Graduation Project
DEPI_1_CAI1_ISS4_G1e AWS Cloud Solution Admin & Architect

Deploying a Highly Available Web Application with Auto Scaling using IAC

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Project Objective

To deploy a highly available web application on AWS using Terraform for easy deployment, with an Application Load Balancer (ALB) distributing traffic across instances in an Auto Scaling Group (ASG). The deployment includes a bastion host for SSH access, S3 for backup storage, and secure network configurations using public and private subnets with a NAT gateway for outbound internet access from private instances.

Why Terraform:

- Declarative configuration
- Support multi cloud providers
- Reusable infrastructure code
- Support version control
- Resource management

Infrastructure Setup

1.AWS Provider:

- Configured for the us-east-1 region to deploy the infrastructure.

2.VPC and Subnets:

- A VPC with CIDR block 192.168.0.0/16 is created.
- Four subnets are defined: two for public resources (e.g., ALB, bastion host) and two for private instances (e.g., ASG instances).

3.Internet Gateway & NAT Gateway:

- An Internet Gateway allows public internet access for the public subnets.
- A NAT Gateway provides outbound internet access to private instances via the NAT gateway in the public subnet.

4.Security Groups:

- Security group for ALB and instances allows HTTP (port 80) and SSH (port 22) traffic from the internet.
- A dedicated security group for the bastion host allows SSH access, enabling the management of private instances through the bastion host.

5.Application Load Balancer (ALB):

- The ALB listens on port 80 and forwards traffic to an Auto Scaling Group (ASG) through a target group. Health checks are performed on the root path to ensure instance availability.

6.Auto Scaling Group (ASG):

- The ASG dynamically scales between 1 to 3 instances, ensuring high availability. Each instance hosts a simple web server using apache that serves a web page for the project.
- The ASG is configured to use an EC2 Launch Configuration, which installs updates, including apache server.

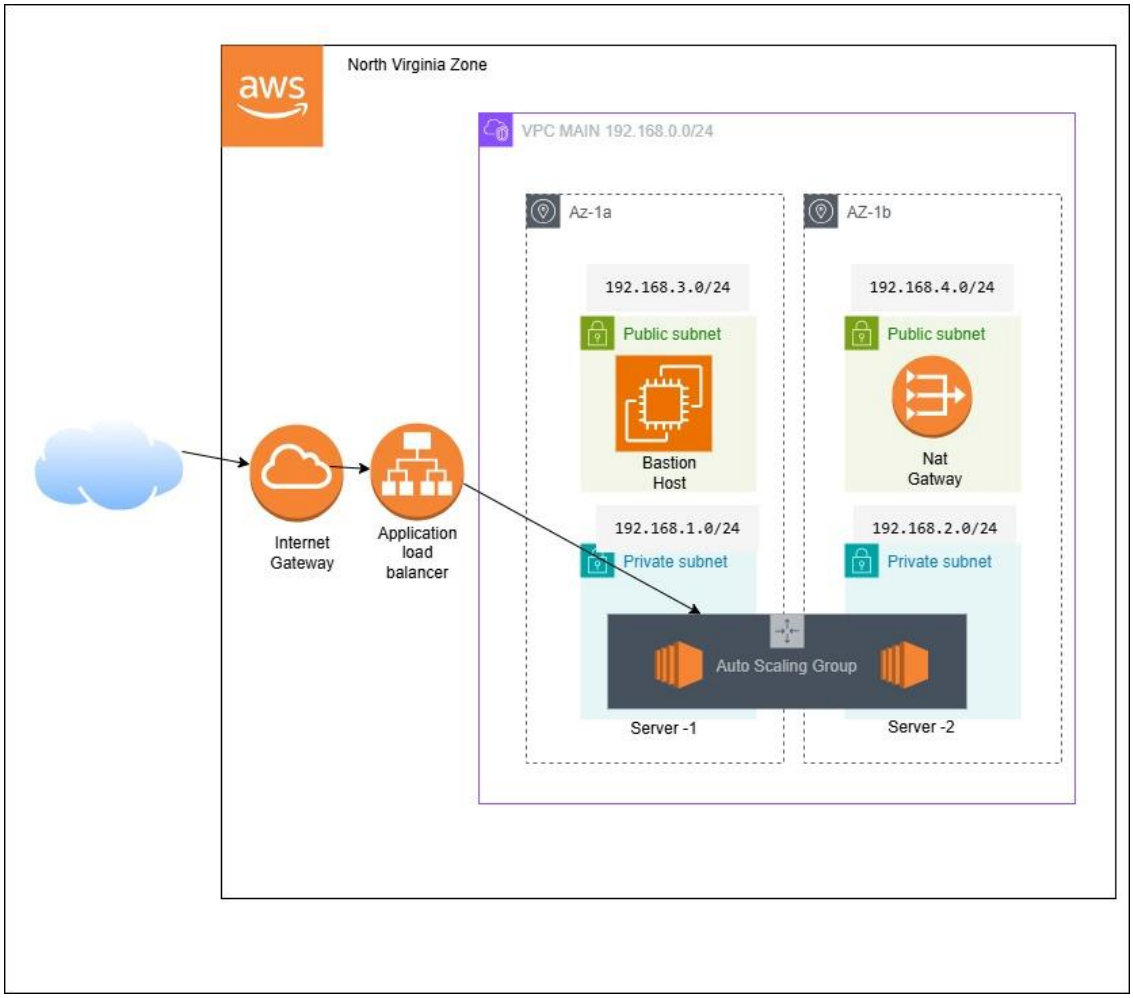
7.Bastion Host:

- A bastion host (EC2 instance) is deployed in the public subnet to securely SSH into the private EC2 instances.
- Users upload an SSH key to the bastion host for connecting to private instances.

