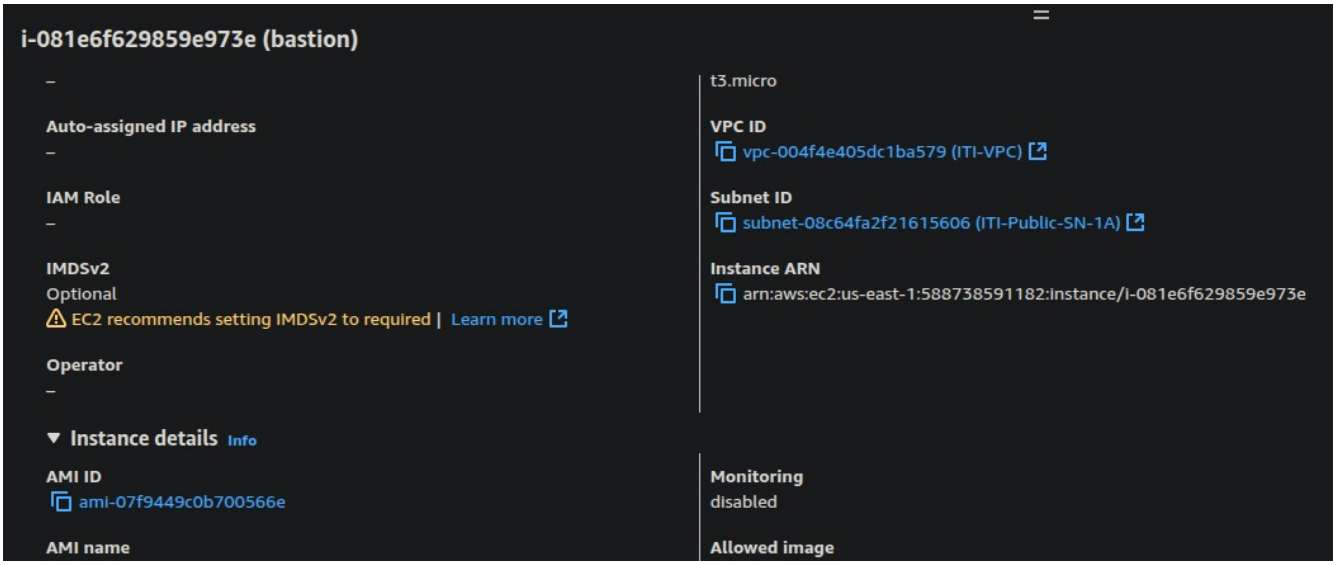





IAM Role
–
IMDSv2
Optional
EC2 recommends setting IMDSv2 to required | Learn more
Operator
–
Subnet ID
subnet-0c009de7937d67700 (ITI-Private-SN-1A)
Instance ARN
arn:aws:ec2:us-east-1:588738591182:instance/i-0e361f0f57e582355
Instance details Info
AMI ID
ami-07f9449c0b700566e
AMI name
ubuntu/images/hvm-ssd/ubuntu-jammy-22.04-amd64-server-20250228
Monitoring
disabled
Allowed image
-


i-0e361f0f57e582355 (application)
Details
Status and alarms
Monitoring
Se
Security details
IAM Role
–
Security groups
sg-065f386d6ac2b79d7 (allow_ssh_3port)


i-081e6f629859e973e (bastion)
Details
Status and alarms
Monitoring
Security
Networking
Storage
Security details
IAM Role
–
Security groups
sg-0ac14a77afc1f9fa9 (allow_ssh)
Owner ID
588738591182


i-081e6f629859e973e (bastion)
–
Auto-assigned IP address
–
IAM Role
–
IMDSv2
Optional
EC2 recommends setting IMDSv2 to required | Learn more
Operator
–
t3.micro
VPC ID
vpc-004f4e405dc1ba579 (ITI-VPC)
Subnet ID
subnet-08c64fa2f21615606 (ITI-Public-SN-1A)
Instance ARN
arn:aws:ec2:us-east-1:588738591182:instance/i-081e6f629859e973e
Instance details Info
AMI ID
ami-07f9449c0b700566e
AMI name
Monitoring
disabled
Allowed image