8.Private Subnet EC2 Access and Internet Connectivity:

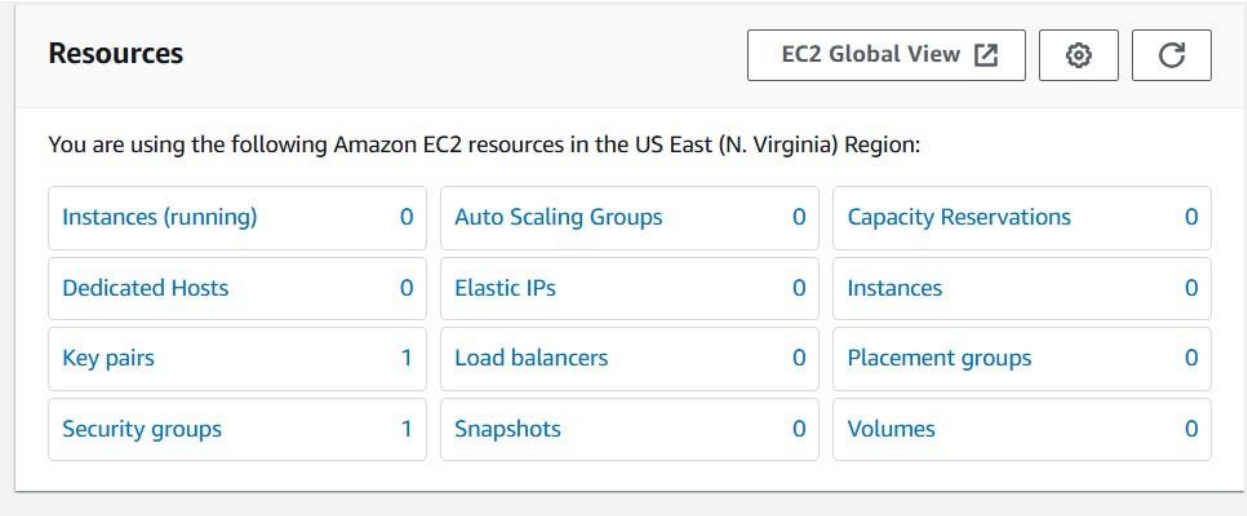
- From the bastion host, SSH access is established to instances in private subnets.
- Private instances can connect to the internet through the NAT Gateway to download necessary software and updates.

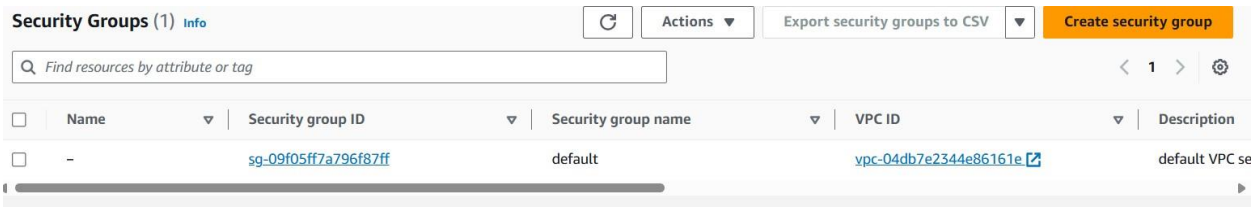
Project Architecture

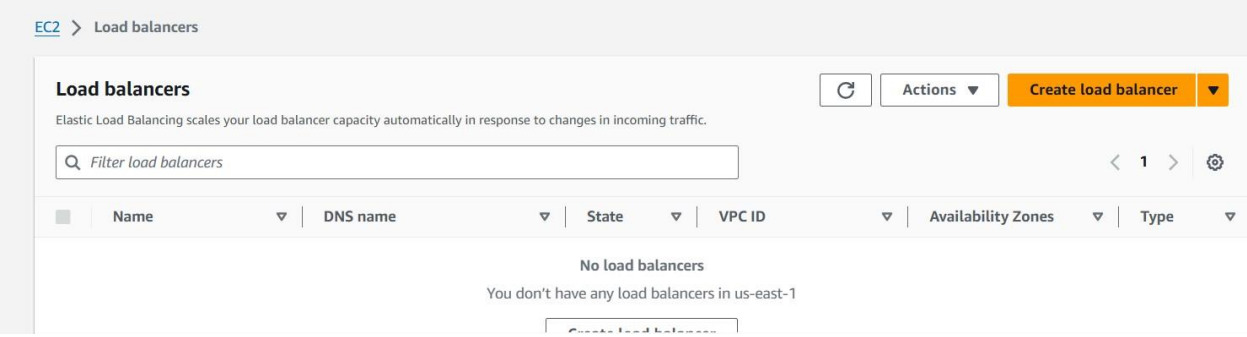


Screenshot before project Deployment:

As shown below, before deployment the code stack all resources are empty except for the default of AWS lab learner







Code Stack:

VPC Configuration

```
resource "aws_vpc" "main" {
  cidr_block = "192.168.0.0/16"

  tags = {
    Name = "main-vpc"
  }
}
```

- **Resource: aws_vpc.main**
- **Description: Creates a Virtual Private Cloud (VPC) with a CIDR block of 192.168.0.0/16.**
- **Tags: Names the VPC as main-vpc.**

Subnet Configuration

```
resource "aws_subnet" "subnet1" {
  vpc_id          = aws_vpc.main.id
  cidr_block      = "192.168.1.0/24"
  availability_zone = "us-east-1a"

  tags = {
    Name = "priv_subnet-1"
  }
}

resource "aws_subnet" "subnet2" {
  vpc_id          = aws_vpc.main.id
  cidr_block      = "192.168.2.0/24"
  availability_zone = "us-east-1b"

  tags = {
    Name = "priv_subnet-2"
  }
}

resource "aws_subnet" "subnet3" {
  vpc_id          = aws_vpc.main.id
  cidr_block      = "192.168.3.0/24"
```

```
  availability_zone = "us-east-1a"

  tags = {
    Name = "pub_subnet-1"
  }
}

resource "aws_subnet" "subnet4" {
  vpc_id          = aws_vpc.main.id
  cidr_block      = "192.168.4.0/24"
  availability_zone = "us-east-1b"

  tags = {
    Name = "pub_subnet-2"
  }
}
```

- **Resources: aws_subnet.subnet1, aws_subnet.subnet2, aws_subnet.subnet3, aws_subnet.subnet4**
- **Description:**
  - **Private Subnets:**
    - **subnet1: 192.168.1.0/24 in us-east-1a**
    - **subnet2: 192.168.2.0/24 in us-east-1b**
  - **Public Subnets:**
    - **subnet3: 192.168.3.0/24 in us-east-1a**
    - **subnet4: 192.168.4.0/24 in us-east-1b**

Internet Gateway and NAT Gateway

```
resource "aws_internet_gateway" "main" {
  vpc_id = aws_vpc.main.id

  tags = {
    Name = "main-gateway"
  }
}

resource "aws_eip" "nat_eip" {
  tags = {
    Name = "nat-eip"
  }
}

resource "aws_nat_gateway" "nat_gw" {
  allocation_id = aws_eip.nat_eip.id
  subnet_id     = aws_subnet.subnet4.id

  tags = {
    Name = "nat-gateway"
  }
}
```

- **Resources:**
  - **aws_internet_gateway.main: Creates an Internet Gateway attached to the VPC.**
  - **aws_eip.nat_eip: Allocates an Elastic IP for the NAT Gateway.**
  - **aws_nat_gateway.nat_gw: Creates a NAT Gateway in subnet4 using the allocated EIP.**

Route Tables

```
resource "aws_route_table" "public_RT" {
 vpc_id = aws_vpc.main.id

 route {
  cidr_block = "0.0.0.0/0"
  gateway_id = aws_internet_gateway.main.id
 }

 tags = {
  Name = "public_RT"
 }
}

resource "aws_route_table" "private_RT" {
 vpc_id = aws_vpc.main.id

 tags = {
  Name = "private_RT"
 }
}

resource "aws_route" "private_route" {
 route_table_id       = aws_route_table.private_RT.id
 destination_cidr_block = "0.0.0.0/0"
 nat_gateway_id       = aws_nat_gateway.nat_gw.id
}
```

- **Resources:**
  - **aws_route_table.public_RT: Route table for public subnets with a default route to the Internet Gateway.**
  - **aws_route_table.private_RT: Route table for private subnets.**
  - **aws_route.private_route: Adds a default route to the NAT Gateway for private subnets.**

Security Groups

```
resource "aws_security_group" "HTTP_SG" {
 vpc_id = aws_vpc.main.id

 ingress {
  from_port   = 80
  to_port     = 80
  protocol    = "tcp"
  cidr_blocks = ["0.0.0.0/0"]
 }

 ingress {
  from_port   = 22
  to_port     = 22
  protocol    = "tcp"
  cidr_blocks = ["0.0.0.0/0"]
 }

 egress {
  from_port   = 0
  to_port     = 0
  protocol    = "-1"
  cidr_blocks = ["0.0.0.0/0"]
 }

 tags = {
  Name = "HTTP-SG"
 }
}

resource "aws_security_group" "bastion_SG" {
 vpc_id = aws_vpc.main.id

 ingress {
  from_port   = 22
  to_port     = 22
  protocol    = "tcp"
  cidr_blocks = ["0.0.0.0/0"]
 }

 egress {
```

```
  from_port   = 0
  to_port     = 0
  protocol    = "-1"
  cidr_blocks = ["0.0.0.0/0"]
 }

 tags = {
  Name = "bastion-SG"
 }
}
```

- **Resources:**
  - **aws_security_group.HTTP_SG: Allows HTTP (port 80) and SSH (port 22) inbound traffic from anywhere. Allows all outbound traffic.**
  - **aws_security_group.bastion_SG: Allows SSH (port 22) inbound traffic from anywhere. Allows all outbound traffic.**

EC2 Instances

```
resource "aws_instance" "bastion_host" {
 ami                    = "ami-0fff1b9a61dec8a5f"
 instance_type          = "t2.micro"
 subnet_id              = aws_subnet.subnet3.id
 vpc_security_group_ids = [aws_security_group.bastion_SG.id]
 associate_public_ip_address = true
 key_name               = "vockey"

 tags = {
  Name = "bastion-host"
 }

 depends_on = [aws_security_group.bastion_SG]
}
```

- **Resource: aws_instance.bastion_host**
- **Description: Launches a bastion host in the public subnet (subnet3).**
- **Configuration:**
  - **AMI: ami-0fff1b9a61dec8a5f**
  - **Instance Type: t2.micro**
  - **Security Group: Attached to bastion_SG**
  - **Public IP: Associated for internet access**
  - **SSH Key: Uses vockey for SSH access**
- **Tags: Named bastion-host.**
- **Dependencies: Depends on the creation of the bastion_SG security group.**

Load Balancer

```
resource "aws_lb" "test" {
  name               = "bassam-alb"
  internal           = false
  load_balancer_type = "application"
  security_groups    = [aws_security_group.HTTP_SG.id]
  subnets            = [aws_subnet.subnet3.id, aws_subnet.subnet4.id]

  enable_deletion_protection = false

  tags = {
    Name = "bassam-alb"
  }
}
```

- **Resource: aws_lb.test**
- **Description: Creates an Application Load Balancer (ALB) named bassam-alb.**
- **Configuration:**
  - **Type: Application Load Balancer**
  - **Security Groups: Attached to HTTP_SG**
  - **Subnets: Deployed in both public subnets (subnet3 and subnet4)**
  - **Deletion Protection: Disabled**
- **Tags: Named bassam-alb.**

Auto Scaling Group

```
resource "aws_launch_configuration" "app" {
 name          = "app-launch-configuration"
 image_id      = "ami-0fff1b9a61dec8a5f"
 instance_type   = "t2.micro"
 key_name      = "vockey"
 security_groups = [aws_security_group.HTTP_SG.id]

 user_data = <<-EOF
          #!/bin/bash
          sudo yum update -y
          sudo yum install httpd -y
          sudo systemctl start httpd
          sudo systemctl enable httpd
          EOF
}

resource "aws_autoscaling_group" "app" {
 launch_configuration = aws_launch_configuration.app.id
 min_size          = 1
 max_size          = 3
 desired_capacity    = 2
 vpc_zone_identifier  = [aws_subnet.subnet1.id, aws_subnet.subnet2.id]

 target_group_arns = [aws_lb_target_group.test.arn]

 tag {
  key             = "Name"
  value           = "ASG_Instance"
  propagate_at_launch = true
 }

 lifecycle {
  ignore_changes = [desired_capacity]
 }
}
```

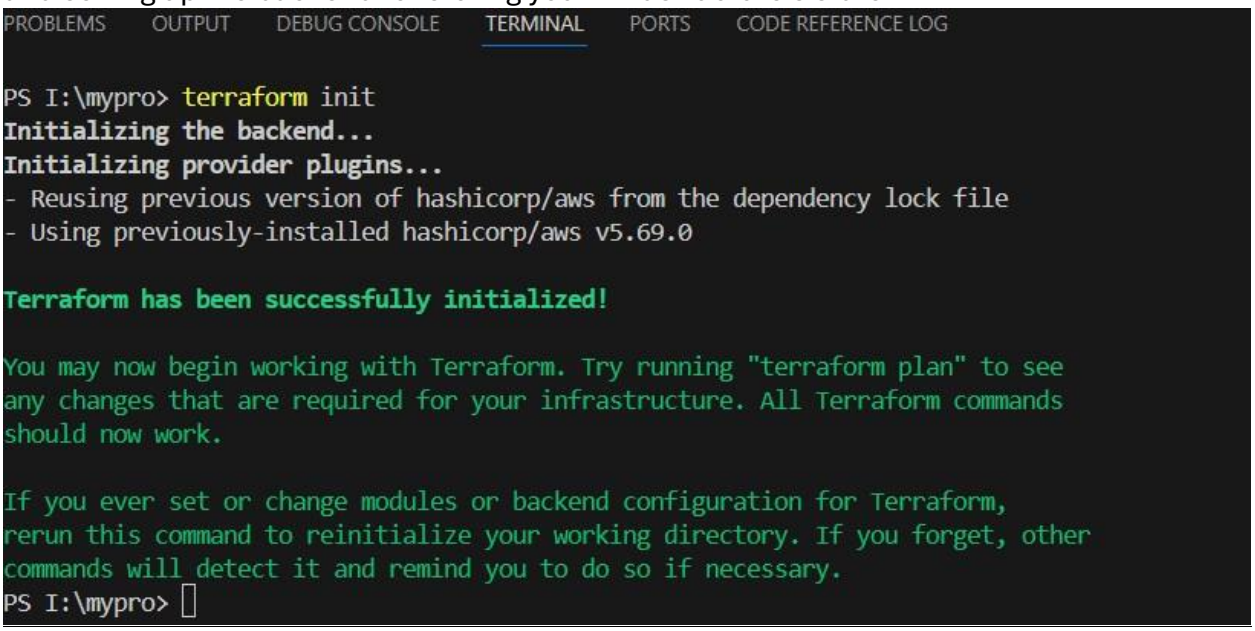
- **Resources:**
  - **aws_launch_configuration.app: Defines the launch configuration for the ASG.**
  - **aws_autoscaling_group.app: Creates an Auto Scaling Group with specified parameters.**
- **Configuration:**
  - **Launch Configuration:**
    - **AMI: ami-0fff1b9a61dec8a5f**
    - **Instance Type: t2.micro**
    - **SSH Key: vockey**
    - **Security Groups: Attached to HTTP_SG**
    - **User Data: Installs and starts Apache HTTP server**
  - **Auto Scaling Group:**
    - **Size: Minimum 1, Maximum 3, Desired 2**
    - **Subnets: Deployed in private subnets (subnet1 and subnet2)**
    - **Target Group: Associated with TG-bassam**
    - **Tags: Instances tagged as ASG_Instance**
    - **Lifecycle: Ignores changes to desired_capacity to allow manual scaling**

Terraform Preparation

In this figures below we initialize ,formatting , validate and plan for the code stack

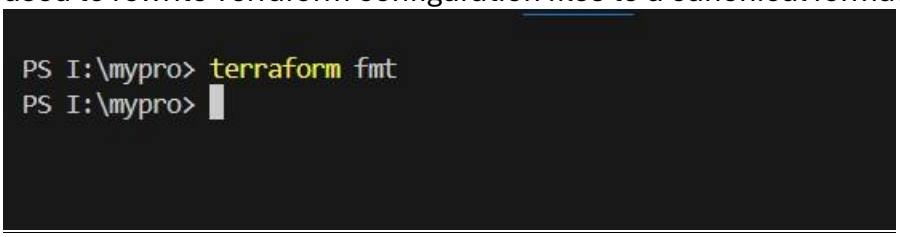
Terraform Initialization

initializes a working directory and downloads the necessary provider plugins and modules and setting up the backend for storing your infrastructure's state



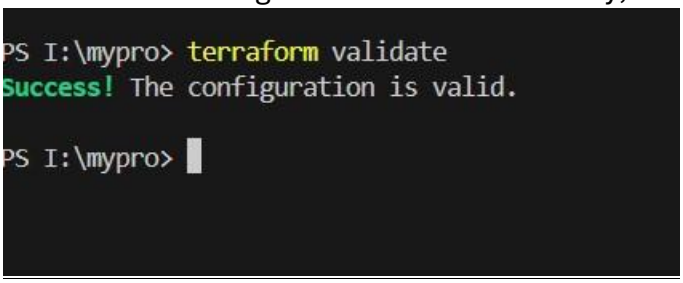
Terraform Format

used to rewrite Terraform configuration files to a canonical format and style.



Terraform Validate:

validates the configuration files in a directory, referring only to the configuration



Terraform Plan:
creates an execution plan, which lets you preview the changes that Terraform plans to make to your infrastructure.

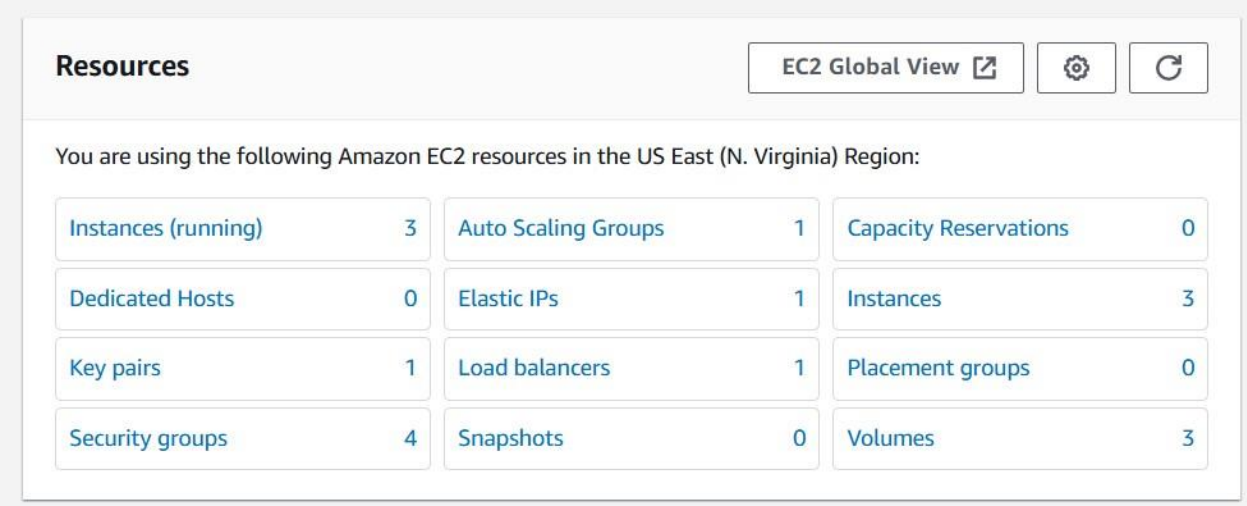
```
PS I:\mypro> terraform plan

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_autoscaling_group.app will be created
  + resource "aws_autoscaling_group" "app" {
      + arn                       = (known after apply)
      + availability_zones        = (known after apply)
      + default_cooldown          = (known after apply)
      + desired_capacity          = 2
      + force_delete              = false
      + force_delete_warm_pool    = false
      + health_check_grace_period = 300
      + health_check_type         = (known after apply)
      + id                        = (known after apply)
      + ignore_failed_scaling_activities = false
      + launch_configuration      = (known after apply)
      + load_balancers            = (known after apply)
      + max_size                  = 3
      + metrics_granularity       = "1Minute"
      + min_size                  = 1
      + name                      = (known after apply)
      + name_prefix               = (known after apply)
      + predicted_capacity        = (known after apply)
      + protect_from_scale_in     = false
      + service_linked_role_arn   = (known after apply)
      + target_group_arns         = (known after apply)
      + vpc_zone_identifier       = (known after apply)
      + wait_for_capacity_timeout = "10m"
```

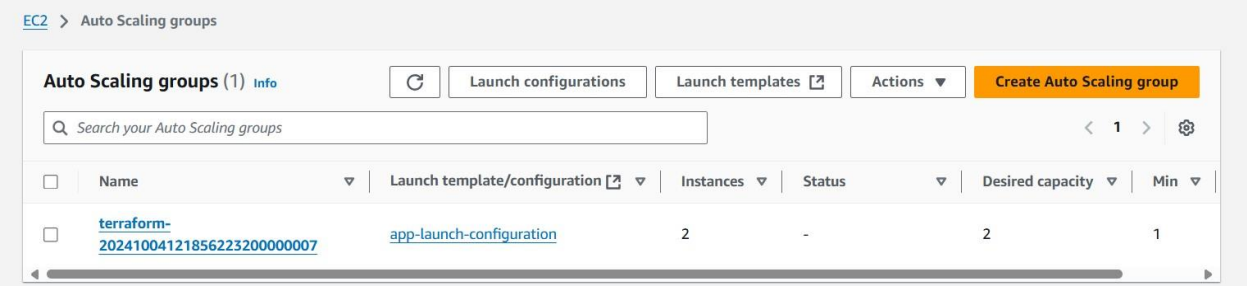
Terraform Apply
executes planned actions, creating, updating, or deleting infrastructure resources to match the new state outlined in your IaC.

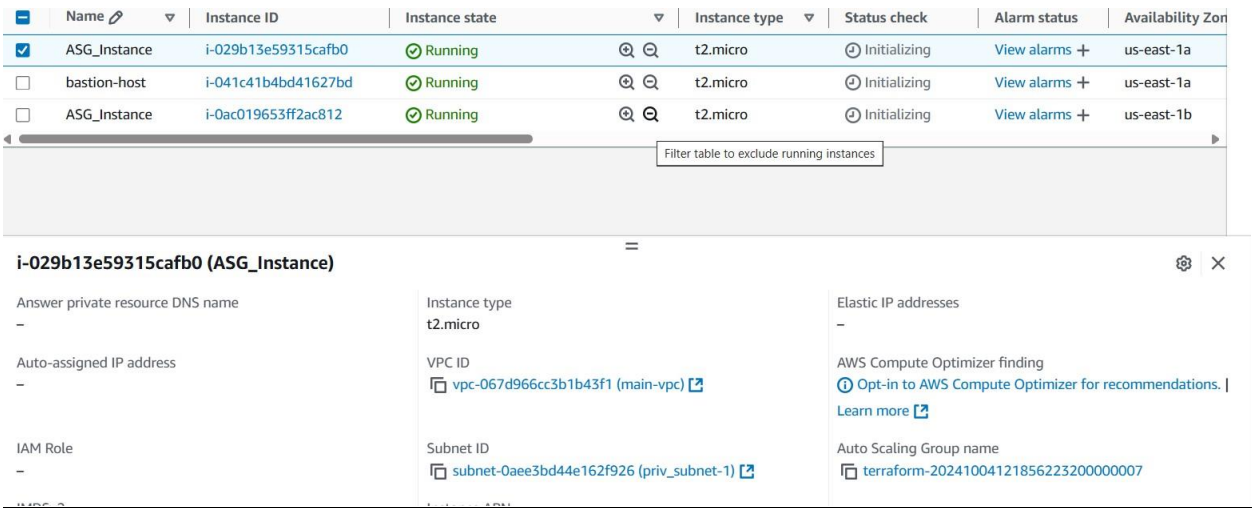
```
Plan: 23 to add, 0 to change, 0 to destroy.

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

  Enter a value:
```

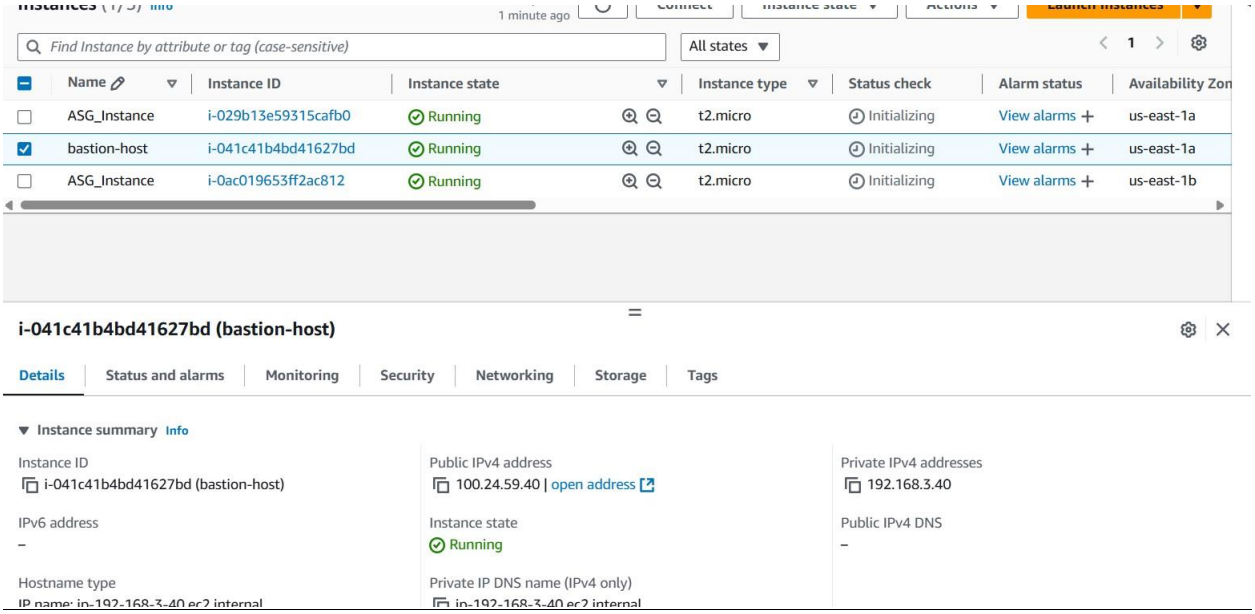
```
aws_lb.test: Still creating... [2m10s elapsed]
aws_lb.test: Still creating... [2m20s elapsed]
aws_lb.test: Still creating... [2m30s elapsed]
aws_lb.test: Still creating... [2m40s elapsed]
aws_lb.test: Still creating... [2m50s elapsed]
aws_lb.test: Still creating... [3m0s elapsed]
aws_lb.test: Still creating... [3m10s elapsed]
aws_lb.test: Creation complete after 3m18s [id=arn:aws:elasticloadbalancing:us-east-1:248193779364:loadbalancer/ap
aws_lb_listener.test: Creating...
aws_lb_listener.test: Creation complete after 1s [id=arn:aws:elasticloadbalancing:us-east-1:248193779364:listener/
b1eca8324092f]

Apply complete! Resources: 23 added, 0 changed, 0 destroyed.
PS I:\mypro>
```

OUTPUT






Name
Instance ID
Instance state
Instance type
Status check
Alarm status
Availability Zon
ASG_Instance
i-029b13e59315cafb0
Running
t2.micro
Initializing
View alarms
us-east-1a
bastion-host
i-041c41b4bd41627bd
Running
t2.micro
Initializing
View alarms
us-east-1a
ASG_Instance
i-0ac019653ff2ac812
Running
t2.micro
Initializing
View alarms
us-east-1b
Filter table to exclude running instances
i-029b13e59315cafb0 (ASG_Instance)
Answer private resource DNS name
–
Instance type
t2.micro
Elastic IP addresses
–
Auto-assigned IP address
–
VPC ID
vpc-067d966cc3b1b43f1 (main-vpc)
AWS Compute Optimizer finding
Opt-in to AWS Compute Optimizer for recommendations.
Learn more
IAM Role
–
Subnet ID
subnet-0aee3bd44e162f926 (priv_subnet-1)
Auto Scaling Group name
terraform-20241004121856223200000007


1 minute ago
Find Instance by attribute or tag (case-sensitive)
All states
1
Name
Instance ID
Instance state
Instance type
Status check
Alarm status
Availability Zon
ASG_Instance
i-029b13e59315cafb0
Running
t2.micro
Initializing
View alarms
us-east-1a
bastion-host
i-041c41b4bd41627bd
Running
t2.micro
Initializing
View alarms
us-east-1a
ASG_Instance
i-0ac019653ff2ac812
Running
t2.micro
Initializing
View alarms
us-east-1b
i-041c41b4bd41627bd (bastion-host)
Details
Status and alarms
Monitoring
Security
Networking
Storage
Tags
Instance summary
Info
Instance ID
i-041c41b4bd41627bd (bastion-host)
Public IPv4 address
100.24.59.40 | open address
Private IPv4 addresses
192.168.3.40
IPv6 address
–
Instance state
Running
Public IPv4 DNS
–
Hostname type
Private IP DNS name (IPv4 only)

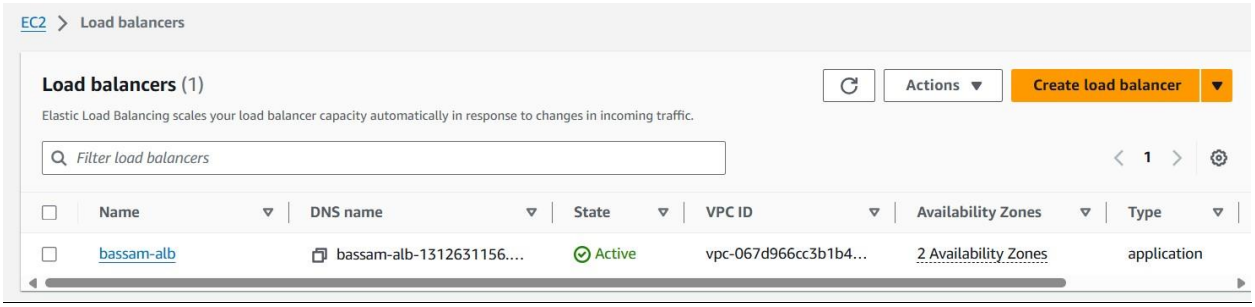
```
Admin@DESKTOP-445DUV0 MINGW64 ~
$ cd Downloads/

Admin@DESKTOP-445DUV0 MINGW64 ~/Downloads
$ ssh -i labsuser.p
labsuser.pem  labsuser.ppk

Admin@DESKTOP-445DUV0 MINGW64 ~/Downloads
$ ssh -i labsuser.pem ec2-user@100.24.59.40
```

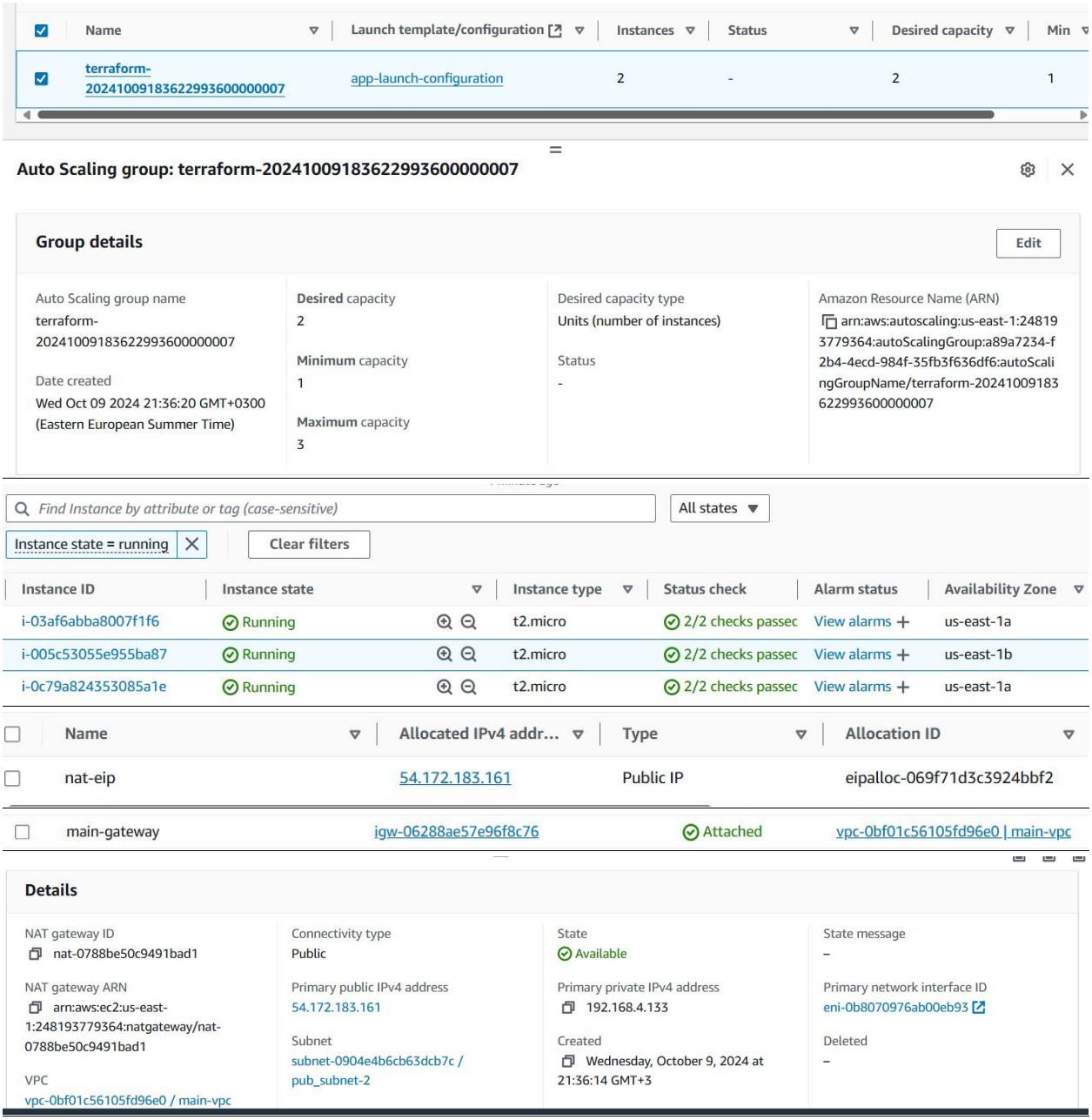

```
Admin@DESKTOP-445DUV0 MINGW64 ~
$ cd Downloads/

Admin@DESKTOP-445DUV0 MINGW64 ~/Downloads
$ ssh -i labsuser.p
labsuser.pem  labsuser.ppk

Admin@DESKTOP-445DUV0 MINGW64 ~/Downloads
$ ssh -i labsuser.pem ec2-user@100.24.59.40
```


```
[ec2-user@ip-192-168-3-40 ~]$ whoami
ec2-user
[ec2-user@ip-192-168-3-40 ~]$
```

```
[ec2-user@ip-192-168-3-40 ~]$ whoami
ec2-user
[ec2-user@ip-192-168-3-40 ~]$ cd /home/ec2-user/.ssh/
[ec2-user@ip-192-168-3-40 .ssh]$ ls
authorized_keys
[ec2-user@ip-192-168-3-40 .ssh]$ cat authorized_keys
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQCL4vSiq/dT8wowxIAK1e/VHZraFcCCpb4DPJa6dQ+z
N8xbsqdf9zvlN/I1QEsGiBYWTLJUU/kmbXBvEwfHYgqObAwBtt/jYUsFh2T/BtGkaPoyhJ61xarlms78
jRdILK2p4R9/2sQntgasI7JNUvSAjPQb8THm/mqRkGPDJDK/KbP/W7tykvSg1D8ouRNAlXnwoH5OzrLi
pPTFLRNL5Xf78yD6RooInQCqPNkNpoTxfg4/217DgaLgG3SVfNlUkNpXFG8fX8Tf1IoZp9pbL2Yp4cZn
Us3kDmZdMY8RMiEqvOhaZ2lBHWTXjk5OksBvuf8JyOyxqLb4Vkotp5dZi++b vockey
[ec2-user@ip-192-168-3-40 .ssh]$ sudo vim labsuser.pem
[ec2-user@ip-192-168-3-40 .ssh]$ ssh -i labsuser.pem ec2-user@192.168.1.156
The authenticity of host '192.168.1.156 (192.168.1.156)' can't be established.
ED25519 key fingerprint is SHA256:yx14b4nEqemXlOxLRHrog4ltY6PU34idmIbq2ACSlFk.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.1.156' (ED25519) to the list of known hosts.
   ,     #_
   ~\_  ####_        Amazon Linux 2023
  ~~  \_#####\
  ~~     \###|
  ~~       \#/ ___   https://aws.amazon.com/linux/amazon-linux-2023
   ~~       V~' '->
    ~~~         /
      ~~._.   _/
         _/ _/
       _/m/'
[ec2-user@ip-192-168-1-156 ~]$
[ec2-user@ip-192-168-1-156 ~]$
[ec2-user@ip-192-168-1-156 ~]$
[ec2-user@ip-192-168-1-156 ~]$
```

```
       _/ _/
     _/m/'
[ec2-user@ip-192-168-1-156 ~]$
[ec2-user@ip-192-168-1-156 ~]$
[ec2-user@ip-192-168-1-156 ~]$
[ec2-user@ip-192-168-1-156 ~]$ ifconfig
enX0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 9001
        inet 192.168.1.156  netmask 255.255.255.0  broadcast 192.168.1.255
        inet6 fe80::10a7:9bff:fe94:d497  prefixlen 64  scopeid 0x20<link>
        ether 12:a7:9b:94:d4:97  txqueuelen 1000  (Ethernet)
        RX packets 22790  bytes 31572665 (30.1 MiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 4215  bytes 327437 (319.7 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 12  bytes 1020 (1020.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 12  bytes 1020 (1020.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

[ec2-user@ip-192-168-1-156 ~]$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=116 time=2.54 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=116 time=1.30 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=116 time=1.33 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=116 time=1.49 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=116 time=1.55 ms
64 bytes from 8.8.8.8: icmp_seq=6 ttl=116 time=2.13 ms
64 bytes from 8.8.8.8: icmp_seq=7 ttl=116 time=1.57 ms
64 bytes from 8.8.8.8: icmp_seq=8 ttl=116 time=1.77 ms
^C
--- 8.8.8.8 ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 7012ms
rtt min/avg/max/mdev = 1.304/1.709/2.536/0.398 ms
[ec2-user@ip-192-168-1-156 ~]$
```




Name
Launch template/configuration
Instances
Status
Desired capacity
Min
terraform-20241009183622993600000007
app-launch-configuration
2
-
2
1
Auto Scaling group: terraform-20241009183622993600000007
Group details
Edit
Auto Scaling group name
terraform-20241009183622993600000007
Date created
Wed Oct 09 2024 21:36:20 GMT+0300 (Eastern European Summer Time)
Desired capacity
2
Minimum capacity
1
Maximum capacity
3
Desired capacity type
Units (number of instances)
Status
-
Amazon Resource Name (ARN)
arn:aws:autoscaling:us-east-1:248193779364:autoScalingGroup:a89a7234-f2b4-4ecd-984f-35fb3f636df6:autoScalingGroupName/terraform-20241009183622993600000007
Find Instance by attribute or tag (case-sensitive)
All states
Instance state = running
Clear filters
Instance ID
Instance state
Instance type
Status check
Alarm status
Availability Zone
i-03af6abba8007f1f6
Running
t2.micro
2/2 checks passec
View alarms
us-east-1a
i-005c53055e955ba87
Running
t2.micro
2/2 checks passec
View alarms
us-east-1b
i-0c79a824353085a1e
Running
t2.micro
2/2 checks passec
View alarms
us-east-1a
Name
Allocated IPv4 addr...
Type
Allocation ID
nat-eip
54.172.183.161
Public IP
eipalloc-069f71d3c3924bbf2
main-gateway
igw-06288ae57e96f8c76
Attached
vpc-0bf01c56105fd96e0 | main-vpc
Details
NAT gateway ID
nat-0788be50c9491bad1
NAT gateway ARN
arn:aws:ec2:us-east-1:248193779364:natgateway/nat-0788be50c9491bad1
VPC
vpc-0bf01c56105fd96e0 / main-vpc
Connectivity type
Public
Primary public IPv4 address
54.172.183.161
Subnet
subnet-0904e4b6cb63dcb7c / pub_subnet-2
State
Available
Primary private IPv4 address
192.168.4.133
Created
Wednesday, October 9, 2024 at 21:36:14 GMT+3
State message
-
Primary network interface ID
eni-0b8070976ab00eb93
Deleted
-

Name	Security group ID	Security group name	VPC ID
–	sg-09f05ff7a796f87ff	default	vpc-04db7e2344e86161e
HTTP-SG	sg-0358b7f640f8e9ba6	terraform-20241009183615478000…	vpc-0bf01c56105fd96e0
–	sg-09fa3c82ae2782e04	default	vpc-0bf01c56105fd96e0
bastion-SG	sg-04f4b8315db6dc02c	terraform-20241009183615470200…	vpc-0bf01c56105fd96e0

Name	Subnet ID	State	VPC	IPv4 CIDR
priv_subnet-1	subnet-090438304101c4a8e	Available	vpc-0bf01c56105fd96e0 | main…	192.168.1.0/24
pub_subnet-2	subnet-0904e4b6cb63dcb7c	Available	vpc-0bf01c56105fd96e0 | main…	192.168.4.0/24
pub_subnet-1	subnet-0b57975c517d51195	Available	vpc-0bf01c56105fd96e0 | main…	192.168.3.0/24
–	subnet-0148f272f7c98d9af	Available	vpc-04db7e2344e86161e	172.31.0.0/20
priv_subnet-2	subnet-02335556e0690fc36	Available	vpc-0bf01c56105fd96e0 | main…	192.168.2.0/24

Name	Route table ID	Explicit subnet associ…
public_RT	rtb-0da6fa665aac0e497	2 subnets
–	rtb-09aa7ec4f411cbc77	–
–	rtb-0a35575a971d00249	–
private_RT	rtb-08f6ba0d2a0b6cb16	2 subnets

Graduation Project DEPI_1_CAI1_ISS4_G1e AWS Cloud Solution Admin & Architect

Deploying a Highly Available Web Application with Auto Scaling using IAC "Terraform"

Supervised by:

DR-Ibrahim Gomaa

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Documentaion

AWS Infrastructure Deployment Documentation

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Stack Destroy

```
    }

  # aws_vpc.main will be destroyed
  - resource "aws_vpc" "main" {
      - arn                                  = "arn:aws:ec2:us-east-1:248193779364:vpc/vpc-0bf01c56105fd96e0" -> null
      - assign_generated_ipv6_cidr_block     = false -> null
      - cidr_block                           = "192.168.0.0/16" -> null
      - default_network_acl_id               = "acl-0f451ed4649a8bc07" -> null
      - default_route_table_id               = "rtb-0a35575a971d00249" -> null
      - default_security_group_id            = "sg-09fa3c82ae2782e04" -> null
      - dhcp_options_id                      = "dopt-047a70bc12cb7ce8d" -> null
      - enable_dns_hostnames                 = false -> null
      - enable_dns_support                   = true -> null
      - enable_network_address_usage_metrics = false -> null
      - id                                   = "vpc-0bf01c56105fd96e0" -> null
      - instance_tenancy                     = "default" -> null
      - ipv6_netmask_length                  = 0 -> null
      - main_route_table_id                  = "rtb-0a35575a971d00249" -> null
      - owner_id                             = "248193779364" -> null
      - tags                                 = {
          - "Name" = "main-vpc"
        } -> null
      - tags_all                             = {
          - "Name" = "main-vpc"
        } -> null
        # (4 unchanged attributes hidden)
    }

Plan: 0 to add, 0 to change, 23 to destroy.

Do you really want to destroy all resources?
  Terraform will destroy all your managed infrastructure, as shown above.
  There is no undo. Only 'yes' will be accepted to confirm.

  Enter a value: yes
```

```
aws_autoscaling_group.app: Destruction complete after 3m50s
aws_subnet.subnet1: Destroying... [id=subnet-090438304101c4a8e]
aws_subnet.subnet2: Destroying... [id=subnet-02335556e0690fc36]
aws_launch_configuration.app: Destroying... [id=app-launch-configuration]
aws_lb_target_group.test: Destroying... [id=arn:aws:elasticloadbalancing:us-east-1:248193779364:targetgroup/TG-bassam/a393b9122df0f83f]
aws_launch_configuration.app: Destruction complete after 0s
aws_security_group.HTTP_SG: Destroying... [id=sg-0358b7f640f8e9ba6]
aws_lb_target_group.test: Destruction complete after 1s
aws_subnet.subnet2: Destruction complete after 1s
aws_subnet.subnet1: Destruction complete after 1s
aws_security_group.HTTP_SG: Destruction complete after 2s
aws_vpc.main: Destroying... [id=vpc-0bf01c56105fd96e0]
aws_vpc.main: Destruction complete after 1s

Destroy complete! Resources: 23 destroyed.
```